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Engineering Economics: Decisions and Solutions from Eurasian Perspective

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Specificity of Sustainability Assessment for Industrial Enterprise Functioning in the Digital Economy

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Abstract. The purpose of this article is to consider the main provisions of assessing the stability of enterprise functioning in the conditions of digitalization of the Russian economy. The paper investigates the essence of the digital economy and proves its relevance at the current development stage of the Russian market. The key indicator of a high level of digitalization is the adoption of management decisions based on objective business analysis data, as well as the use of technological tools to improve the stability of enterprise functioning. Therefore, the author examines the Russian and foreign methods of assessing sustainability, identifying similarities and differences between them. The author also considers the need for a comprehensive assessment of sustainability not only from the financial point of view, but also from the point of view of the environmental and social significance of this issue. This is a time-consuming, painstaking process, so you cannot do without developing appropriate information programs. It can be argued that with the help of digitalization, an industrial enterprise is able to strengthen the sustainability of its functioning in the market, and increase its work efficiency.

Keywords: Digital economy · Industrial enterprise functioning · Sustainability

1 Introduction

The topic of the digital economy is extremely relevant nowadays. The term "digital economy" itself has moved from scientific journalism to the mass media relatively recently, in the last 5–6 years. The maximum attention to it arose in 2017 during the rise of the cryptocurrency profitability, after which various structures, businesses, and individuals became interested in this problem. Accordingly, at the state level, they began to deal with digitalization issues: the national program "Digital economy of the Russian Federation" was developed [15]. It stated that the Russian state policy in the digital economy is focused on creating conditions for its full development. So now "digital economy" is a common term. It is common in many sectors of the national economy of our country, and even in the sphere of state management (for example, the Ministry of Digital Economic Development was created in the structure of the Government of the Russian Federation in May 2018).

The digital economy is based on a qualitatively new type of digital information and communication technologies (ICT), which cover and transform all areas of the

industrial and social life of the world economy in general and the national economy of Russia in particular. This economy type is still in the process of formation, but already now, with its powerful potential, it offers businesses and countries a chance to take leading positions in the main areas of the socio-economic development (if it is successfully implemented).

The financial component of digitalization plays a crucial role in the efficient allocation of resources, economic growth and job creation. Having an efficient enterprise to stimulate and maintain the growth of the state economy is a requirement for all countries [12]. In Russia, the construction of a digital model of the economy is based on an industrial and production model. Therefore, the main leverage of the digital breakthrough for Russian enterprises is to obtain sufficient finance for the development and acquisition of digital assets by increasing the efficiency of industrial enterprises and strengthening the stability of their functioning in the market.

The basis of the digital economy is the digitalization of production. It ensures the optimization of the workflow by making software and hardware decisions. In turn, this implies, in addition to replacing production tools, the application of analytical systems that can make production as efficient as possible. Key indicators of a high level of digitalization are: making management decisions based on objective business analysis data, as well as using technological tools to improve the labor productivity and, ultimately, the sustainability of enterprise's functioning.

At present, the company's stability is one of the main factors of its activity in modern conditions, so the importance and role of its assessment, as well as the search for improvement factors, has significantly increased both for the company itself and for its contractors. In turn, instability can have a negative impact on the state of the Russian economy in general, and can also cause non-payments and a slowdown in the business activity of enterprises in particular. That is why it is so important to prevent an unstable financial state of an industrial enterprise at an early stage. This can be achieved through timely identification of factors that affect the sustainability level, as well as through a continuous analysis and development of specific measures based on it to restore stable functioning of the enterprise, which in turn guarantees its survival.

Sustainable development has become a fundamental issue in the modern world, a task that businesses can no longer ignore. But here the main drawback of the existing methods of assessing sustainability in the Russian economic literature comes to the fore – they consider only financial stability, since the main goal of the enterprise's functioning in the market is fairly considered to be profit maximization. In other words, entrepreneurship is mainly focused on the economic development and welfare growth, while environmental and social issues are mostly avoided [13]. This is extremely narrow consideration of the problem. Through digitalization, businesses can maintain their sustainability by acting responsible or more precisely: financially, environmentally and socially sustainable [4].

The term "sustainable development" was first used in 1987 when the report "Our common future" (the World Commission on Environment and Development, WCED) was published [3]. According to this report, sustainability is aimed at ensuring the equality between generations. The sustainability principles expressed in this way are indisputable. Most people want to live like their parents, and they want their children to enjoy the same opportunities. The same logic applies in business – most managers want

their business to be at least as profitable as it was in the past, and, ideally, to grow profits. Thus, time is a central factor in the sustainability concept [1].

The growing importance of environmental, social issues and sustainable enterprise development has given rise to the concept of sustainable entrepreneurship, which can be considered as an opportunity to assess financial sustainability at the intersection of environmental and social aspects. Digitalization helps to solve this problem and industrial enterprises are increasingly strengthening their competitive positions through innovative actions in the field of sustainable development, considering issues of financial stability in conjunction with the social and environmental sustainability. Based on this, it can be stated that sustainable entrepreneurship opens up new opportunities for the development of corporate responsibility, taking into account environmental and social aspects [16].

2 Methodology

Historically, the success of the enterprise was explained almost exclusively by its economic efficiency. Many authors emphasize the importance of "planning and efficiency as the main elements of integrating sustainability into enterprise operations" [9]. The research purpose in the field of entrepreneurship was to generate economic benefits or, in some cases, create sources of employment. These factors traditionally determine the contribution of sustainable entrepreneurship to the development of the national economy as a whole. Therefore, value creation was usually measured in economic and financial terms by indicators such as sales, profit, or return on investment, and was always understood solely as maximizing individual profits.

Generalization and comparative analysis of methodological provisions for assessing the sustainability of the enterprise allows identifying the most advanced methods of managing sustainability, so that they can be used in the practical activities of analytical services of Russian enterprises. For this purpose, it is necessary to describe typical procedures for assessing sustainability in Russian and foreign economic literature and identify similarities and differences between them.

First of all, it should be noted that both in the Russian Federation and abroad, qualitative (non-financial) aspects that reflect current trends in the sustainable business development are increasingly supplemented by quantitative (financial) indicators. Here, we are talking about the process of creating new concepts for measuring, accounting and evaluating non-financial aspects that are related to sustainable business, as well as how the classical model for assessing performance and management affects this process [2].

Considering differences between domestic and foreign methods for assessing sustainability, we can note a fairly broad system of sustainability indicators in the foreign literature, when it includes, for example, the return on equity (a variable widely used in research related to finance and accounting); the return on assets (the growth of this indicator in dynamics is considered as a necessary condition for the stability growth of the enterprise's functioning) [7]. In the domestic economic literature, profitability indicators clearly relate to criteria for evaluating the efficiency of the enterprise performance, and the Russian economists usually do not mix sustainability indicators and profitability indicators.

The main specific feature of the Russian approach is that business sustainability can be assessed using absolute and relative indicators. To determine a sustainability type using a three-component indicator (depending on the coverage degree of reserves with various financial sources, four types are distinguished: absolute, normal, unstable, and crisis), it is proposed to calculate three absolute indicators, and then compare them with the size of reserves. Considerations of this method by different authors may not coincide in detail, but in general its meaning is unchanged. Abroad, this method is not used at all (the use of absolute indicators implies the impossibility of their spatial and temporal comparisons). As for relative indicators of business sustainability, there are a significant number of them in the Russian economic literature, and they are most often divided into two groups:

1. Indicators of the capital structure (independence coefficients, loan-to-equity ratios, etc.) – in fact, they represent the ratio of various elements of the enterprise's capital;

2. Indicators of asset finance (coefficients of working capital mobility, maneuverability of equity capital, and others) – the ratio of current assets or own working capital to various elements of an asset or liability.

A comparison of Russian and foreign methods of assessing the business sustainability using relative indicators allows us to conclude: in the foreign economic literature, there are no analogues of the second group of coefficients at all. However, it is replaced by a group of indicators (for example, the ratio of profit before taxation and interest paid for the use of borrowed funds or "times interest earned ratio") that characterize the ability to service debt – this group of indicators, in turn, is not used in the Russian methodology for assessing sustainability [10].

As another difference, we can highlight the fact that in the foreign economic literature, the normative values of financial stability coefficients are most often absent, and in the domestic one – almost all coefficients have regulatory restrictions. However, their use is not effective enough, because they are not differentiated by industries and therefore the very meaning of establishing such strict criteria is lost. In addition, the existing regulatory restrictions have not been revised for a long time, and during this period, the changes in the business environment have made this revision very relevant.

As a result of this research, we can conclude that the main content of the methodology for assessing the stability of the enterprise's functioning does not differ in the domestic and foreign literature. At the same time, directions of this assessment and the set of indicators for each of them are quite stable abroad, so results can be comparable in the spatial and temporal aspect, and are effective for their practical use. In the Russian economic literature, we can note a variety of approaches, but there is still no unity: different authors have their own definition of key concepts, their own set of sustainability indicators, their own methods of calculating and analyzing them. Therefore, it is necessary to expand research on the problem of selecting indicators for assessing the enterprise sustainability (financial, environmental and social – in a complex) in the conditions of modern Russian economy and develop a unified methodology for this assessment. This extension is necessary to improve the analysis quality of the enterprise sustainability and improve the reliability results obtained. But this is painstaking and extremely time-consuming work that requires statistical

processing of a lot of data, and for this you need appropriate software. Consequently, the relevance of the production digitalization in modern economic conditions is confirmed.

3   Results

The main goals of enterprise development in the modern conditions of the Russian market are: profit maximization, growth of the share, diversification, etc. These goals make business entities to develop new approaches to achieve them. It is necessary that these approaches allow you to create and more effectively use the existing resource potential of the enterprise, are comprehensive and focused on the application of innovations in organizational, economic, economic and managerial issues.

The economic development process is uneven, and traditional management methods are extremely weak in linking goals of an industrial enterprise with such a dynamic market situation. Therefore, traditional management methods should be replaced with more advanced ones, which would be aimed at adapting the enterprise to modern market conditions. The constantly changing market situation determines the main goal of Russian enterprises – to maintain the stability of their activities.

In modern market conditions, the basis for sustainable operation of the enterprise is the stability of its functioning. A sustainable enterprise has many advantages over other enterprises of the same sphere in attracting investments, loans, selecting suppliers and qualified personnel [8]. The lack of stability is fraught with a lack of funds to finance current and investment activities and can lead to insolvency, and if the financial condition deteriorates – to bankruptcy. In turn, an overabundance of sustainability puts the company on a difficult development path, burdening it with unnecessary expenses.

The concept of enterprise sustainability is attracting more and more attention from the point of view of the theory for studying this issue and its practical application. It becomes especially important for Russian enterprises because of the sanctions (i.e. restrictions on the purchase and sale of goods from foreign countries), the deterioration of foreign trade relations, and the depreciation of the Russian national currency. However, this has also become a stimulating factor for activities of industrial enterprises at the regional level in Russia. In addition, the constantly changing situation in the field of accounting and reporting has contributed to the adaptation of economic entities to dynamic environmental conditions. All this together contributes to a comprehensive analysis of sustainability issues. Thus, we can say that the basis for the stability of the company's position and the key to success is its sustainability. Without its strengthening, no enterprise can present itself on the market as a competitive organization, operate atlist full capacity, and is able to move forward in its activities. Assessment of the company's sustainability helps to identify the financial condition at a certain point in time, evaluate the dynamics of its changes, disclose reasons for ist deterioration or improvement, and develop a plan of actions to increase the liquidity and solvency of the organization.

4   Discussion

Innovative development of an industrial enterprise using digital technologies is always aimed at increasing the efficiency of its activities and forms appropriate reserves for this growth. But in practice, different types of innovations have different effects on the economic efficiency, i.e. they determine different ways to increase (reserves) the effectiveness of forming an enterprise's innovation and technological potential. Innovations provide for an increase in the production efficiency in some cases by increasing demand for products, improving their quality, expanding production of products with new properties; in other cases – by reducing production costs as a result of using new, more advanced and cost-effective technologies. There are many types of innovations in the activities of industrial enterprises at present. And here, it is most appropriate to identify and analyze those innovations that have a direct impact on the efficiency of an industrial enterprise and the stability of its functioning through new technologies, organizational and managerial structures [6].

The review of the Russian economic literature on the research issues allows us to conclude that sustainability is directly related to the financial condition (solvency and liquidity) of the business entity and persists for a fairly long period of time. Therefore, as sustainability in relation to an industrial enterprise can be considered the creation of such an internal system of organization for its production and financial activities, which could guarantee the operation of the enterprise in the market through effective management of its assets. At the same time, in conditions of instability of external factors, own and attracted sources of capital are used, so without effective use and distribution of the enterprise's resources, as well as cost-effective management of the sources of their formation and financial risks, it is impossible to achieve success in the market. In other words, if an enterprise has a system of organizing production and financial activities that ensures its financial sustainability for a long time, then it has financial and economic stability.

A well-functioning enterprise is capable of self-regulation. In other words, it is adapted to changing external and internal conditions. In this regard, we can highlight an important feature of the term sustainability of an industrial enterprise as an economic system: it reflects the ability of the enterprise to maintain its integrity as a system, and at the same time to develop (progress), despite the impact of external and internal factors. The company has responsibilities and obligations to many different internal and external stakeholders in the market and society. This underscores the need for organizations not only to maximize their revenue (value), but also to do so in a sustainable and socially responsible manner [14].

At the request of global investors and regulators, enterprises disclose internal information about sustainability indicators, on the basis of which scientists have begun to conduct research to assess reporting of enterprises and the financial stability of their functioning. The goal of creating value for an organization can be achieved if its management takes into account the interests of all stakeholders and integrates the five dimensions of sustainability (economic, managerial, social, ethical, and environmental) into management strategies, actions, and reporting [11]. This is more relevant in modern conditions, when financial management implements tactical measures to the

detriment of the strategic interests of the company's development [17]. During the crisis, most Russian organizations revised their strategies under the influence of factors such as the devaluation of the ruble, difficult access to capital (primarily credit resources because of the lack of liquid collateral), lower oil prices, and consequences of the introduction of sectoral sanctions by the United States and the European Union against Russian companies.

The enterprise management is associated with the delegation of managerial goals and tasks. The concentration of financial leverages (rewards and restrictions) in the hands of a manager increases the importance of these communications for the sustainable development of the enterprise. The controlling influence from above rises from below as a signal related to the surrounding circumstances and processes. Digitalization allows management personnel to maximize the efficiency of the enterprise and strengthen the sustainability of its functioning.

5   Conclusion

The issue of the economy digitalization in modern conditions of the Russian market (and the world economy as a whole) is one of the priorities. With the help of digitalization, an industrial enterprise can strengthen the sustainability of its functioning in the market. To achieve maximum success in the market and increase the efficiency of its activities by several percent, the company needs to put digitalization as the basis for working out its development strategy [5].

Our country has all the prerequisites for accelerating the pace of the economy digitalization. The Russian Federation has all the necessary intellectual and scientific base. In addition, it has original organizational and technological solutions for creating an effective infrastructure for the digital economy. It is essential for the implementation of the program "Digital economy of the Russian Federation" [15], not only R&D funding was increased, but also training in the field of IT was improved, because in our country there is a serious shortage of qualified personnel in the ICT sector. It is necessary to solve this problem at all levels: at the level of high educational institutions, at the level of industrial enterprises (during corporate training), and at the state level (during the implementation of the state program to support the development of education in the field of ICT).

References

1. Bansal, P., DesJardine, M.R.: Business sustainability: it is about time. Strateg. Organ. **12**(1), 70–78 (2014). https://doi.org/10.1177/1476127013520265
2. Dvořáková, L., Zborková, J.: Integration of sustainable development at enterprise level. Procedia Eng. **69**, 686–695 (2014). https://doi.org/10.1016/j.proeng.2014.03.043
3. Environment & Society Portal: UN world commission on environment and development, ed., report of the world commission on environment and development: Our common future. http://www.environmentandsociety.org/mml/un-world-commission-environment-and-development-ed-report-world-commission-environment-and. Accessed 08 Apr 2020 (1987)

4. Flores-Hernández, J.A., Cambra-Fierro, J.J., Vázquez-Carrasco, R.: Sustainability, brand image, reputation and financial value: manager perceptions in an emerging economy context. Sustain. Dev. **28**(1) (2020). https://doi.org/10.1002/sd.2047

5. Istomina, E.A.: Methodology assessment of trends in the digital economy of industry. Bull. Chelyabinsk State Univ. **12**(422), 108–116 (2018). https://doi.org/10.24411/1994-2796-2018-11212

6. Khalabuda, Y., Nikolaev, M.: Increase of efficiency of industrial enterprises activity on the basis of innovations of various types. Procedia Econ. Finance **16**, 299–302 (2014). https://doi.org/10.1016/S2212-5671(14)00805-3

7. Lassala, C., Apetrei, A., Sapena, J.: Sustainability matter and financial performance of companies. Sustainability **9**(9), 1498 (2017). https://doi.org/10.3390/su9091498

8. Mokeev, V.V., Bunova, E.V., Perevedentceva, A.V.: Analysing the economic stability of an enterprise with the help of Eigenstate method. Procedia Eng. **129**, 681–689 (2015). https://doi.org/10.1016/j.proeng.2015.12.091

9. Phusavat, K., Rassameethes, B., Lesjak, D., Chindavijak, C.: Developing model for integrating sustainability into enterprise operations. Int. J. Manage. Enterp. Dev. **17**(4), 329–346 (2018). https://doi.org/10.1504/IJMED.2018.096237

10. Pimenova, E.M.: The main directions and indicators of assessing the financial condition of the enterprise in the domestic and foreign literature. In: Khasaev, G.B., Ashmarina, S.I. (eds.), Proceedings of the 17th International Scientific and Practical Conference "Problems of Enterprise Development: Theory and Practice, pp. 237–242. SSEU Publishing House, Samara (2018)

11. Rezaee, Z.: Business sustainability research: a theoretical and integrated perspective. J. Acc. Lit. **36**, 48–64 (2016). https://doi.org/10.1016/j.acclit.2016.05.003

12. Roghaniana, P., Raslia, A., Gheysari, H.: Productivity through effectiveness and efficiency in the banking industry. Soc. Behav. Sci. **40**, 550–556 (2012). https://doi.org/10.1016/j.sbspro.2012.03.229

13. Sarango-Lalangui, P., Santos, J.L.S., Hormiga, E.: The development of sustainable entrepreneurship research field. Sustainability **10**(6), 2018 (2005). https://doi.org/10.3390/su10062005

14. Svensson, G., Wood, G., Callaghan, M.: A corporate model of sustainable business practices: an ethical perspective. J. World Bus. **45**(4), 336–345 (2010). https://doi.org/10.1016/j.jwb.2009.08.005

15. The National Program: Digital economy of the Russian Federation (2018). http://government.ru/rugovclassifier/614/events/. Accessed 08 Apr 2020

16. Urbaniec, M.: Sustainable entrepreneurship: innovation-related activities in European enterprises. Polish J. Environ. Stud. **27**(4), 1773–1779 (2018). https://doi.org/10.15244/pjoes/78155

17. Vovchenko, N.G., Holina, M.G., Orobinskiy, A.S., Sichev, R.A.: Ensuring financial stability of companies on the basis of international experience in construction of risks maps, internal control and audit. Euro. Res. Stud., **XX**(1), 350–368 (2017). https://doi.org/10.35808/ersj/623

Formation of Industrial Policy Under Uncertainty Growth

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Abstract. With the growing global uncertainty index caused by unforeseen shock scenarios from viral exposure, as well as the rapid development of new digital technologies, it is necessary to find effective ways to manage production activities. The relevance of the study is to justify the need to institutionalize the forms and methods of directive management of the economy to increase its innovativeness and competitiveness, in accordance with the characteristics of each country. The research purpose is to reveal the nature of modern discussions regarding the methods regulating economic processes and to justify the increasing role of industrial policy of states in combination with ensuring freedom of enterprises. The methods include a retrospective analysis of the forms and methods regulating economic activity, a comparative analysis justifying the scenarios of industrial revival on a new technological and social base under centralized state planning and management. As a result, incentives for production and investment activities in high-value added industries are justified using industrial policy tools (investment, tax, financial, administrative regulation, etc.).

Keywords: Competitiveness · Crisis · Development · Industrial policy · Institutionalization · Uncertainty

1 Introduction

At present, profound transformational shifts are taking place in the scale and models of reproductive activity of business entities at the level of world and national economies. Representatives of economic authorities and business are to understand the essence of the changes to develop new lines and directions of development, competencies, methods of organizing production. It is no coincidence that in the scientific and business environment there is increasing interest in the search for effective methods and ways to develop the potential of manufacturing sectors that are adequate to modern challenges of the development of society, the world economy, science and technology, and natural factors.

The exhaustion of purely market mechanisms and models for the priority organization of high value-added industries requires the identification of new ways to boost the business activity of industrialists and entrepreneurs based on focused policy that ensures clear and stable operating conditions on the planning horizon of up to three to five years. In the global economy, the interdependence of firms in individual countries

has become strong. The links of a single cross-border value chain, the jumps of uncertainty for them are more synchronized due to the general dynamics of production and consumption, regulatory instruments. In such large integration entities as the European Community, NAFTA, Mercosur, as well as the Eurasian Economic Union (EAEU), close trade and economic relations between the participants lead to more rigorous synchronization of the uncertainty factor caused by unforeseen shock phenomena, such as a modern oil crisis or social stagnation due to the coronavirus pandemic.

The argument has become significant regarding the growing role of unforeseen large-scale factors provoking uncertainty around the world, because of which both domestic production and global value chains will suffer, weakening production links especially in less developed countries of the world that do not have high scientific and technical potential. To avoid a particularly negative scenario of a fall in GDP due to a loss of a place in global value chains, national economies need to switch to production of higher value-added goods, import-substituting policies and increase domestic consumption, which will promote a new economic order using state policy decisions.

2   Methodology

In the course of the study, the authors applied the retrospective analysis of the forms and methods of managing countries with different types of economic activity, attitudes toward freedom of enterprises, a meaningful economic interpretation of the implemented industrial policy, and the characteristics of the economic practice of leading world powers. Changes in distribution of centers of economic power in world economic geography, mainly caused by Industry 4.0, as well as by significant social and humanitarian shocks in the form of a deadly virus pandemic, an oil market crisis, local wars, and West-East sanctions, are considered.

In the business agenda and specialized literature, it has become a habitual place to exploit the terminology of national economic egoism, protectionism, promote various restrictive measures in sanction and counter-control regimes for political purposes, decline in living standards under the influence of the global crisis, etc. The increased macroeconomic uncertainty in the ways and methods of economic development compel even developed capitalist countries to introduce and strengthen directive methods regulating economic activity. The implemented measures of direct and indirect support of private enterprises are more inherent in doctrines of socialism than the concept of "pure capitalism" in the version of the Washington Consensus, and contribute to the revival of industry on a new technological and social base under centralized state planning and management.

3   Results

Since 2011, many researchers note that international value chains have stopped expanding, their volume growth has almost stopped today. According to Ahir, Bloom and Furseri [1], this change along with the digital transformation of industry has been

caused by the growth of the uncertainty factor. They showed that from 2008 to 2011, the World Index of Uncertainty (VIN) grew by 200%, and in today's environment of deep geo-economic shock caused by the coronavirus pandemic, the suspension of industrial production and limited human mobility, it has grown even more. Under a high degree of uncertainty regarding the favorable business environment and the deteriorating business environment, the willingness of companies to invest in the development of production and to hire workers, as well as to carry out industrial research and development (R&D), is declining. In the consumer market, people are objectively intensifying their tendency to save, they are reluctant to spend money since there is lack of understanding the favorable nature of ongoing changes and a clear increase in unemployment.

The experience of countries successfully implementing industrial policy, especially in the face of growing uncertainties, shows that all of them used import substitution, but at the same time they focused on exporting products to the world market. They are characterized by systemic measures to attract foreign investors and to form the global competitiveness of their enterprises and their products. The most successful of them were embedded in global value chains, making extensive use of various forms of cooperation, strategic alliances, while maintaining their independence and economic security. The main approaches to the formation of industrial policy are presented in Table 1.

Table 1. The content of industrial policy in scientific works of specialists

No.	Author	Definition	Kea features
1.	Tolkachev and Teplyakov	Russia needs reindustrialization policy, not only import substitution or export-oriented development [16]	We need new industrialization
2.	Tatarkin	The system of relations between state and municipal authorities, business entities, scientific organizations and civil institutions regarding the formation of a structurally balanced, competitive industry	We need institutionalization of the competitive industry on the innovative basis, the intellectual core of which corresponds to the latest technological structure [15]
3.	Rubenstein	The synthesis of relations between the state and business entities aimed at the formation of the competitive industry [10]	We need collaboration policy to improve the competitiveness of industrial enterprises
4.	Simachev, Kuzin, Kuznetsov, and Pogrebnyak	Allocate separate types: – industrial policy in the open economy, – compensatory industrial policy, – technological industrial policy [12]	We need structure industrial support measures in the categories of sustainability, innovation and international competitiveness

(continued)

Table 1. (*continued*)

No.	Author	Definition	Kea features
5.	Larionova	A system of measures aimed at developing the national economy, the latest technologies and products with a high degree of processing, modern information and other services, human capital [8]	Industrial policy is considered as part of socio-economic policy of the state
6.	Spring, Hughes, Mason, and McCaffrey	Industrial policies can prevent disruptions to production systems as technology innovations become commercially viable products	Industrial policy should expand its conceptual scope, contribute to a change in the institutional structure of the economy, and organize active interaction with applied research organizations and universities [14]
7.	Shyu, Joseph, Ding	Super-efficient technologies and intensified global competition have generated the desire for industrial revival through relevant active policies in many countries	It is authorized by the state to use certain acceleration instruments of industrial development that are most suitable for the conditions of individual countries [11]

Source: authors.

With the increasing role of public administration in the specialized literature, one can come across various definitions of industrial policy. Some interpret it as a condition for modernization and revitalization of economic growth, assistance in carrying out structural reforms. In many ways, this approach identifies it with economic policy, depriving industrial policy of its subject of study. Others define it as a separate component of general economic policy, along with financial, tax, etc. In Russia, with the beginning of market reforms, following liberal concepts prevailing in the leading capitalist countries, until recently, measures to support the structural transformations of high-tech types of economic activity were ignored by officials and scientists. However, in recent years such measures of "industrial policy" have received increasing support in developed economies, especially in the manufacturing sector, which has been heavily influenced by technological innovations. A comparative analysis of innovation policy undert revitalization of the industrial sector showed differentiation of specific tools in relation to different countries: in the USA, preference is given to demand-side policies and public services; in Germany, scientific and technological development is being added to this; in China, this is additional environmental and regulatory policy.

According to the definitions in Table 1, the tools of industrial policy include methods of various functional links of state regulation (investment, tax, financial, administrative regulation, etc.). Industrial policy has no separate, own tools. This erodes to some extent the boundaries and essential characteristics of industrial policy. In addition, while characterizing the experience of applying industrial policy, it is

important to justify the necessity, the direction of its use and the political factor. Despite a wide difference in approaches, all of them have common characteristics:

– need for state influence is determined in one form or another,
– certain prioritization system is singled out either in a sectoral context, or for individual functions of the economic mechanism,
– orientation to the long-term (strategic) perspective,
– comprehensiveness, that is, coverage of a wide range of measures and areas of activity.

In macroeconomic terms, government policy to support the economic activity of industrialists and entrepreneurs will help reduce risks for large corporations in developed countries by stimulating re-sharing processes (returning production capacities to the territory of parent companies). On the other hand, the "reverse pulling" of production and technological lines of transnational corporations into their national borders will negatively affect the industrial appearance of regions – their former locations, mainly in countries with developing economies. In addition to this, in the context of widespread digital transformation, the previous policy of moving production of added value to countries with cheap labor (Asia, Latin America, Russia recently) is currently changing to organizing its own production in countries with developed economies which have fully automated production lines with the prospect of lowest paid workers - robots.

Under the crisis and a high level of uncertainty, the role of industrial policy of the state as an organizing and guiding principle in the structural modernization of high value-added industries will increase in the interests of increasing the competitiveness of domestic enterprises. For this, we introduce various traditional measures, methods of stimulating an increase in the organizational and economic level of the activity of economic structures in the interests of the national economy: financial, regulatory, administrative, technical, foreign trade, labor, social, etc. Objectively, industrial policy is designed to reduce the level of uncertainty for enterprises in the spontaneous market environment and to increase their adaptive abilities to conditions of high turbulence in the business environment, to provide flexibility in modifying successful tools and methods of production and business activities.

It is no coincidence that industrial capital, evaluating future events with a high degree of probability as extremely negative for successful entrepreneurial activity, like the oil crisis of the 70s of the last century or the global financial and economic crisis of a decade ago, very carefully proceeds with new investments, being not sure of state support. For example, capital would never have gone into our domestic agricultural production if it had not outlined the possibility of successful investment and making big profits (the state program for leasing agricultural machinery, the program for supporting food export) gave impetus.

4 Discussion

In the studies of specialists, much attention is paid to the coordinating role of the state, as well as to the problems of improving the efficiency of manufacturing industries, which generate a high level of development in accordance with socio-economic interests of the country in the given period. In the conditions of economic crisis of both in our country and on a global scale, there are many uncertainties regarding forecasts for the global economic development, the goals of scientific and technological development in the face of challenges of Industry 4.0. We need an adequate design of industrial policy based on differentiation of approaches, accounting interests of specific actors of industrial and entrepreneurial activity, industrial complexes.

Andreoni and Chang [2] confirm the debatable nature of modern concepts of industrial policy. Its main theories, which were formed in the analysis of consistent development over the past few decades, revolve around three fundamental provisions regarding:

– roles and structural interdependencies of economic sectors, the conjugation of the processes of actors arising under industrialization,
– need to harmonize economic policy of a set of institutions promoting the industrial agenda,
– recognition of the role of the state in managing economic policy, its policy measures in combination with its entrepreneurial function.

These authors talk about the need for strategic coordination of interactive measures of industrial policy, coordinated interaction of management structures at the national economy level [2].

The work of Andreoni, Chang and Scazzieri [3] points out the need to update the discussion agenda on the content and form of industrial policy, focused on establishing the relationship of structures, institutions and policies. It should consider historical traditions of industrial relations, aspects of industrial, technical and market relations, as well as political economy. It is proposed to consider industrial policy in a broader aspect, within the framework of a holistic structure of socio-economic and political relations of society.

Landesmann and Stöllinger [7] note that the world economy is undergoing rapid structural changes. There are steady changes in the position of countries in global value chains, and they suggest discussing the importance of creating appropriate industrial policies for countries at different stages of development. In the context of financial and economic crises, middle-income countries are especially vulnerable to "structural external imbalances", uncertainties, and therefore the policy of supporting their productive forces is of great importance.

Eikhoff [6] emphasizes the so-called new industrial policy (declared in the European Union), aimed at "increasing the importance of the service sector (thermalization) on a global scale and at preventing the possible consequences of the form of de-industrialization and the associated reduction of jobs". It should fulfill the following two tasks: to restore lost ground in traditional areas of the domestic market (automotive, steel production, shipbuilding), to ensure the entry and conquest of new foreign

markets (genetic engineering, biochemical production, etc.) At the same time, considering the characteristics of these types of regulation in more detail, they can be defined as one or another modification of the vertical or horizontal industrial policy.

In turn, Bianchi and Labory [4], analyzing the nature and dynamics of four industrial revolutions experienced by capitalism, the characteristics of the introduced technological and technological innovations, show how radical structural changes occur in industrial policy in the medium term and in production organization methods.

Wu, Zhu, and Groenewold [17] based on a review of China's industrial policy, carried out through central planning for a five-year perspective, note its rigidly prescriptive nature of carrying out the levels of management of national economies and regions. This approach significantly increases the level of production.

A special study by Meckling and Nahm [9] is devoted to green industrial policy for alternative transport technologies, especially electric vehicles, which solve the problem of reducing greenhouse gas emissions. The authors rightly note that such declarations for environmental friendliness of production, the corresponding modernization of industry will promote export opportunities of auto-producing countries and will successfully participate in the competition.

Cheah and Ho [5], while studying 153 public-private technology transfer projects in the context of the Singapore economy, found that project financing through industrial policy and public funding for research and development significantly affects the results of innovation activities.

Ślusarczyk [13] emphasizes the importance of discussions in favor of new industrial policies to develop economies in the crisis. On the materials of industrial enterprises of the European Union, the author confirms the need to formulate new goals of industrial policy aimed at increasing the competitiveness of enterprises of the EU countries in the global economy, exploiting mainly the results of high-tech industry.

5   Conclusion

The industry of the developed country (for example, Russia of the Soviet period) has a highly differentiated complex of industries with both powerful mining and developed manufacturing industries. However, over the years of market reforms, due to various reasons, the state of the manufacturing industry has deteriorated significantly and, even though government authorities are trying to increase the role and share of manufacturing in the industrial structure of the industry, the share of manufacturing does not grow, and the share of extractive industries in gross value added has upward trend. In view of this, the formation and implementation of industrial policy should solve the systemic problem of restoring the proper technological level of manufacturing industries, especially machine-building economic activities. It is necessary to bring the level of contiguity of the technological structure of manufacturing industries to the level of advanced developed countries. At the same time, to neutralize the negative features of catch-up development, it is necessary to consider current geo- and macroeconomic conditions and make extensive use of modern tools of innovation, namely, focus on

breakthrough innovations, ensure faster growth of investments in the middle and final stages of technological chains, and facilitate the participation of domestic enterprises in global value chains.

References

1. Ahir, H., Bloom, N., Furseri, D.: 60 years of uncertainty. Finance Dev. **57**(1), 59–60 (2020)
2. Andreoni, A., Chang, H.-J.: The political economy of industrial policy: structural interdependencies, policy alignment and conflict management. Struct. Change Econ. Dyn. **48**, 136–150 (2019)
3. Andreoni, A., Chang, H.-J., Scazzieri, R.: Industrial policy in context: building blocks for an integrated and comparative political economy agenda. Struct. Change Econ. Dyn. **48**, 1–6 (2019)
4. Bianchi, P., Labory, S.: Manufacturing regimes and transitional paths: lessons for industrial policy. Struct. Change Econ. Dyn. **48**, 24–31 (2019)
5. Cheah, S., Ho, Y.: Effective industrial policy implementation for open innovation: the role of government resources and capabilities. Technol. Forecast. Soc. Chang. **151**, 11845 (2020)
6. Eikhoff, N.: Competition support policy or industrial policy. Bull. St. Petersburg Univ. Econ. Finance **3**(69), 8 (2011)
7. Landesmann, M.A., Stöllinger, R.: Structural change, trade and global production networks: an 'appropriate industrial policy' for peripheral and catching-up economies. Struct. Change Econ. Dyn. **48**, 7–23 (2019)
8. Larionova, I.V.: The role of innovation in industrial policy. Bull. Yakutsk State Univ. **3**(2), 59 (2006)
9. Meckling, J., Nahm, J.: The politics of technology bans: Industrial policy competition and green goals for the auto industry. Energy Policy **126**, 470–479 (2019)
10. Rubinstein, E.I.: Fundamentals of Industrial Policy. Surgut State Univ., Surgut (2000)
11. Shyu, C., Joseph, Z., Ding, K.: Industrial revitalization via industry 4.0 – a comparative policy analysis among China, Germany and the USA. Global Trans. **1**, 3–14 (2019)
12. Simachev, Yu., Kuzin, M., Kuznetsov, B., Pogrebnyak, E.: Russia on the way to a new technological industrial policy: among alluring prospects and fatal traps. Foresight **8**(4), 8–12 (2014)
13. Ślusarczyk, B.: The requirement of new industrial policy to support Polish economy. Procedia Econ. Finance **27**, 93–101 (2015)
14. Spring, M., Hughes, A., Mason, K., McCaffrey, P.: Creating the competitive edge: a new relationship between operations management and industrial policy. J. Oper. Manage. **49–51**, 6–19 (2017)
15. Tatarkin, A.I.: Industrial policy as the basis for modernization of the Russian economy. Bull. Chelyabinsk State Univ. **19**, 5–17 (2008)
16. Tolkachev, S.A., Teplyakov, EYu.: The law "On industrial policy" and the real industrial policy in the Russian Federation. The World New Econ. **2**, 113 (2015)
17. Wu, Y., Zhu, X., Groenewold, N.: The determinants and effectiveness of industrial policy in China: a study based on five-year plans. China Econ. Rev. **53**, 225–242 (2019)

Local Energy Strategies: A Digital Challenge

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Abstract. The paper addresses the problem of ensuring the sustainable development of local territories in the context of increasing demands for energy efficiency in regional development and new technological possibilities of energy due to digitization. The aim of the study is to carry out a typological characterization of energy strategies of the municipalities of the region (a Russian subject) on the basis of an analytical study of the strategic objectives adopted and implemented by them. The author's methodology has been developed and tested, and result in a set of energy strategies of municipalities of a specific region; their groupings and differentiation of all municipalities into various groups of innovative energy technologies. The author has done conclusions on readiness of local territories to digital challenges in the energy sphere, emphasized the role of prospective projects of Smart City, and identified barriers to Smart Energy Systems implementation.

Keywords: Energy Internet · Energy strategy · Municipal entity · Strategic planning · Smart City · Smart energy systems

1 Introduction

The strategic objective of the regional energy policy is to create a sustainable and self-regulating system for regional energy security which requires optimizing the territorial structure of fuel and energy production and consumption [1]. The strategic initiatives in the field of energy are of particular importance among regional energy policy instruments: development and territorial diversification of energy infrastructure; promotion of new renewable energy sources and energy carriers; development of digital energy conservation technologies. These initiatives are being decomposed at different hierarchical levels in relatively autonomous territorial subsystems (country-regions-municipalities-organizations) [12].

The regional dimension is important in Russia because of the existing economic specialization of certain regions, as well as the growing regional and subregional imbalances in the development of the Russian regions [4, 13]. The importance of the regional dimension is also determined by the rapid change in scientific approaches to energy management, influenced by digital technological trends: Smart Grids – Smart Energy – Smart Energy Systems.

The Smart Energy System concept represents a scientific shift in paradigms from single-sector thinking to a coherent understanding of energy systems that integrate all sectors and infrastructures on a digital technology basis (electricity, heating, cooling,

industry, construction, transport, etc.) [6]. This will require researching into energy strategies at the subregional level, taking into account: (i) advanced energy technologies and (ii) the long-term development priorities of each local territory.

The research is aimed at carrying out a typological characterization of energy strategies of the municipalities of a region (a constituent entity of the Russian Federation) on the basis of an analytical study of the strategic planning documents adopted and implemented by them.

2   Methodology

The study is based on the author's methodology, which makes it possible to perform a typological characterization of the energy strategies of the municipalities of a Russia subject based upon an analytical study of the strategic planning documents adopted and implemented by them (primarily targeting).

The methodology consists of the following steps:

1. The formation of a body of strategic planning documents of first-level municipalities (urban districts and municipal raions) of the Russian subject.
   For each municipality, the following documents posted on the official site of the local self-government body (as of 31 December 2019) are used:

   – municipal regulations on strategic planning,
   – the current strategy for the socio-economic development of a municipal entity (hereinafter referred to as the municipal strategy), which was approved not earlier than 2017 or an up-to-date municipal strategy approved earlier in 2017, plus an updated plan of activities to implement the municipal strategy.

2. The content analysis of key legal acts and strategic documents which resulted in a set of municipal energy strategies.
   The energy strategy of a municipality in this study refers to the set of priorities, goals, objectives and policies and project for the long-term development of various elements of the energy sphere of the municipality which are presented in the municipal strategy. The municipal energy sphere covers the fuel and energy complex as well as all energy-related facilities and processes. This is part of the heating sector owned by non-energy agencies; direct fuel installations; energy management of direct fuel and energy consumers (energy consuming industries and households) located at the territory.

3. The construction of groupings that allow all municipalities to be placed within various groups of energy technologies reflected in their energy strategies.

4. The implementation of the typological characterization energy strategies of the municipalities of the Russian subject.
   The methodology involved the following methods to ensure the reliability of the research and the scientific validity of the conclusions: theoretical methods (scientific abstraction, induction and deduction, analogies, graphic methods); empirical methods (classifications and typologies, structuring, expert estimates).

3   Results

Within the framework of the study, the methodology was applied to 37 municipalities of the Samara region consisting of 10 urban districts and 27 municipal raions.

A list of promising energy technologies has been compiled in five groups:

1. Electrical and heating networks.
2. Technologies of the oil industry.
3. New materials and coatings.
4. MicroGrid and autonomous renewable energy (RES).
5. Intelligent systems (smart technologies).

The results of the study Volkova, Burda, Gavrikova, and Konev [17] were used to mark and characterize the identified groups. Based on the results of the content analysis of the key legal acts and strategic documents of the municipalities of the Samara Region, a set of energy strategies was developed and an analytical table for urban districts and municipal raions was constructed (Table 1). This has enabled all municipalities to be positioned within the different groups of energy technologies reflected in their energy strategies.

Table 1. The availability of advanced energy technologies in energy strategies of municipal entities of the Samara region

Advanced energy technologies	Urban districts	Municipal raions
Electrical and heating networks	Samara, Togliatti, Syzran, Novokuybyshevsk, Chapaevsk, Zhigulevsk, Otradny, Kinel, Oktyabrsky, Pohvistnevo	Alekseevsky, Bezenchuksky, Bogatovsky, Bolsheglushitsky, Bolshechernigovsky, Borsky, Volzhsky, Elkhovsky, Isaklinsky, Kamyshlinsky, Kinel-Cherkassky, Kinelsky, Klyavlinsky, Koshkinsky, Krasnoarmeysky, Krasnoyarsky, Neftegorsky, Privolzhsky, Pokhvistnevsky, Sergiyevsky, Stavropolsky, Syzran, Khvorostyansky, Chelno-Vershinsky, Shentalinsky, Shigonsky
Technologies of the oil industry	Samara, Novokuybyshevsk	Neftegorsky
MicroGrid and autonomous renewable energy (RES)	Samara, Zhigulevsk	Borsky, Shigonsky
New materials and coatings	Samara, Togliatti, Pohvistnevo	Borsky, Pokhvistnevsky, Sergievsky, Shigonsky
Intelligent systems and smart technologies (smart city)	Samara, Togliatti, Syzran, Novokuybyshevsk, Zhigulevsk, Otradny, Kinel, Oktyabrsky, Pohvistnevo	Bezenchuksky, Elkhovsky, Isaklinsky, Neftegorsky, Pestravsky, Pokhvistnevsky jh21

Source: author.

The most popular advanced energy technology is electric and heating grid technology, which is used by all urban districts and municipal districts. As can be seen from the table, the energy strategies of the largest agglomeration centres – the urban districts of Samara and Tolyatti – incorporate promising energy technologies from most of these groups.

Among the small towns, we highlight the strategic initiatives of the city of Zhigulevsk within the framework of the project «The creation of an innovative solar generation complex and renewable energy sources aimed at the green economy» [16] with the implementation date of 2020–2030. Alternative energy as a new specialization of the urban district of Zhigulevsk is also reinforced at the regional level in the Strategy for socio-economic development of the Samara Region until 2030 [15].

It is noteworthy that all city districts propose to introduce the technologies of «smart city», along with technologies from the group «Electric and heat networks». Three cities of Samara, Tolyatti and Novokuybyshevsk are participants of the federal pilot project «Smart City» [14]. The project is being implemented in Russia within the framework of the national project «Housing and Urban Environment» [9] and the national program «Digital Economy» [8]. The analysis of the data presented at Fig. 1 shows a lack of innovation in municipal energy strategies.
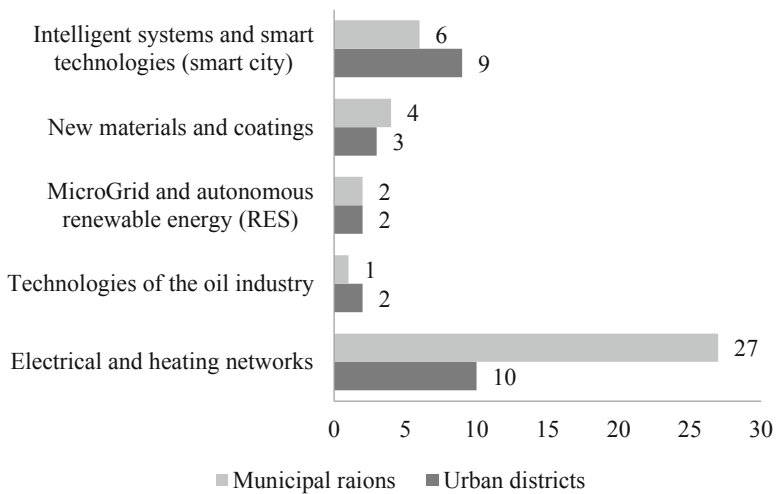
Fig. 1. The distribution of energy strategies of the municipal entities of the Samara Region according to the groups of advanced energy technologies, units . (Source: author)

Only 7 municipal raions out of 27 (25.9%) use advanced energy technologies of more than two groups. Less than a quarter of municipal raions (6 out of 27) plan to use intelligent systems and smart technologies (smart city). The Borsky, Neftegorsky, Pokhvistnevsky and Shigonsky municipal raions stand out positively in the overall array of municipalities. As an organizational innovation we shall highlight the strategic project envisaged by the municipal strategy of the Syzransky raion aimed at the creation of «Innovative center of thermal energy of small towns in the urban settlement of

Mezhdurechensk» . Thus, urban district energy strategies can be characterized as innovative-oriented, responding to digital challenges. The conclusion about municipal energy strategies is the opposite - their strategies do not meet current digital challenges.

4   Discussion

The results of the study can be interpreted in two ways. First of all, let us consider the digital dimension of the innovative technologies. The main technological trend that is rapidly transforming the energy sphere is the transition from Smart Grids to Smart Energy. Smart Grid technology is emerging as a result of the transformation of an electrical network based on rapidly evolving technologies: Microgrid, smart sensors, two-way communication, the digitization and automation of energy management processes. Smart Grid significantly changes the operating principles of the power supply chain, offering new principles of active and decentralized interaction between producers and consumers.

The integration of Artificial Intelligence (AI), Internet of Things (IoT) and blockchain technologies into the energy sphere ensures the digital response of the electrical network to rapidly changing real-time electricity needs. Thanks to solar panels, wind turbines and other energy sources, consumers are becoming energy producers, so the energy flow goes in two directions. The emerging Smart Energy has many advantages - from efficient power transmission to rapid energy recovery, energy efficiency and tariff reduction, and increased integration of various energy sources.

The driver for Smart Energy is Energy Internet (IoE). According to Zhou, Yang, and Shao [18], the Energy Internet is a new form of energy system development that implements the integration of energy flow, information flow and business flow. Energy Internet is an innovative presentation of energy systems at the fourth stage of development (smart & connected energy system). Energy Internet is a new solution for green development of smart cities [5]. Its wide application contributes to the improvement of the quality of life of the population and sustainable energy-efficient urban development [7].

In this context, the projects of the «smart city» within the municipal strategies mentioned above seem to be promising. We agree with the findings of O'Dwye, Pan, Acha, and Shah that digital solutions for systems with a wide range of characteristics and temporal scales require overcoming new barriers, related to the lack of proven methods and algorithms for dealing with complex networks of actors, often with competing objectives [10]. This leads us to the important question: are the regions ready for the development of their energy infrastructure, which is localized in their municipal entities? The existence of an innovation infrastructure, in turn, is a source and condition for the growth of innovation and, as a consequence, the overall competitiveness of each Russian region [2].

The second aspect relates to the implementation of the institutional conditions for strategic planning and management of the development of regional socio-economic systems. The relevant question is whether municipal strategies incorporating energy strategies meet current digital challenges. Note that the digital technologies that we consider in a broad sense include innovative management technologies [3]. This view

of the problem is consistent with the conclusions about the prospects of introducing the concept of Smart Energy Systems. In this regard, a possible regional initiative in this area could be the intersectoral integration of Smart Energy Systems at the territory of Samara-Togliatti agglomeration (STA) which comprises 8 urban districts and 9 municipal raions of the Samara Region [11].

5   Conclusion

Thus, the study defines the essence of municipal energy strategies. Based on the results of the application of the author's methodology, the characterization of the energy strategies of the municipal entities of the Samara Region on the basis of an analytical study of the strategic planning documents adopted and implemented by them for the period up to 2030. The main points and conclusions of the presented study develop the theory of spatial socio-economic systems from the perspective of methods of identification and expert assessment of factors and conditions of digital transformation of the regional energy sphere. The practical significance of the research is determined by the possibility of the use of the results obtained by business structures, state and municipal governments of Russian regions in decision-making on the implementation of Smart Energy Systems technologies.

References

1. Energy Strategy of Russia for the period up to 2030. Adopted by the Regulation of the Government of the Russian Federation No. 1715-r of 13 November 2009. http://www.consultant.ru/document/cons_doc_LAW_94054/. Accessed 01 Apr 2020
2. Khmeleva, G.A., Semenychev, V.K., Koroleva, E.N., Agaeva, L.K., Korobetskaya, A.A., Zvereva, I.V., Zenina, K.S.: Innovative development of Russian regions under sanctions. SamNZ RAS Publishing House, Samara (2017)
3. Kurnikova, M.V., Koroleva, E.N., Timofeev, A.G.: The model of municipal strategic planning in the context of digital economy. In: Mantuenko, V. (ed.) Proceedings of the International Scientific Conference "Global Challenges and Prospects of the Modern Economic Development". The European Proceedings of Social & Behavioural Sciences, vol. 57, pp. 1469–1482. Future Academy, London (2019). https://doi.org/10.15405/epsbs.2019.03.149
4. Lapin, A.V.: Socio-economic Territorial Differentiation: Theoretical and Methodological Aspects, Assessment and Analysis. Perm State National Research University, Perm (2018)
5. Li, L., Zheng, Y., Zheng, S., Ke, H.: The new smart city programme: evaluating the effect of the internet of energy on air quality in China. Sci. Total Environ. **714**, 136380 (2020)
6. Lund, H., Østergaard, A., Connolly, D., Mathiesen, B.V.: Smart energy and smart energy systems. Energy **137**, 556–565 (2017)
7. Mahapatra, C., Moharana, A.K., Leung, V.C.M.: Energy management in smart cities based on internet of things: peak demand reduction and energy savings. Sensors **17**(12), 2812 (2017). https://doi.org/10.3390/s17122812

8. National Program: Digital Economy. http://government.ru/rugovclassifier/614/events/. Accessed 01 Apr 2020
9. National Project: Housing and urban environment. http://government.ru/rugovclassifier/846/events/. Accessed 01 Apr 2020
10. O'Dwyer, E., Pan, I., Acha, S., Shah, N.: Smart energy systems for sustainable smart cities: current developments, trends and future directions. Appl. Energy **237**, 581–597 (2019)
11. Pavlov, Y.V.: Development of urban agglomerations: problems and solutions. Cent. Russ. J. Soc. Sci. **14**(5), 112–140 (2019)
12. Salina, T.K., Tchaikovskaya, D.D.: Nature and content of fuel and energy complex as an economic system. Probl. Modern Econ. **2**(42), 316–321 (2012)
13. Skufyina, T.P.: Socio-economic differentiation of space: inconsistencies between the theory and regulation practice. Econ. Soc. Changes Facts Trends Forecast **6**(30), 60–68 (2013)
14. The list of pilot municipalities of the Departmental project for the digitalization of urban economy "Smart City". https://russiasmartcity.ru/documents/22. Accessed 01 Apr 2020
15. The Strategy of the social and economic development of the Samara Oblast until 2030. https://economy.samregion.ru/upload/iblock/0ca/1_proekt-strategii-so_2030.pdf. Accessed 01 Apr 2020
16. The Strategy for the social and economic development of the Zhigulevsk urban district of the Samara Oblast until 2030. https://www.zhigulevsk.org/strategiya_2030/. Accessed 01 Apr 2020
17. Volkova, I.O., Burda, Y.D., Gavrikova, E.V., Konev, A.V.: Assessing conditions for the development of advanced energy technologies on the regional level in Russian Federation. Manage. Sci. **9**(1), 47–67 (2019)
18. Zhou, K., Yang, S., Shao, Z.: Energy Internet: the business perspective. Appl. Energy **178**, 212–222 (2016). https://doi.org/10.1016/j.apenergy.2016.06.052

Multidimensional Statistical Analysis of the Construction Cluster of the Samara Region

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Abstract. The article is devoted to the study of the interaction of the participants in the construction cluster, which determines the dynamics of the volume and pace of construction in the region. The main subjects of this process are construction organizations and manufacturers of building materials, products and structures. The basic requirements of regional construction companies to suppliers of building materials are determined. Factors are revealed that reflect the dependence of the results of the activities of construction companies on the production and economic activities of manufacturers of building materials. These factors comprehensively affect the growth rate of construction, the development of infrastructure facilities and the introduction of innovations in production processes. Based on the available observations for 7 years, a variance analysis of the samples was performed and regression dynamics models were built monthly and by year, and the significance and adequacy of the constructed models were estimated. The constructed mathematical models reflect the dependence of the volume of work performed in construction on the production indicators of manufacturers of building materials and supplying organizations.

Keywords: Building cluster · Forecasting · Regression models

1 Introduction

The capital-intensive branch of the economy, capable of increasing the country's economic growth rate, creating new jobs, and solving the sore social problems of the population, is construction [3]. To understand the reasons for the slowdown in this economic sphere, it is necessary to conduct a comprehensive analysis of the factors that comprehensively affect the growth rate of construction in the Russian Federation and the Samara region [1, 4].

This study examines the industrial and economic relations between construction organizations and manufacturers of building materials, products and structures. Developing organizations have a need to identify factors affecting the formation of industrial and economic relations and contractual relations in the field of construction in the region [2], the formation of optimal criteria for choosing sources of material and technical support for the construction process [6, 10].

2   Methodology

Formalized forecasting methods are based on the mathematical processing of statistical data; their accuracy largely depends on how accurate the information received used in the calculations [15]. If we consider the methods of extrapolation, then a great deal of complexity is the study and understanding of the dynamics of changes in a process or phenomenon in the previous period. Moreover, it is necessary to identify patterns and transfer them to the next period. Of course, modeling can be considered an effective means of forecasting [7]. One of the most acceptable forecasting methods is the regression analysis method. When studying the object of modeling, it is necessary to establish the relationship between the parameters included in the model and the effective attribute. In addition, the regression method is universal, there is the possibility of a wide selection of functional dependencies. But the most important thing to note is the use of information technology.

The regression models include only those factors that are most associated with the effective indicator. In addition, factors that duplicate the same information about an effective indicator should not be included in the model in order to exclude the phenomenon of multicollinearity.

3   Results

A survey of regional construction companies revealed a list of their requirements for suppliers of building materials. The significance of certain criteria for the selection of sources of material and technical support for the construction process is reflected in Fig. 1.
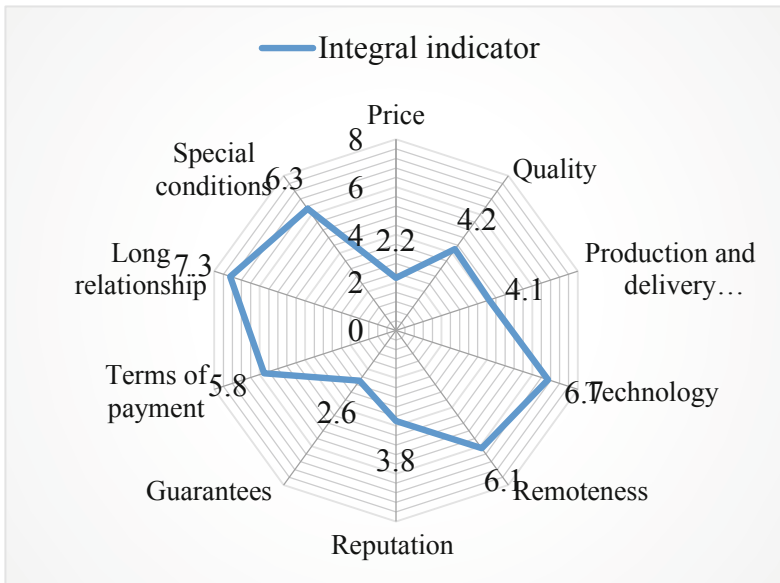
Fig. 1. An average assessment of the significance of the selection criteria by construction organizations of the Samara region for suppliers of material resources (on a 10-point scale). (Source: author)

According to the results of the survey, the following significant selection criteria for suppliers of building materials can be identified that affect the nature of industrial and economic relations and contractual relations with both existing and potential contractors:

1. The duration of industrial and economic relations, estimated by regional builders at 7.3 points, determines the choice of customers in favor of reliable suppliers, cooperation with which is time-tested, which ultimately reduces the risks of partners not fulfilling obligations under the transaction, observing the logistics principles of organizing goods supply.
2. The requirement to use modern technologies for the production of building materials (6.7 points) is justified by the desire of builders to maintain a high level of energy efficiency of the erected buildings and structures, their internal environmental friendliness, which ultimately affects the reduction of material consumption and increased reliability and durability of construction objects.
3. Special conditions determining the terms acceptable for the production process and the minimum batch size are estimated at 6.3 points. The delivery times set by manufacturers of building materials for their products significantly affect the duration of technological processes in construction. The requirement of a minimum supply lot size often does not correspond to the financial capabilities of the customer, who in the conditions of fierce competition in the building materials market will give preference to the supplier whose conditions the builder satisfies.
4. The territorial remoteness of the supplier (6.1 points) is of no small importance. Construction organizations give preference to suppliers located in relative transport accessibility, helping to reduce a number of logistics costs associated with the supply and storage of material resources, as well as increasing the efficiency of deliveries.
5. The terms of payment are traditionally significant in the selection of the supplier (5.8 points), which is also due to the financial capabilities of the construction company, for which full prepayment or a large down payment is undesirable [11].
6. The quality of building materials, as a factor in the selection of a supplier of construction by the organization, is estimated at 4.2 points. As noted earlier, in the analysis of factors affecting the production and economic activities of developers, the quality of the materials purchased should satisfy the need for the construction of energy-efficient and environmentally friendly buildings and structures.
7. The schedule of production and delivery (4.1 points) as the basis for planning the production and economic activities of the construction organization forms its choice in favor of those suppliers whose schedule allows for uninterrupted technological processes in construction.
8. The supplier's reputation as a criterion for his choice is assessed by the construction companies of the region at 3.8 points, since this parameter of the manufacturer of building materials is largely ensured by the fulfillment of all obligations under the contractual relationship. The smaller, in comparison with the above criteria, significance of the supplier's reputation is explained by the emergence of new manufacturers in the construction materials market of the Samara region, whose duration of work does not yet allow to draw adequate conclusions regarding its reliability and commitment.

9. Guarantees of production (supply), estimated at 2.6 points, respectively, having less significance, in contrast to the criteria listed above, are nevertheless important in the conditions of instability of the construction market. Failure to fulfill obligations for the production and supply of material resources leads to the builder's unpreparedness to search and select a new supplier, to search for financial resources at a new price, taking into account changes in market conditions.

10. The least significant (2.2 points) when choosing a supplier is the cost of the supplied building materials, due to the competitors achieving the same level of price offer while differentiating other competitive advantages that determine the nature of production and business relations and contractual relations of partners in the construction industry.

According to a survey of construction organizations in the Samara region, the main problems determining the nature and prospects of further cooperation with manufacturers of building materials are the following (Fig. 2):
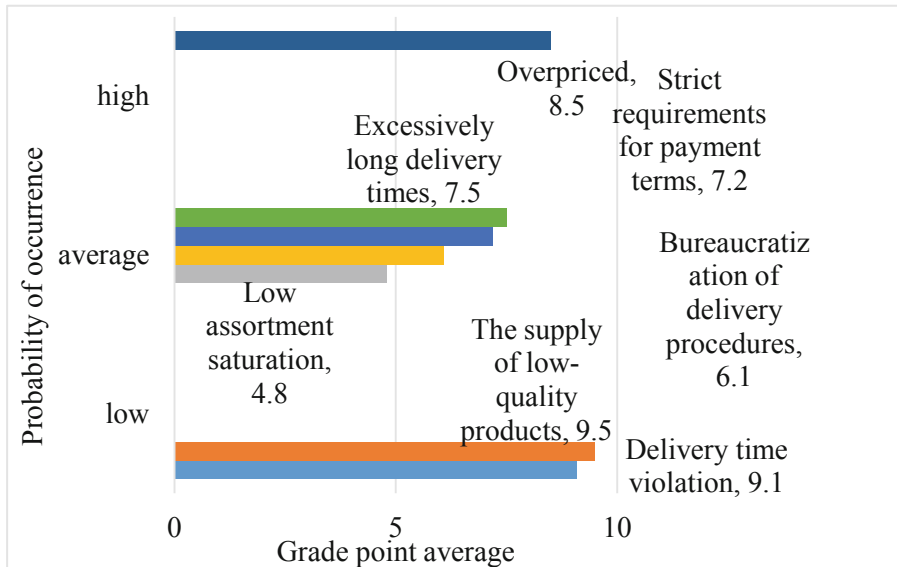
Fig. 2. Distribution of problems of developers in the organization of industrial and economic relations with suppliers of building materials. (Source: author)

1. With a high probability of occurrence:

   – overpricing - 8.5 points. The significance of the influence of the factor of the high cost of building materials, products and structures is described above, in the analysis of factors affecting the production and economic activities of construction organizations.

2. With an average probability of occurrence:

   – low saturation of the assortment - 4.8 points, which expresses the builders' need for integrated supplies of material resources for the construction of various kinds of objects,
   – bureaucratization of delivery procedures - 6.1 points, which increases the delivery time and violates the established construction schedule,
   – stringent requirements on terms of payment - 7.2 points, which, given the limited financial resources of builders, determines their choice in favor of more loyal suppliers,
   – excessively long delivery times - 7.5 points, along with bureaucratization of delivery procedures, leading to disruption of production and technological processes of construction organizations.

3. With a low probability of occurrence:

   – violation of the delivery time - 9.1 points, which has the same consequences as the previous problems of interaction between builders and suppliers,
   – delivery of low-quality products - 9.5 points, which fits into the influence of the factor of lack of materials highlighted by the builders of the Samara region.

According to the results of surveys, research of scientific works, regulatory legal acts and materials of discussion platforms relating to sources of information on the development of the construction industry in the country and the region, the list of factors affecting the formation of industrial and economic relations and contractual relations in the field of construction and production building materials in the Samara region should include such as:

1. Good faith (timely payment of supplies, adherence to a delivery schedule, delivery of products of the required quantity and quality) of contractors, determining the prospects for long-term cooperation of specific developers with specific manufacturers of building materials, and which can be expressed by indicators of their accounts payable.
2. The price level of material resources, also determining the choice of a particular supplier of building materials.
3. The territorial concentration of the production of building materials, narrowing the choice of suppliers of material resources for developers, in connection with an increase in the cost of their transportation.
4. The requirements of suppliers regarding the minimum size of the supply lot, which is reflected in the dynamics of costs for both the transportation of products and the organization of their storage.
5. The manifestation of the conditions for the development of the digital economy, which creates the possibility of inclusion in a single information and logistics space, to update the information about the existing needs for building materials or work and promptly generate the appropriate proposal [11].
6. State support for resolving issues of providing construction organizations with innovative materials produced in the Samara region [13, 14].

Analysis of the conditions of industrial and economic activity of enterprises in the field of construction and production of building materials in the Samara region allows us to confirm the above list of factors affecting the formation of industrial and economic relations and contractual relations between the subjects studied.

All of the above factors of the formation of industrial and economic relations and contractual relations between the subjects under study are reflected in statistical indicators that demonstrate the level of socio-economic development of the Samara region as a whole, business activity in the field of construction and production of building materials, in particular [8, 9].

To simulate the interconnections of the enterprises of the construction cluster and build forecasts, we selected the dynamic series of 2011–2017 on a monthly and yearly basis by the main indicators of the construction industry. Methods of multivariate statistical analysis were applied to the obtained data.

Using the correlation analysis, a close connection was established between the indicators X22 - the commissioning of residential buildings in total, thousand square meters. m and X23 - commissioning of residential buildings by individual developers, thousand square meters. m with indicators of production of building materials in the Samara Region with other factors. It was found that these indicators are significantly affected by the following production indicators:

X5 - Production of large wall blocks (including basement wall blocks) from concrete, one million conventional bricks,

X10 - Production of frame structures for buildings and prefabricated reinforced concrete structures, thousand cubic meters,

X12 - Production of slabs, panels and flooring of floors and coatings of reinforced concrete, thousand cubic meters,

X18 - Production of concrete, ready for pouring (ready-mixed concrete), thousand cubic meters,

X20 - Production of mixtures of asphalt concrete road, airfield and asphalt concrete (hot and warm), t.

In addition, the indicator X23 - the commissioning of residential buildings by individual developers, thousand square meters. m significantly affect indicators:

X3 - Production of ceramic non-refractory building bricks, million conventional bricks,

X9 - Prefabricated reinforced concrete foundation structures, thousand cubic meters,

X15 - Production of structural and architectural-building buildings and prefabricated reinforced concrete elements, thousand cubic meters,

X16 - Manufacture of prefabricated structures for reinforced concrete other, thousand cubic meters.

The presence of this deviation suggests that individual construction is more focused on local manufacturers of building materials.

Since the number of observations in the time series is not large (12 observations), it is advisable to select no more than 2 factors as an argument. In addition, some factors should be excluded from consideration for substantive reasons and interdependent argument factors.

Upon further analysis of the selected factors for building models, the following were left:

Resulting factor X52 (Y1) - Volume of work performed (million rubles) and factor-arguments:

– X9- Price dynamics of finished metal products (%),
– X12- Price dynamics transmission and distribution of electricity (%),
– X38- Price dynamics of cement, lime production (%),
– X47- Dynamics of prices for the production of asphalt mixtures (%);

The following regression models were obtained for the resulting factor X52 (Y1) - the volume of work performed (million rubles):

$$Y_1 = 5512750 - 38452, 1X_9 - 1606, 75X_{12},$$
$$Y_1 = 152787, 9 - 826, 52X_{38} - 0, 43X_{47}$$

We turn to the statistical analysis of the obtained regression equations: checking the significance of the equations and its coefficients. The tightness of the combined influence of factors on the result is estimated by the coefficient of multiple correlation. In the first model, the coefficient of multiple correlation R = 0.75. Determination coefficient R2 = 0.622. those. in 62.2% of cases, changes in X lead to a change in Y1. The variation in the indicator, the volume of work performed by 62.2% is due to a variation of factors included in the model, and by 0.8% due to a variation of other factors not included in this model. Similar statistical indicators of adequacy have the other models presented in this paper. In other words, the accuracy of the selection of regression equations is high. The above indicates the good quality and adequacy of the constructed models.

The regression coefficient bi shows how many units on average the value of the productive attribute Y changes when the attribute Xi changes by 1 unit is presented in the Table 1.

Table 1. The change in the value of an effective attribute X52 (Y1) when the attribute Xi changes by 1 unit

Variable	Factor	Factor change (%)	The increment of the resulting factor (million rubles)
X9	Price dynamics finished metal products	1	−38452,1
X12	Price dynamics power transmission and distribution	1	−1606,75
X38	Cement, lime production price dynamics	1	−826,5
X47	Dynamics of production prices of asphalt mixtures	1	−0,43

Source: author.

Similarly, the resulting factor X54 (Y2) was considered:

X54 (Y2) - The volume of work performed (thousand square meters) significantly depends on:
X9- Price dynamics of finished metal products (%).
X12- Price dynamics transmission and distribution of electricity (%).
X38- Price dynamics of cement, lime production (%).
X40- Production volume silicate blocks (mln. pcs.).
X45- Dynamics of production of concrete for pouring (%).

The following regression models were obtained for the resulting factor X54 (Y2) - the volume of work performed (million rubles):

$$Y_2 = 7289,98 - 49,36X_9 - 21,68X_{12}$$
$$Y_2 = 101,04 - 1,01X_{38} + 14,29X_{40} + 1,25X_{45}$$

The regression coefficient bi shows how many units on average the value of the productive attribute Y changes when the attribute Xi changes by 1 unit is presented in the Table 2.

Table 2 The change in the value of an effective attribute X54 (Y2) when the attribute Xi changes by 1 unit

Variable	Factor	Factor change (%)	The increment of the resulting factor (thousand sq. M.)
X9	Price dynamics finished metal products	1	49,36
X12	Price dynamics power transmission and distribution	1	−21,68
X38	Cement, lime production price dynamics	1	−1,01
X40	Silicate production volume	1(million pieces)	14,29
X45	Dynamics of production of concrete for pouring	1(%)	1,25

Source: author.

At the third stage of the study, 23 indicators were selected. Based on these factors, the dynamic series for six years 2012–2017 were selected. As the resulting indicators were considered: X1 - the volume of work performed by type of activity "Construction" (million rubles), X2 - the commissioning of residential buildings, total area (thousand square meters).

Some factors were excluded from consideration from substantive considerations and interdependent factors-arguments were eliminated. The following trend was identified is presented in the Table 3.

Table 3. The change in the value of an effective attribute X2 (T2) when the attribute X21 changes by 1 unit

Variable	Factor	Factor change	The increment of the resulting factor (thousand sq. M.)
X21	Producer price indices for construction products	1(%)	−28,02

Source: author.

X2 (T2) - Commissioning of residential buildings, thousand square meters. m of total area significantly depends on:

X21 - Producer price indices for construction products, %.

$$T_2 = 4731,05 - 28,02X_{21}$$

4   Discussion

The criteria established by construction organizations for the selection of suppliers of building materials, products and structures are the result of an individual policy in the field of procurement logistics, however, taking them into account when organizing production and business relations with contractors can minimize the negative impact of the above factors on counterparty insolvency, lack of financing, and high cost materials, structures and products.

The importance of a multi-criteria evaluation of suppliers of material resources for construction needs is emphasized by the fact that in industrial and construction activities construction companies of the Samara region often encounter problems in relations with regional suppliers, differentiated by frequency and significance for the customer (Fig. 2).

An analysis of the problems of developers in organizing industrial and economic relations with suppliers of building materials allows us to supplement the idea of the factors affecting the industrial and economic activities of construction organizations in the Samara Region, since most of them fit into the lists highlighted above and are also reflected in a number of statistical indicators of the state of construction industries of the region [12].

5   Conclusion

Summing up the above, we note that in many respects the nature of the relationship between the subjects of the construction industry is determined by price factors. The low degree of provision of machinery and mechanisms, the localization of the raw material base, the lack of industrial products of innovative building materials, the high cost of energy and transportation services, limit their ability to meet the full range of needs of construction organizations at competitive prices.

In turn, the volume of orders from construction companies is determined by the pace of construction, the dynamics of which, first of all, are limited by declining consumer demand amid inflation in the country and the region. The affordability of housing is also determined by the high costs of various types of resources of the construction organization, including the tax burden and state credit policy [5].

Nevertheless, a study of the markets for construction and production of building materials in the Samara region showed the presence of prospects for its growth. The growing investment attractiveness of the region, state support for the introduction of innovative technologies and equipment in the production processes of industry entities contribute to the development of industrial and economic relations and contractual relations in the field of construction and production of building materials in the Samara region and beyond.

Significantly reduce the negative impact of a number of the described factors, the implementation of the option system for ordering the supply of building materials at the request of developers can significantly reduce the existing imbalance of supply and demand in the construction industry of the Samara region. The positive influence of the described factors must be used in the formation of the organizational and economic mechanism of cluster interaction between builders and manufacturers.

References

1. Decree of the Government of the Russian Federation of 07.02.2011 N 165-r: On approval of the Strategy for socio-economic development of the Volga Federal District until 2020. https://bazanpa.ru/pravitelstvo-rf-rasporiazhenie-n165-r-ot07022011-h1612615/strategiia/5/6/. Accessed 11 Feb 2020
2. Decree of the Government of the Samara Region dated 03.06.2014 No. 315: On approval of the concept for the development of the cluster of the building materials industry and industrial housing in the Samara region until 2020 and an action plan for the development of the cluster of the industry of building materials and industrial housing in the Samara Region until 2020. http://docs.cntd.ru/document/464011116. Accessed 11 Feb 2020
3. Federal Law: On participation in the shared construction of apartment buildings and other real estate objects and on amending certain legislative acts of the Russian Federation, dated December 30, 2004 N 214-FZ. http://www.consultant.ru/document/cons_doc_LAW_51038/. Accessed 11 Feb 2020
4. Federal State Statistics Service: Construction in the Russian Federation (2018). https://www.gks.ru/folder/14458. Accessed 11 Feb 2020
5. Federal Tax Service: Tax analytics (2018). https://analytic.nalog.ru/portal/index.ru-RU.htm. Accessed 11 Feb 2020
6. Government of the Samara Region: Raw material base (2018). https://www.samregion.ru/economy/source/. Accessed 11 Feb 2020
7. Ivanushkin, N.S., Kirshin, I.A.: Features of financing construction projects in Russia. Actual Dir. Sci. Res. Theory Pract. **2**(4), 198–200 (2015)
8. Ministry of Economic Development and Investments of the Samara Region: RAEX rating agency (Expert RA) upgrades investment climate of Samara region (2017). http://economy.samregion.ru/press-center/sobytiya/reytingovoe-agentstvo-raex-ekspert-ra-povysilo-reyting-investitsionnogo-klimata-samarskoy-oblasti-/. Accessed 11 Feb 2020

9. National Rating Agency: Rating of investment attractiveness of Russian regions by the end of 2018 (2018). http://www.ra-national.ru/sites/default/files/analitic_article/IPR-6-06112018.pdf. Accessed 11 Feb 2020
10. Ru-Stat: Import to the Samara Region for 2013–2018 (2018). http://ru-stat.com/date-Y2013-2018/RU36000/import/world/0525. Accessed 11 Mar 2018
11. Samarastat: Finance. Organizations (2018). https://samarastat.gks.ru/finance. Accessed 11 Feb 2020
12. Samarastat: The population of the Samara region (2018). https://samarastat.gks.ru/population/. Accessed 11 Feb 2020
13. The state program of the Samara region dated 09.12.2015 No. 822 "Development of the infrastructure of urban development in the territory of the Samara Region" for 2016 – 2019 years". http://docs.cntd.ru/document/434605300. Accessed 11 Feb 2020
14. The state program of the Samara region dated November 27, 2013 No. 684 "Development of housing construction in the Samara Region" until 2020. http://docs.cntd.ru/document/464012122. Accessed 11 Feb 2020
15. Tikhomirov, N.P., Tikhomirova, T.M., Ushmaev, O.S.: Methods of econometrics and multivariate statistical analysis. Economics, Moscow (2011)

Foreign Experience in Organizing and Evaluating the Internal Control and Audit System

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Abstract. For Russian enterprises, the formation of effective internal control and audit systems is not just a matter of efficiency or ensuring market competitiveness, but also national security, which determines the relevance and increases the significance of this study. The aim of the study is to study international experience in the formation and assessment of the reliability of the internal control and audit system. During the study, such methods as analysis, observation, formalization, classification, modeling and others were used. The analysis allows us to conclude that very often in Russian companies there is a situation where the same unit combines the functions of internal control, internal audit and risk management. On the other hand, little time has passed since the introduction of the organization's best practices, internal control and internal audit at domestic enterprises. These processes can become successful only in conditions of a developed corporate mentality, which the Russian business environment cannot boast of so far.

Keywords: Internal control · Internal audit · Risk management · Risk-based approach

1 Introduction

The current processes of globalization against the backdrop of the global financial crisis make states not only focus on strategically important sectors of the economy, but also introduce the most effective tools for their accelerated development in order to ensure a high level of international competitiveness. Strengthening the role of internal control and audit as effective tools for the development of entities of various levels has become a strict trend in almost all leading economies of the world. A key factor in the development of this trend is the ability of internal control and audit systems to act as a barrier, providing a barrier to the inefficient use of financial, material and other resources, as well as a powerful factor in mobilizing on-farm reserves. In the current geopolitical conditions of the development of the Russian economy, the organization of reliable internal control systems is of fundamental importance in the practical plane of the formation and improvement of enterprise development strategies as a locomotive of the country's economic development in the near future.

2 Methodology

The theoretical basis of the study was formed by scientific results presented in the fundamental works of Russian and foreign experts on the problems of organizing effective internal control and audit systems [2–4, 11, 14, 15].

The author considers the methodology for constructing internal control systems in large German companies. According to this methodology, internal audit system is formed taking into account the principles and standards of the Institute of Internal Auditors, although there are no legislatively established requirements for the application of these particular standards.

3 Results

Consider the foreign experience of organizing and assessing the reliability of the internal control and audit system. We would like to start the study of the current practical models of organizing and assessing the reliability of the internal control and internal audit system from foreign experience, and it is from the experience of European countries, which is often taken by Russian companies as the basis for the implementation of certain innovations, such as, for example, COSO standards and etc. First of all, among European countries, the experience of Germany as one of the most economically developed countries is of interest.

The methodology for constructing internal control systems in large German companies is based on the well-known and widely used COSO document [5]. The internal audit system is formed taking into account the principles and standards of the Institute of Internal Auditors, although there are no legislatively established requirements for the application of these particular standards.

In addition to the well-known international rules and principles, Germany has developed a system of standards for the National Institute of Internal Audits. At the corporate control system level, all national and international standards are supplemented by their own internal rules. The experience of the functioning of the internal control system at German enterprises indicates that the internal audit in these systems is considered as a central independent link (including relying on the Law on Accounting Reporting Reform (BilMoG)).

Let us consider one example of creating an effective system of internal control and internal audit using the example of Konzern revision Deutsche Bahn AG (DB AG) (Konzern revision Deutsche Bahn AG official website: http://www.deutschebahn.com/en/start/). A subsidiary company responsible for scientific and innovative development has been identified in the structure of this holding, therefore it is useful to analyze the experience of this corporation from the point of view of application in Russian organizations [3].

Following the COSO model, in DB AG, the processes of internal control and internal audit are integrated into the system of functioning of all processes of the enterprise, and management is personally responsible for the quality construction and maintenance of an effective internal control system. The personal interest and responsibility of top management determines a very high level of involvement of

employees of all levels in the processes of internal control and internal audit. The internal control system actively interacts with all divisions of DB AG: accounting, human resources, IT, security, etc., as well as members of the Management Board and the Supervisory Board of the enterprise [6].

On the basis of a developed corporate culture that offers a positive attitude to internal control procedures, a control environment is formed in the company that defines a management style focused on the complete suppression of illegal actions.

In many German companies involved in intellectual products, including the concern in question, internal control is based on corporate standards that provide for the use of control procedures at all stages of existing business processes. The risk-based approach based on the processes of internal control and internal audit in DB AG defines a risk management system in which risks are analyzed and assessed taking into account the probability of their occurrence by studying the causes, consequences and ensuring system control over each type of risk.

In addition, risks are necessarily taken into account in the process of planning the activities of the enterprise [5], as a result of which the objects with the worst risk indicators are selected and prioritized. For a subsidiary engaged in the promotion of intellectual products, regardless of the level of risks identified, audits are carried out at a specified frequency (2 times a year), and in addition, a risk self-assessment system has been built as an effective element of internal control. This was done in order to protect an effective development strategy of the concern and prevent the diversion of strategically significant developments. For a subsidiary of DB AG, as well as other companies with intellectual products, loss of copyright in a particular product may lead to a complete loss of competitiveness in local as well as global markets.

Given that in the current business environment, the management of any company is personally responsible for violations in subordinates and problems in controlled processes, the management itself is focused on improving the effectiveness of the internal control system and its reliability, which is assessed through internal audit.

Thus, the quality of internal control and internal audit in German companies is determined by:

- the synergy of generally recognized and intra-company standards and rules; integrated involvement of the processes of the internal control system and internal audit in all business processes,
- independence and free access to information,
- professional training of employees of the internal control system and internal audit,
- the presence of a high corporate culture; systematic solution to the problems of internal control and internal audit.

Next, we consider the experience of Japanese companies in organizing an internal control system and internal audit and, in some aspects, compare it with German. This experience is interesting in that a significant number of companies here are high-tech and produce intellectual property products. Japanese corporations have an exceptionally high level of development of the internal control system as an integral component of corporate governance. Internal control functions are included in the responsibilities of all employees of any company from top management to employees in initial

positions [7]. Practical experience in the functioning of Japanese companies suggests that special committees work on a regular basis to improve the corporate internal control system.

If we analyze in general, the principles of building an internal control system in Japanese companies are similar to German ones and are based on generally accepted principles in the world according to: Sarbanes-Oxley law, INTOSAI International Standards for Internal Auditing and the Institute of Internal Auditors (all these institutions were mentioned above). However, at the same time, unlike German companies, which although they have the freedom to choose the model of internal control, but often prefer the already established approaches, Japanese corporations, taking into account the national mentality and peculiarities of doing business, build internal control and internal audit based on the national legal framework. First of all, these are the laws "On financial instruments and exchanges" (J-SOX law, developed on the basis of the Sarbanes-Oxley law) and "On corporations" [9].

In Japan, the law provides for the submission of an internal control report to the Ministry of Finance (for companies whose shares are traded in accordance with J-SOX on the Tokyo Stock Exchange). The responsibility for its preparation lies with the management of the company, which controls the conduct of an internal subjective assessment of the effectiveness of internal control and the preparation of a report. Internal control in Japanese companies is defined as a process with a view to: effective economic activity; the reliability of financial statements; strict compliance with laws and others. Internal audit as an element of internal control and the corporate governance system provides an assessment of the effectiveness of internal control [7].

By analogy with the German experience in implementing internal control systems in large corporations in Japan, its procedures are integrated into all processes of companies, are included in the duties of employees, ranging from ordinary posts to top management. In addition to independent internal control and internal audit, self-assessment procedures and tools are actively used (i.e., activities for self-monitoring and self-assessment of their responsibilities in accordance with established internal documents). Self-assessment as a process includes: identification of risks, the formation of control measures, monitoring of their implementation, a continuous process of improving their activities.

It should be emphasized that the extremely important attention in Japanese corporations is paid to the risks of internal fraud, bribery and corruption. In Germany, increased attention is also paid to the prevention of such situations, but nevertheless, in German companies this issue is not posed as harshly as in Japanese corporations.

Based on the requirements of the standards and principles of internal control and internal audit, Japanese enterprises organize and integrate anti-corruption and fraud procedures in the corporate governance system with the maximum degree of transparency of this mechanism from the level of top management to ordinary employees [10].

In conclusion of the analysis of the features of foreign experience in organizing the internal control system and internal audit, let us dwell on the practice of organizations of Canada as a country of the American continent. According to tradition with European practice, in Canada a risk-based approach to organizing internal control is also quite common for doing business, but first of all, the Sarbanes-Oxley law is the leading guide [12].

In contrast to the components of the organization of the internal control system in companies in Germany and Japan, here are just a few aspects of the internal control assessment system, which, in our opinion, is suitable for any organization, and some of its components can be used in Russian practice.

In Canadian corporations, the quality assessment of the internal control system is carried out by the Board of Directors, which evaluates the actions of top management as a whole. Moreover, the assessment itself is qualitative; as a rule, several levels are established (strong, medium, low) [13].

The presented procedures related to the development of the internal control system in Canadian corporations are focused on a high level of corporate culture and discipline. At the moment, in our opinion, not all of them are applicable in Russian practice, but at the same time they can serve as a guide for the development of the internal control system in national companies.

4   Discussion

It is important to note that the state imposes certain requirements on the organization of internal control, internal audit and risk management, and the requirements in many aspects comply with international best practices (in particular, COSO standards). In this regard, the experience of Germany in terms of implementing COSO standards, as well as the accumulated corporate experience of Germany, Japan and Canada, will be able to become a guideline for Russian companies with regard to the adaptation of world best practices.

If we draw a parallel between current practices abroad and in Russia, we note that it is recommended for Russian enterprises to create independent structural divisions of internal audit and separate divisions for risk management and internal control.

An analysis of the practices of some Russian and foreign companies allows us to conclude that in almost all of them internal control and internal audit are carried out by separate structural units. However, there are cases when all these units are subordinate to one top manager, which reduces the effectiveness of these processes and leads to a conflict of interest.

The analysis allows us to conclude that very often in Russian companies there is a situation where the same unit combines the functions of internal control, internal audit and risk management (according to the research of O. Ivanov, this situation is repeated in every fifth company [8]). In our opinion, the reason for this situation may be: a misunderstanding of the key principles of internal control and internal audit, a lack of readiness to bear the costs of their correct implementation, a lack of understanding of the appropriateness of implementing internal control and internal audit tools, an undeveloped corporate culture (this factor is manifested in a significant number of Russian enterprises of different sectors, but recently the situation has begun to change for the better).

Over the past five years from 2011 to 2016. Internal control and internal audit in Russian organizations began to develop actively, although if we pay attention to organizations with state participation, approximately 75% of them introduced a risk-based model of internal control only in 2014–2015 [1].

With regard to internal audit, statistics show that only 30% of organizations of the internal audit service have existed for more than 10 years, and in about 35% of the analyzed companies only 1–2 years [8]. At the same time, one must understand that it is not the period of existence that matters, but the quality of the processes built, which, in our opinion, is determined not only by the number of inspections per year. The fact is that some authors suggest that the number of inspections per period (for example, a year) be considered the leading indicator of the effectiveness of internal audit at the enterprise, citing statistics to confirm their position: almost 75% the studied companies carry out checks at least 50 times a year; almost 20% of companies – 90–100 inspections per year; 22% of companies - 10 inspections per year [8]. Of the total number of inspections, about 25% are unscheduled (approximately for each of the selected groups of respondents).

If you look at the survey data, then almost 96% of company executives are sure that the number of inspections within the framework of internal audit is the most significant indicator in terms of efficiency (Fig. 1).
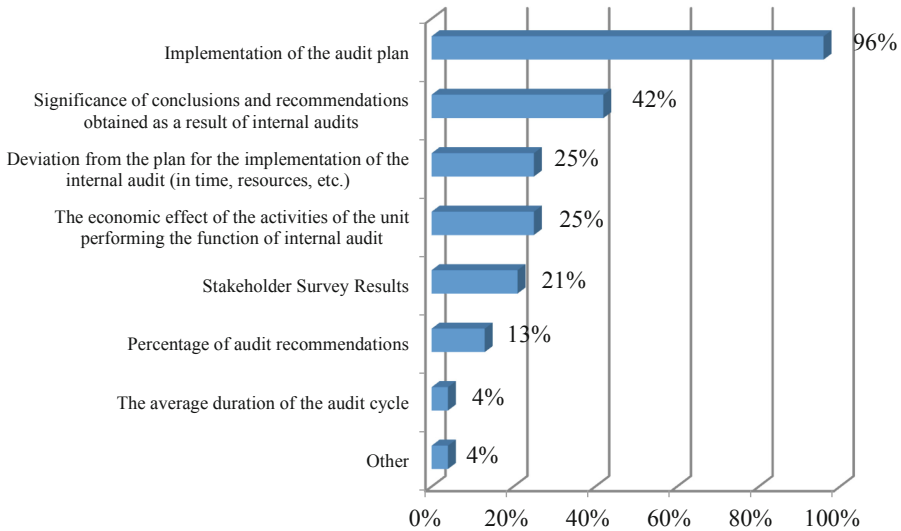
Fig. 1. Key performance indicators of internal audit in Russian companies with state participation (Source: author).

In our opinion, this indicator is important, but perhaps not the main one in the list of indicators of the effectiveness of internal control.

The significance of the number of inspections is manifested to a greater extent in preventing the development of various negative situations (process failures, inconsistencies with established criteria for product quality, fraud, etc.), but if the internal control system is effective, then other indicators come to the fore, for example, the significance of conclusions on inspection results (Fig. 1), etc.

At the same time, it is fair to take into account the fact that the legal framework for the formation of the internal control and internal audit system in companies with state participation is quite young, is in the process of formation, and some common standards and performance indicators are needed for the transition period, allowing accumulate information on the implementation of certain internal control and internal audit procedures at Russian enterprises in order to take it into account in order to improve the already adopted and develop s legal provisions.

From the point of view of identifying the main problems for the effective development of best practices of internal control and internal audit for companies with state participation, most organizations highlight such difficulties as a lack of qualified personnel, a weak interest of senior management in implementing internal control and internal audit, and an insufficiently effective legal framework regulation of these procedures in the Russian Federation, weak interaction between internal control, internal audit services and other Thousands separator companies (especially those who are most responsible for the financial results of the business), the lack of a positive attitude of the overwhelming number of employees to the services of the internal control, internal audit, and others.

5   Conclusion

The considered problems show that there are urgent tasks of developing internal control, internal audit and risk management for Russian organizations. Among their priority ones can be attributed: increasing the level of integration of procedures and functions of internal control processes, internal audit, risk management in the main business processes of the organization; increase in the number of controlled/audited processes; increasing the level of interaction between all departments of the organization within the framework of the internal control and risk management system; intensification of the process of developing the principles of a risk-based VK model at Russian enterprises increasing the level of interest of senior management in implementing the best practices of internal control, internal audit and risk management; automation of internal control procedures, internal audit and risk management [8]).

As one of the significant directions of increasing the effectiveness of internal control and internal audit, we can single out automation of such procedures as: data collection, information exchange, documentation, reporting, archiving, etc. At the same time, the presented functions can be significantly expanded. In addition, we note that most enterprises with state participation prefer to use their own software.

In conclusion, we note that, on the one hand, it is necessary to change the idea of the top management of Russian companies that internal control and internal audit are unnecessary processes and/or do not have (have partially) economic efficiency. To do this, it is necessary to build a new corporate culture (perhaps at the initial stage of policy). On the other hand, little time has passed since the introduction of the best practices of organizing internal control and internal audit at Russian enterprises. These processes can become successful only in the conditions of a developed corporate mentality, which the Russian business environment cannot boast of yet, but it has already chosen these landmarks as the goals of the near future.

References

1. Bondina, N.N., Zubkova, T.V., Lavrina, O.V.: The financial mechanism and the assessment of its impact on improving the efficiency of agricultural production. Bull. Samara State Agric. Acad. **2**, 29–35 (2014)

2. Borovikov, A., Smolyakov, O.: Principles of organization and structure of the management system of a holding type company. Upravlenie **7**(3), 54–62 (2019). https://doi.org/10.26425/2309-3633-2019-3-54-62

3. Dmitrieva, I., Kharakoz, Yu., Zhakan, T.: Development of the state financial control and audit system in the EAEU member countries. Auditor **5**(12), 10–15 (2019). https://doi.org/10.12737/1998-0701-2019-10-15

4. Huang, W.: Built on value. Palgrave Macmillan, Singapore (2019). https://doi.org/10.1007/978-981-13-7507-1_15

5. COSO: Enterprise risk management - Integrating with strategy and performance (2017). https://www.aicpastore.com/AST/Main/CPA2BIZ_Primary/PRDOVR∼PC-ACOSOERM/PC-ACOSOERM.jsp. Accessed 11 Feb 2020

6. Ivanov, O.B.: Organization of internal audit in a German company. STAGE Econ. Theory Anal. Pract. **5**, 129–142 (2013)

7. Ivanov, O.B.: Organization of internal control in the corporate governance system of Japan. STAGE Econ. Theory Anal. Pract. **5**, 125–146 (2014)

8. Ivanov, O.B., Egorova, E.A.: Status and development directions of internal audit systems, internal control and risk management in companies with state participation. ETAP Econ. Theory Anal. Pract. **6**, 7–28 (2015)

9. Liker, J.: The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer. Alpina Business Books, Moscow (2005)

10. Messier, W., Reynolds, J., Simon, C., Wood, D.: The effect of using the internal audit function as management training ground on the external auditor's reliance decision. Account. Rev. **86**, 2131–2154 (2011)

11. Nusa, I.B.S.: Quality of audit system information for internal control effectiveness. In: Warlina, L., (ed.) Proceedings of the International Conference on Business, Economic, Social Science, and Humanities – Economics, Business and Management Track (ICOBEST-EBM 2019), pp. 198–202. Atlantis Press, Paris (2020). https://doi.org/10.2991/aebmr.k.200108.046

12. Peshkova, T.Yu.: Risk management, internal control and internal audit of insurance organizations in the Canadian insurance supervision system. Financ. Analytics Probl. Solutions **42**, 48–56 (2013)

13. Tsyganov, A.A., Bumbaji, Ya.V.: International experience of integrated financial supervision. Financ. Analytics Probl. Solutions, **43**, 45–52 (2012)

14. Vahdani, M., Rashedi, R., Mehr, J.M.: Investigating the effect of business strategy and internal control on audit quality. Humanit. Soc. Sci. Rev. **7**(6), 787–798 (2019). https://doi.org/10.18510/hssr.2019.76119

15. Younas, A., Md Kassim, A.A.: Essentiality of internal control in audit process. Int. J. Bus. Appl. Soc. Sci. **5**(11), 1–6 (2019). https://doi.org/10.33642/ijbass.v5n11p1

Institutional Measures to Support Industrial Enterprises of the Samara Region

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Abstract. The article contains an analysis of the main industrial development trends in the Russian Federation and the Samara region in particular, identified on the basis of aggregated statistical data. The author considered the industrial potential of the Samara region and its structure. The analysis of the main programs of support and development of the industry until 2018 and after (for the period of the implementation of national projects 2018–2024) at the level of the federal and regional authorities is presented, the main results of this support in the Samara region are presented. The author conducted a survey of 70 representatives of business and scientific communities, one way or another connected with the industry of Russia and the Samara region. Based on the results of the survey, conclusions were drawn on the conformity of the measures being implemented to the needs of the business and market conditions, a number of recommendations were proposed.

Keywords: Industry · Information support · Institutional support · Support measures

1 Introduction

Due to geographical and historical preconditions, a number of objective advantages of the Samara region allows the region to occupy positions in the top 10 regional economies of Russia. The region is located in the European part of the Russian Federation, as part of the Volga Federal District, the total area is 53 565 km 2 (0.3% of the territory of the Russian Federation; 5.1% of the territory of the Volga Federal District (VFD)), the population is 3 205 975 people (2.2% of the population of the Russian Federation; 10.94% of the population of the Volga Federal District) according to regional authorities. The region owes much of its rich industrial potential, an extensive research, development, scientific and cultural base to the decisions of the State Defense Committee (1941–1945) on the transfer to Kuibyshev region (until 1991, later the Samara region) of a significant part of the aviation, bearing, and radio-electronic enterprises, machine-building, plaster, petrochemical, peat, gas industries, as well as decisions on the transfer to Kuibyshev (until 1991, later Samara) of foreign embassies, broadcasting, arts and cultural organizations.

In the postwar years, the rise of the industrial base was provided mainly due to rocket science and aircraft construction, as well as the production of components. The article provides an analysis of the current state of the industry in the Samara region,

analyses support measures created by authorities at various levels, and also, through a survey, the conclusion is made about the information security of the measures taken.

2 Methodology

To assess the level of information security of the implementation of industrial production support programs at the federal, regional and municipal levels, it is necessary to identify the economic institutions through which their development is carried out. Table 1 presents data on the main industrial support programs, the timing of their implementation, as well as institutions at different levels.

Table 1. Institutional support for industry

Name of the program (Purpose of creation)	Implementation level	Implementation dates	Economic Institutions
State program of the Russian Federation "Development of industry and increasing its competitiveness"	Federal	2014–p.t.	Industry Development Fund (IDF), State Industry Information System (GISP)
National project "International Cooperation and Export" (As part of the federal project "Export of Services")	Federal	2018–2024	Ministry of Economic Development of the Russian Federation, Ministry of Industry and Trade of the Russian Federation
Federal project "Implementation of the best available technologies" (In terms of improving the environmental friendliness of industrial production)	Federal	2018–2024	Ministry of Economic Development of the Russian Federation, Ministry of Industry and Trade of the Russian Federation
The project to create a favorable investment climate in the Samara region	Regional	2016–p.t.	Ministry of Economic Development, Investments and Trade of Samara Region, Agency for Investment Attraction of Samara Region

Source: author.

Based on the above programs, it is worth noting that most of the measures taken are at the federal level, in addition, these measures were developed as an economic tool designed to minimize geopolitical threats. However, the industry did not become a real driver of economic development (2015–2018) and a way out of the crisis situation (2018–p.t.). Meanwhile, it is worth analyzing the actual indicators characterizing the state of industrial production in the Russian Federation (Fig. 1). Hereinafter, according

to the Federal State Statistics Service, the analytical center under the Government of the Russian Federation and the Ministry of Economic Development of the Russian Federation.
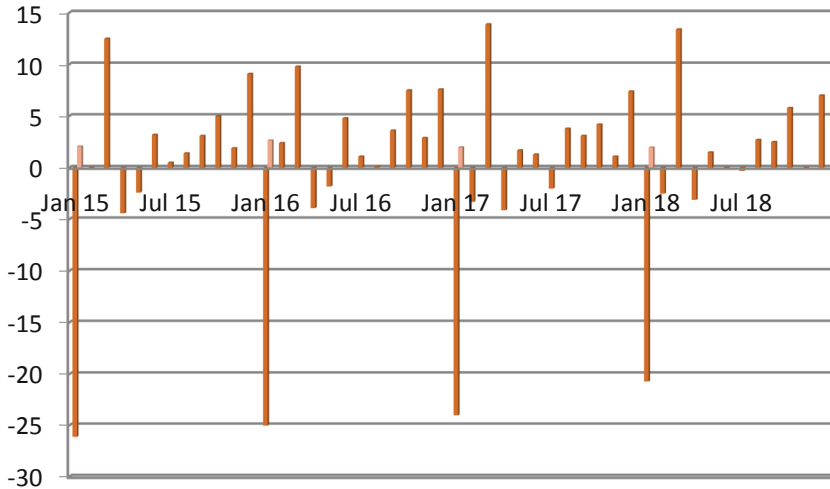
Fig. 1. The increase rate of industrial production compared to the previous month in the Russian Federation in 2015–2018, % (Source: author)

Getting rid of the influence of periods of an intermittent drop in the increase rate of industry in January of each year (due to long holidays), it should be said that the average annual increase rate of this indicator fluctuates in the range of 2–3%. So, according to the analytical center under the Government of the Russian Federation, in 2018, GDP growth amounted to 2.3%, and industrial output increased by 2.9%. And in the first quarter of 2019, the increase rate of industrial production slowed to 2.1% in annual terms, and GDP - to 0.5%.

However, general indicators of industrial production growth cannot objectively reflect a number of negative trends:

1. The growth of industrial production was primarily ensured by sustainable long-term growth of the extractive industry (4% by 2017, 14% by 2014), that in the conditions of an already uneven structure of the Russian economy and falling energy prices, could lead to budgetary insecurity (the share of oil and gas production in the production structure in the Russian Federation is about 70%).
2. Uneven dynamics of industrial production in the constituent entities of the Russian Federation (industry growth in 2018 was observed in 66 constituent entities of Russia (–10% compared to 2017).
3. The outstripping growth in industrial output in 2018 was recorded in the city of Sevastopol (+29.2%), the Yamal-Nenets Autonomous District (+17.0%), Astrakhan (+16.2%) and Tambov (+14.4%) areas. The analyzed Samara region (+1%).

4. In 2018 and in the first half of 2019, the output of high-tech manufacturing activities decreased (–11.5% by 2018).
5. According to a study by the Analytical Center under Government of Russian Federation, the factors limiting production growth in mining and manufacturing are insufficient demand for the products of enterprises in the domestic market, a high level of taxation and the uncertainty of the economic situation as a whole [2].

Based on international conditions (regionalization, sanctions confrontation, emergencies, such as closing borders and production due to COVID-19) and all of the above, it is worth noting the importance of transforming industry in the direction, primarily of the processing high-tech industry. To implement the tasks set by the President of the Russian Federation V.V. Putin and ensuring GDP growth of 3–4% annually require serious institutional changes.

The Russian model, based on the super centralization of economic and political institutions in Moscow and St. Petersburg, practically does not allow regions that are not involved in oil and gas production and processing without serious transfers from the Federation to execute budgets. In turn, this inevitably leads to an outflow of economic entities (or their parent enterprises) to capitals and regions offering preferential conditions for the functioning of the business. The decrease in the number of large taxpayers affects the investment climate and even more leads to the unsecured budgets of the entities. Samara region (a region with a diversified economy) in the ranking of regions is included in the second decile of the economies of the constituent entities. Largely because it takes 2nd place in Russia in terms of oil refining (19.5 million tons per year).

Regional authorities are making efforts to create a favorable investment climate in the Samara region. On the electronic site (online platform) of the Agency for attracting investments, basic information is presented that may interest key stakeholders: investors, project authors, regional authorities. Key attention is paid to the creation of one of the largest agglomerations in the country, Samara-Tolyatti, which is an attempt to adopt the experience of agglomerations in Moscow, St. Petersburg, Tyumen and so on. The portal provides funding for socially important projects both in the field of public-private partnership (PPP), and by attracting third-party investors.

Conditionally, the activities of regional authorities can be divided into three key areas:

1. Regulatory support of the field of PPP (approval of the list of objects the property right to which belongs or will belong to the Samara region, regarding which it is planned to conclude concession agreements).
2. Development of the institutional environment in the field of PPP (at the end of 2018, the Samara Region became one of the 6 leading regions of the Russian Federation in terms of the development of public-private partnerships along with Moscow, St. Petersburg, the Moscow Region, the Republic of Bashkortostan and the Khanty-Mansi Autonomous District scoring 90 points).
3. Accumulation, aggregation and transfer of experience in implementing PPP projects (22 projects are currently under implementation (implemented) for a total amount of

extrabudgetary investments attracted 25.86 billion rubles, of which 14 projects amounting to 6.22 billion extrabudgetary funds raised rubles have already been implemented and 1345 jobs have been created, 25 projects are under consideration and structuring).

Among the main projects it is worth highlighting:

1. The construction of the highway "Central".
2. Construction of a bridge over the Volga River with a detour of Togliatti and access to the M-5 Ural highway.
3. Construction and exploitation of railways to ensure the operation of the special economic zone of the industrial-production type "Togliatti".
4. Organization of high-speed railway communication "Samara-Kurumoch airport-Togliatti".

3   Results

According to the results of an electronic questionnaire, a representatives of the business and scientific field of the city of Samara and the Samara region conducted by the authors of the article, it is worth noting the similarity of indicators of statistical bodies and the empirical assessment of respondents. The survey involved 70 people, of whom 52 identified themselves as being associated with industrial production. Distribution of respondents by gender: men - 61% (82% of those related to industry), the most frequent range value of age: 30–40 years. Respondents were asked the following questions:

1. "How do you assess the general state of industrial production in the Russian Federation on a scale from 1 to 5?", Where 1-unsatisfactory, 2-poor, 3-lowered, 4-corresponds to the average world level, 5-exceeds the average world level.
2. "How do you assess the general state of industrial potential in the Russian Federation on a scale from 1 to 5?", Where 1-unsatisfactory, 2-poor, 3-lowered, 4-corresponds to the average world level, 5-exceeds the average world level.
3. "Refer the Russian Federation to one of the following groups": 1-driver countries of economic development, 2-developed countries, 3-developing countries, 4-lagging countries, 5-backward countries.
4. "How do you assess the state of extractive industrial production in the Russian Federation on a scale from 1 to 5?", Where 1-unsatisfactory, 2-poor, 3-lowered, 4-corresponds to the average level of developing countries, 5-exceeds the average level of developing countries.
5. "How do you rate the state of manufacturing in Russia on a scale from 1 to 5?", Where 1-unsatisfactory, 2-poor, 3-lowered, 4-corresponds to the average level of developing countries, 5-exceeds the average level of developing countries.
6. "What drivers of industrial development in the Russian Federation do you consider the most important?": Technology adoption, technology development, planning system, strengthening state regulation, increasing competition, militarization, environmental friendliness, I find it difficult to answer.

7. "Do the current methods of industrial management in Russia correspond to the scale of the new economic paradigm?": Yes, no, I find it difficult to answer.
8. "Is the existing scientific and technological base capable of ensuring the development of industry in the Russian Federation in the medium term?": Yes, no, I find it difficult to answer.

According to the results of the survey, 48% of respondents assess the state of Russian industry as lowered (while 69% believe that the development of extractive industries is above average among developing countries, and 59% consider the development of the manufacturing sector as lowered). At the same time, the respondents positively assess the industrial potential of the Russian economy (47% corresponds to the world average, 37% exceeds the world average).

Among the other survey results, it is worth highlighting the respondents' hopes that technology development and a well-planned planning system will be able to become drivers of the social and economic development of the Russian Federation. More than half (56%) believe that the current methods of industrial management in the Russian Federation do not correspond to the scale of the new economic paradigm, however 60% are convinced that the existing scientific and technological base is capable of ensuring the development of industry in the medium term. The second block of the survey questions concerned the information security of the measures taken to support the industry and their effectiveness.

So, the following questions were asked:

9. "How do you assess institutional measures taken by federal and regional authorities to stimulate industrial production on a scale from 1 to 5?", Where 1-unsatisfactory, 2-poor, 3-average, 4-good, 5-high.
10. "How do you assess the measures taken by federal and regional authorities to stimulate industrial production on a scale of 1 to 5?", Where 1-unsatisfactory, 2-poor, 3-average, 4-good, 5-high.
11. "How do you assess the ability of small and medium-sized businesses to take part in entrepreneurship support programs on a scale from 1 to 5?", Where 1-unsatisfactory, 2-poor, 3-average, 4-good, 5-high.

The survey results are presented in Figs. 2, 3 and 4.
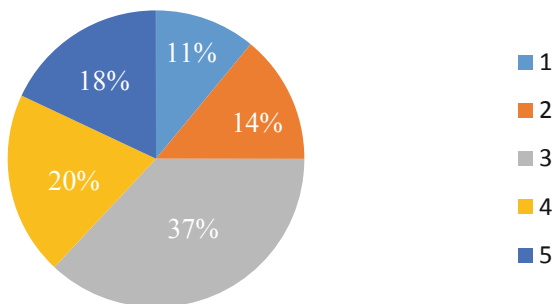
Fig. 2. The results of the survey "How do you assess the institutional measures undertaken by federal and regional authorities to stimulate industrial production?" (Source: author)
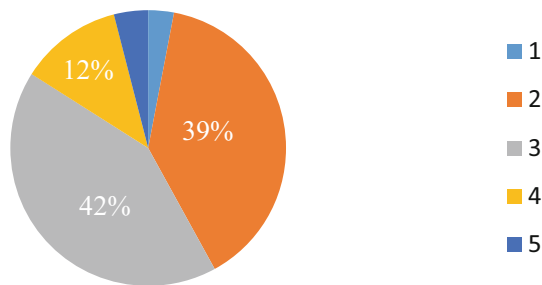
Fig. 3. The results of the survey "How do you assess the information measures taken by the federal and regional authorities to stimulate industrial production?" (Source: author)
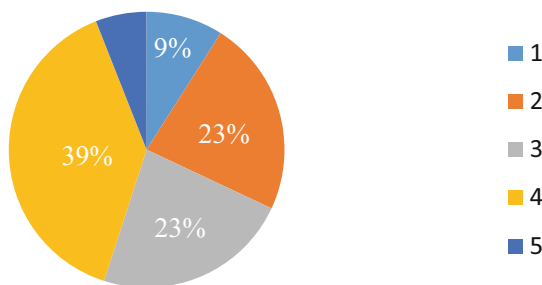
Fig. 4. The results of the survey "How do you assess the capabilities of small and medium-sized enterprises to take part in entrepreneurship support programs?" (Source: author)

Thus, it is possible to assess the degree of satisfaction of the business and scientific sectors in ongoing programs and their information support as average.

4 Discussion

The development of the domestic industrial field is constantly discussed in the scientific and business communities. It is no coincidence that industry is at the forefront of discussions: on the one hand, the presence of a strong industry can ensure national security and hedge the risks of international instability, and on the other hand, the industry must act as a driver of sustainable economic growth, which, unfortunately, failed to implement in Russia. Significant studies of institutional measures, including those applicable in the context of this issue, were published by Aganbegyan, Glazyev, Ivanter, Zubarevich, and Safronov [1, 5, 7, 9].

However, despite a number of objective negative aspects: a high degree of centralization in Moscow, the Moscow region and St. Petersburg, a high degree of imbalance in the economies of constituent entities, varying degrees of industrial

development, the share of transfers, lack of funding for science and technology, the outflow of knowledge capital, etc., about which experts say industry has a high potential for development.

Foreign researchers, in turn, are considering such a development of the industry that can allow them to go completely to a green economy [6, 8]. The work also reveals the relationship and interdependence of social and industrial (economic) growth [3]. In addition, the researchers noted the advantage identified by the authors to create agglomerations, the basis for which is an industrial cluster [4].

5   Conclusion

The author analyzed the current state of industry in the Russian Federation, examined the industrial potential of the Samara region and its structure. Based on the analysis of statistical data, a conclusion is drawn about industrial development trends in the Russian Federation.

The article provides an analysis of the main programs of support and development of industry at the level of federal and regional authorities, the main results of this support are presented.

The authors conducted a survey of representatives of business and scientific communities, one way or another connected with the industry of Russia, based on analytical data and the results of the survey, it is possible to draw a number of conclusions and recommendations.

The main findings include:

1. Industry is a prerequisite for the formation of national security, an adequate response to economic and political challenges.
2. Industry can and should act as a driver of the socio-economic development of the Russian Federation, as in the cases of developed countries manufacturing high-tech industry.
3. The measures to support domestic industry that existed before the launch of national projects in 2018 were not enough to at least somehow significantly increase the GDP (GRP) and living standards.
4. Industrial support programs in the Russian Federation in 2018–2024 are mainly built on the implementation of national projects (especially after the change of the Government of the Russian Federation).
5. Implemented measures to support industry do not fully meet the expectations of the real sector.
6. Information measures to support industry development programs were rated by 81% of respondents as poor and medium.
7. It is recommended to develop at the federal level a methodology for balancing regional inequality, a transparent system of distribution of transfers, tax exemptions, the goals of which will be to attract business in general and industry in particular to the regions.
8. Development of regional programs to attract significant financial resources to the Samara-Tolyatti agglomeration on favorable terms is recommended.

References

1. Aganbegyan, A.: Lessons from the crisis: Russia needs modernization and an innovative economy. ECO **1**(427), 34–60 (2010)
2. Analytical Center under Government of Russian Federation: Industrial dynamics production in Russia: Faster growth extractive sector (2019). https://ac.gov.ru/files/publication/a/23445.pdf. Accessed 02 Apr 2020
3. Basakha, M., Hossein, S., Kamal, M.: Industrial development and social welfare: a case study of Iran. Socio-Econ. Plann. Sci. **68**, 100661 (2019). https://doi.org/10.1016/j.seps.2018.10.012
4. Gan, L., Shi, H., Hu, Y., Lev, B., Lan, H.: Coupling coordination degree for urbanization city-industry integration level: Sichuan case. Sustain. Cities Soc. (2020). https://doi.org/10.1016/j.scs.2020.102136. Accessed 26 Mar 2020
5. Glazyev, S.: A Leap into the Future. Russia in the New Technological and World Economic Order. Book world, Moscow (2018)
6. Guo, Y., Tong, L., Mei, L.: The effect of industrial agglomeration on green development efficiency in Northeast China since the revitalization. J. Clean. Prod. **258**, 120584 (2020). https://doi.org/10.1016/j.jclepro.2020.120584
7. Ivanter, V.: The potential for economic growth in Russia. Sci. Works Free Econ. Soc. Russia **218**, 70–80 (2019)
8. Xu, L., Tan, J.: Financial development, industrial structure and natural resource utilization efficiency in China. Res. Pol. **66**, 101642 (2020). https://doi.org/10.1016/j.resourpol.2020.101642
9. Zubarevich, N., Safronov, S.: Inequality in the socio-economic development of Russian regions and cities in the 2000s: growth or decline? Soc. Sci. Modern. **6**, 15–26 (2013)

The Rational Enterprise Strategy Development: Marketing Aspect

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Abstract. Developing and implementing a rational enterprise strategy issues are becoming especially important for domestic organizations in today's unstable economy. The relevance of the article is: an enterprise engaged in the production, the sale of goods or services will not be able to withstand competition, act effectively in accordance with market requirements without the rational strategy based on a marketing approach. At the same time, special attention should be paid to the developing strategy principles, methods and tools reflecting the industry features of enterprises functioning. Consumer behavior research in the pharmaceutical industry has shown a potential customer has a significant impact on pharmacy retails and pharmaceutical manufacturers marketing communications. Domestic market restructurisation of the pharmacy retails increases competition for consumers. The problem is the following: the pharmaceutical market is actively entering the network business, which often exceeds the local business amount. The effective strategy development by the Federal departments top management leads to local and regional enterprises displace from the pharmaceutical market. At the same time, this can open up new offers of the most affordable and high-quality products in the pharmaceutical industry to the consumers.

Keywords: Competition · Consumer · Factors · Marketing · Pharmaceutical industry · Strategy

1 Introduction

Today, there is a difficult situation in the field of Russian public health due to population ageing, increase in the prevalence rate of chronic diseases, and existence of socio-economic inequality in obtaining access to health services. The main state socio-economic value is to preserve and strengthen public health. Therefore, building an effective, open to public, and safe health care system and a rational medicine assistance system is crucial for the country's prospective success to achieve its long-term strategic goal, that is to say, a higher level of economic and social development. Nowadays, any form enterprises and any activity sphere face increasing competition at the domestic and international commodity markets. Therefore, in order to adapt to the constantly changing market conditions, as well as to the increasing customer preferences, the company needs to develop an effective strategy using marketing tools which allow meeting consumer demand fully by providing high-quality goods and services.

In order to be successful, the organization must have a clear focus, in other words, the enterprise must have a specific strategy that will determine the enterprise management system. The enterprise effectiveness depends on the achieved strategic goals, so the research relevance is undoubtful. The strategy should be subjected to changes, depending on the external and internal environment state. The organization strategy should have its own uniqueness. Concerning the latter point, it is important to emphasize if the organization uses standard technologies, have already been tested by someone, the company cannot expect a high result, since it had been achieved by the leader in this field.

2 Methodology

Modern ideas about the role and importance of strategic management in the economic entities activities make us conclude that there is an urgent need for its use in overcoming the economic crisis, domestic enterprises competitiveness increase on the marketing tools use basis. A strategy is an organization pre-planned reaction to the external environment change, a policy chosen for achieving the desired result. For example, Chandler believes that the strategy should "define the long-term goals of the enterprise, as well as plan actions and allocate the necessary resources to solve the tasks" [2, p.122]. Ansoff defines strategy as "one of several sets of rules for making decisions about the organization behavior" [3, p.45]. Mintsberg, Ghoshal, and Quinn note that the strategy is not just a plan, but a set of actions to solve specific tasks [9]. Ackoff considers strategy as the category of planning. He believes that it is "the process of making and evaluating a number of interdependent decisions predicting a certain activity…" determining "… the desired future state…" [1, p.62]. Porter expresses his approach to defining a strategy: "Strategy is the creation of a unique and profitable position providing a certain choice of activities" [10, p.95].

Vikhansky and Naumov [14] emphasize that strategic management shifts the focus of managers attention to the company surroundings in order to respond to external changes properly. Strategic management tools – Balanced Scorecard, BSC [13], developed by Kaplan and Norton, [7] make the enterprise management process rational.

Hofer [6] defines strategic management as a special process that results in an enterprise interaction with its external environment. Meskon, Albert, and Heduri [8] emphasize the strategy is a comprehensive plan, the goal of which is to achieve the enterprise mission, and its main goals. The researchers Toymentseva, et al. [12] also state the strategic planning leads to the individual strategy development for each individual enterprise and helps the company to achieve its goals.

To define management strategic guidelines the following market tools were used in the Vita pharmaceutical enterprise: PEST and SNW and SWOT analyses, as well as Porter Competitive Forces model. In modern conditions the methodological basis for development strategy forming is both Western and Russian specialist theories and concepts. Evaluation of the general level of satisfaction with the quality of services provided by Vita pharmacy chain was based on the economic and mathematical modeling methods. Through the use of the sociological research method, it became possible to identify the main problems of the pharmaceutical industry and determine strategic development benchmarks.

3   Results

Modern requirements for the economic growth quality improving are accompanied by significant structural changes in the national economy. Today, there is a market share decrease of material production industries and service intensive development: educational, medical, financial, tourism, infrastructure, etc. The original structuring of social services involves the social-economic activities marking directly related to the production of health, education and culture capital, as well as social-economic activities providing conditions for its development (Fig. 1).
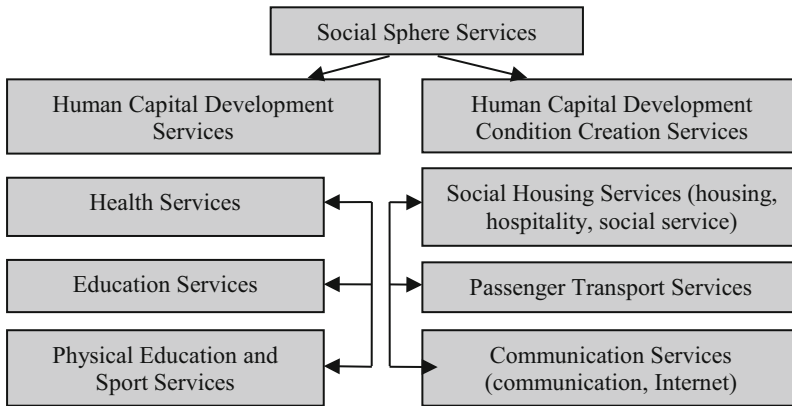
Fig. 1.   Social services structure (Source: authors).

The economic value of this type of service is determined by the number of circumstances. Firstly, saving time in the human capital reproduction cycle, that is, increasing the time of its useful functioning, associated with health capital, education and culture increase. Secondly, increasing its mobility, that is, the speed and deadlines of implementation methods and development guidelines.

Methodological approach to determine the integrated index of health services development, including the pharmaceutical industry, comprises the following algorithm for calculating the index. At the first stage, the expert evaluation method allowed to determine the list of the most significant quantitative and qualitative indicators to the population that characterize the consumer properties of the service. Consequently, the main indicators include availability, quality, safety, and price. Based on the fuzzy sets

theory, the per unit indicator of each parameter is calculated at the second stage. The performance evaluation of service development indicators in the pharmaceutical industry in 2010–2015, as well as the projected rate for the period up to 2030, are presented in Table 1.

Table 1. Calculation of the integrated index of customer satisfaction

Indicator name	2010	2015	2020 (projection)	2030 (projection)
	Performance evaluation			
Availability, weight coefficient 0.283	0.692	0.692	0.873	0.951
Quality, weight coefficient 0.209	0.692	0.873	0.873	0.951
Safety, weight coefficient 0.349	0.368	0.873	0.873	0.951
Price, weight coefficient 0.159	0.368	0.692	0.873	0.951
Integrated index	0.755	0.792	0.873	0.951

Source: authors.

The calculations allowed determining the integrated index of the service development in the form of the sum of productions of expert evaluations of the indicators under consideration by the corresponding weight coefficients.

The economic and mathematical model of the interpolation problem includes a transposable row-vector of annual time period valuations (X), a row-vector of valuations of the corresponding integrated indexes of service development (Y), as well as cubic spline interpolation operators (cspline, interp).

The calculation of the integrated index of service development within a dynamic series through a software product is carried out below:

$X = (2010\ 2015\ 2020\ 2030)^T$

$Y = (0.523\ 0.781\ 0.873\ 0.951)^T$

$s := \text{cspline}(X, Y)$

$A(t) := \text{interp}(s, X, Y, t)$

Therefore, the values of integrated targeted indexes of long term service development are the following:

$A(2020) = 0.885\ A(2025) = 0.897\ A(2027) = 0.91\ A(2029) = 0.933$

According to the results of the survey on the issues faced by pharmaceutical and healthcare companies in Russia over the period of 2019, the significance of insufficient solvency of the population (by 0.30 pt.) as well as the lack of state funding for health programs and Russian manufacturers support (by 0.24 pt.) has increased dramatically.

At the same time, the significance of the problems related to imperfect legislative regulation (by 0.32 pt.), corruption (by 0.18 pt.), and geopolitical risks (by 0.32 pt.) has slightly decreased. The difficulties associated with the marking system implementation rank fourth. The results are shown in Fig. 2.
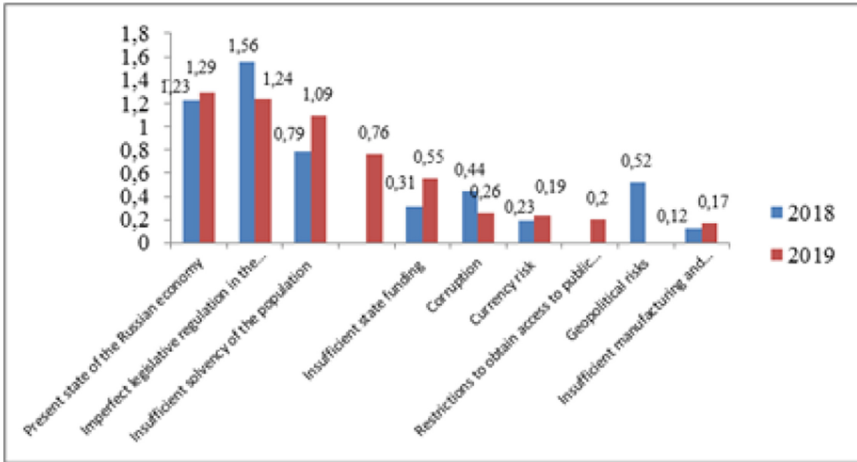
Fig. 2. Dynamics of problems of pharmaceutical companies (Source: authors).

By the end of 2019, 67.2 thousand pharmacies are successfully working in Russia, which is 2% higher than in the previous period. The reported period revenue of 2019 was 1,299 billion rubles, which is also 8% higher than in 2018. The analytical company RNC Pharma has ranked pharmacy chains by their share in the retail market for 2019 [11]. The results are shown in Table 2.

Table 2. TOP 5 pharmacy chains rating in Russia by the end of 2019

№	Pharmacy chain	Central office location	Retail number for 01.01. 2020	Volume, bln. rub	Market share, %
1	Rigla	Moscow	2846	57,9	6,6
2	CC Erkafarm	Moscow	1168	46,4	5,2
3	Pharmacy chain "36 и 6"	Moscow	1403	38,0	4,2
4	Neo-Farm	Moscow	736	31,6	3,8
5	Vita	Samara	1742	30,9	3,4

Source: authors based on [11].

By the end of 2019 leader in the pharmaceutical market share is pharmacy chain "Rigla" (6, 6%), the second place is the company group "Erkafarm" (5, 2%), the third is pharmacy chain "36, 6" (4, 2%). The pharmacy chain "Vita" ranks fifth with a market share of 3.4% and sales volume of 30.9 billion rubles.

The Vita pharmacy chain management pays great attention to customer structure analyzing, the average purchase price and the customer revenue volume. According to the survey results in Vita pharmacies, 82% of customers are women aged 29–75 years. The highest-income client group are people aged 36–45 years (21%), and 20% of revenue coming from the 56–65 age group. Low-income categories include the elderly over 76 (5%) and young people under 22 (2%).
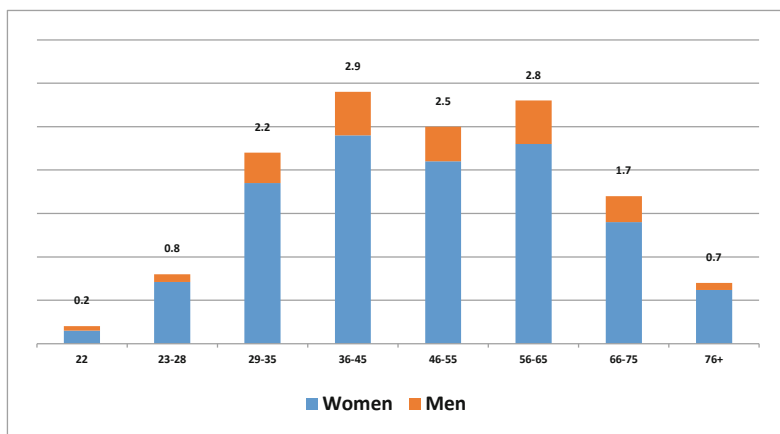
Fig. 3. The distribution of the proceeds of the company "Vita" depending on the gender and age of customers, rub (Source: authors).

Men make purchases 4 times less, and the men receipt average cost is 11% higher than the average receipt cost. The distribution of the proceeds of the company "Vita" depending on the gender and age of customers is shown in Fig. 3. According to research, the main turnover of the company – 87% - is formed by men and women aged 29 to 65 years. To analyze the "Vita" pharmacy retail external environment a PEST analysis was performed, the results of which are presented in Table 3.

One can clearly see the technological advances provide a good opportunity to develop the trade in medicines and medicinal products from the Table 2 data. The main threat is the state prices regulation for VEIMP (vital essential and important medical product) and the over-the-counter medical product sale legalization in retail chains. SNW analysis was performed to identify the company's strengths and weaknesses. The results of the analysis are presented in Table 4.

The following conclusions can be made based on the results of the analysis:

– the weak points of the "Vita" pharmacy chain are a small number of outlets, compared to the main competitor, and a smaller market share,
– the strong points – the loyalty program, the own brand development, the wide stock.

SWOT analysis was performed to compare external and internal environment factors, as well as opportunities and threats. The results are presented in Table 5.

The following conclusions can be made, based on the results of the SWOT analysis:

– the company key competence: new form of trade pharmacies (the "supermarket" format), with a wide stock, low prices and the possibility of expert advice on any type of product offered,
– the main threat to the company: possible competition from the retails and insufficient use of promotion channels contribute to the customers outflow, reducing purchasing power.

Table 3. The "Vita" pharmacy retail PEST analysis

Characteristic	Possibility	Weight	Threat	Weight
1	2	3	4	5
P	1. The pharmaceutical industry development state program	5	1. State price regulation for VEIMP (vital essential and important medical product)	5
			2. The government legislation changes related to allowing over-the-counter medical product sale drugs in retail chains	5
			3. The state spending increase on pensioners maintenance and support in medical establishments	4
E	1. The demand growth for PLP (Private Label Products)	4	1. The medical product fraud increase	3
	2. The adult paying capacity increase due to the retirement age raising	5	2. The population income decrease, the unemployment rate growth	4
			3. Currency instability	4
			4. The non-medical product demand reduce	4
S	1. The population growth	4	1. The alternative medicine promotion	4
	2. The medicine demand increase during the population increase morbidity period	5		
	3. The aging population proportion increase	3		
	4. The government acts development to healthy lifestyle goods and services increase demand	3		
T	1. The automated sales technologies development in the sales area	5	1. The new hardware treatment methods in medical establishments substituting the medicine consumption	4
	2. The e-trade development	5		

Source: authors.

Table 4. The "Vita" pharmacy retail SNW analysis

Rating system	S	N	W	Comment
1	2	3	4	5
Sales system, organization of retail outlets				
Quality opening of new retails	1			665 pharmacies were opened in 2018 which increased revenue by 54%
Pharmacies with open display	1			Open retail equipment
Merchandising	1			Own layout standards
Double quality control	1			The delivered product control
The clients communication standards	1			Communication checklists, equipment, complaint hotline
Organizational system				
Planning Prediction		1		Planning processes do not always work on time
Warehouse and transport logistics			1	Product delay, the warehouse insufficient work organization, lack of warehouses in other regions
Divisions and departments communications		1		Some divisions communications are not effective enough
Financial system				
Profitability achievement	1			Decent pricing, quality work with marginal goods
Financial control	1			Tracking expenses, accounting
Financial stability	1			Company scale
Marketing				
Brand image	1			The company perfoms marketing events to improve its image
Marketing campaigns advertising and promotion			1	Not full coverage of promotion channels, the problem of their understanding by the staff
Staff				
Salary level		1		High competition compared to other pharmacies
Motivation system		1		Motivation is registered for all positions
Training system	1			The company has a professional training base

Source: authors.

The authors also made a strategic analysis of the "Vita" pharmacy retail based on the M. Porter model of competitive forces. The results are shown in Fig. 4. Based on the study, the most rational strategy for the Vita pharmacy retail will be to optimize costs (new pharmacies led to a significant increase in costs in 2018–2019). Today, the costs incurred must be minimized. Thus, we can conclude, generally, the main factors

Table 5. SWOT-analysis

Strong points	Weak points
1	2
1. A rapidly growing pharmacy chain; 2. Highly qualified personnel; 3. Open layout form; 4. Merchandising standards availability	1. Low level of stock management; 2. Weak organization of transport logistics; 3. High costs for training and staff development; 4. Insufficient use of advertising and marketing promotion channels
Capabilities	Threats
1. Private Label Products demand increase based on attractive prices for customers; 2. Preventive agents demand increase connected with the healthy lifestyle promotion; 3. Information technologies development, including the e-trade	1. VEIMP prices state regulation; 2. National currency instability; 3. Increased competition due to the possible sale of parapharmaceutical products in retail chains

Source: authors.
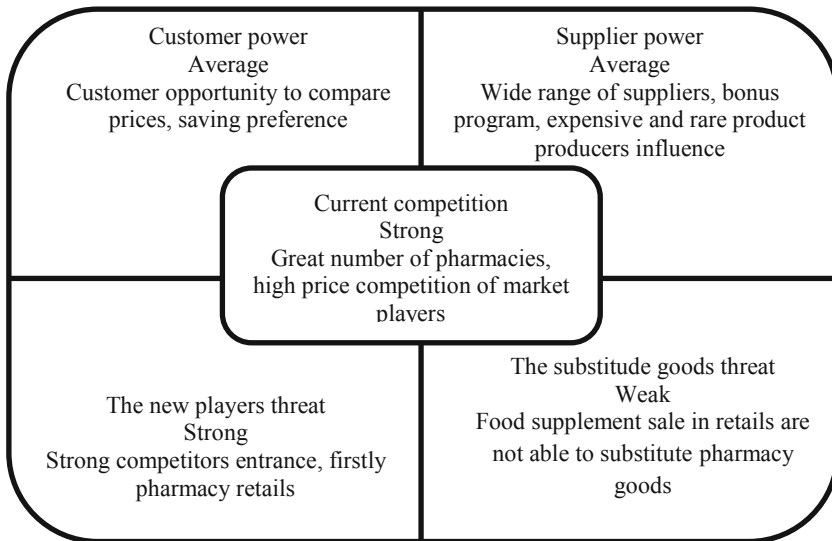
Fig. 4. Model of competitive forces (Source: authors).

having the most significant impact on the pharmaceutical market are income decrease and dietary supplement consumer demand increase. It is also noticed the traditional retail to an online system transition. The "Vita" pharmacy retail is actively developing, and many awards for the company's results and the profit increase in its core business show a positive and sustainable development.

4 Discussion

Promotion of any product or service is not possible without advertising tools. Medicine, medical services, in particular prevention, diagnosis, treatment and medical rehabilitation methods, medical devices advertising should be accompanied by side effects warning in their use, the instructions acquaintance or the expert advice. These requirements do not apply to ads that are exclusively consumed by medical and pharmaceutical workers.

In Russian legislation, medicinal products advertising is regulated by two acts: the General Federal law "On Advertising" [4] and article 44 of the Federal Law "On Medical Products Circulation" [5]. Existing restrictions do not allow many companies to spend money on direct advertising of their products.

The profile Committee of the State Duma on Health Protection has prepared amendments to the second reading of the bill allowing the retail sale of medicines on the Internet. Currently, a draft law on the legalization of remote trade in medicines is being discussed. So far, we are talking about over-the-counter medical products, which can only be sold by pharmacies. This can increase the over-the-counter products demand due to the availability increase and ability to compete with cheaper prescription products offline. In this regard, one of the most important tasks for the "Vita" pharmacy retail is to increase activities in digital. Currently, there is an increase in requests for the topic "online pharmacy".

According to the respondents, the most strategic way to promote pharmaceutical products over the next two years (+40%) is interaction with medical personnel. Pharmacy chains stimulation by paying bonuses, as well as by entering into service contracts (the balance is +36% and +34%, respectively) ranks second. As for online sales through the own online store, the opinions are divided: 46% of respondents believe that it is a priority, while 54% of respondents do not share this opinion.

5 Conclusion

The "Vita" pharmacy retail takes one of the leading positions in the pharmaceutical market. A lot of promotions with discounts, reduced prices, and gifts are held for customers every month. The main qualities the company develops in employees are leadership and partnership. The "Vita" company was one of the first companies to introduce new technologies in retail (IT-solutions for stock management, products addressing and displaying, effective promotions and offers for customers), in warehouse logistics, in personnel training and management.

The need to shape the state policy in the field of medicine assistance is determined by the role of the state in public health protection. In the context of implementation of "Development strategy of the pharmaceutical industry in the Russian Federation for the period up to 2030", every second respondent (50%) expects new medicines and medical devices to be launched on the market. The respondents also forecast a reduction in product imports (31%) and an increase in country-specific production/extension of local manufacturing content (25%).

Two-thirds of respondents (67%) from foreign companies without any local manufacturing content in Russia declare to reduce the volume of imports as a result of the strategy implementation.

The advantages of the state support measures to further business development are:

– guaranteed public procurement (+60%),
– preferential access to public procurement (+52%),
– tax benefits (+36%).

To enhance the pharmacies image and increase advertising contacts with customers, the cross-marketing is recommended to use. In this case, two companies that run their own business combine and exchange their target customers. That is, if customers trust one company, they become potential consumers of the second company. At the same time, cross-marketing campaigns can be aimed at attracting absolutely new customers. Partner marketing tools should be used for the "Vita" pharmacy retail as a part of strategic advertising actions:

Free tickets offer to the children's entertainment centers. The pharmacy will give a free ticket to visit children's entertainment for a certain amount check. This is an opportunity to increase customer loyalty and the check average cost for a pharmacy, and an additional ticket purchase for a children's entertainment center.

Thus, we can conclude that the implementation of a rational strategy will allow "Vita" to develop new products, improve the services quality, find new customers, enter new markets, develop successfully, strengthen its competitive position in the pharmaceutical market and improve its activity efficiency.

References

1. Ackoff, R.L.: The Democratic Corporation: A Radical Prescription for Recreating Corporate America and Rediscovering Success. Oxford University Press, New York (1994)
2. Chandler Jr., A.D.: Strategy and Structure: Chapters in the History of the American Industrial Enterprise. MIT Press, Cambridge (1962)
3. Ansoff, H.I.: Strategic Management. Palgrave Macmillan, London (2007)
4. Federal Law from 13.03.2006 N 38-FZ (edited from 01.05.2019) "On Advertising" (from changes and additions, valid from 12.05.2019). www.consultant.ru/document/cons_doc_LAW_58968. Accessed 07 May 2020
5. Federal Law from 12 April 2010 г. № 61-FZ "On Medical Products Circulation". www.consultant.ru/document/cons_doc_LAW_99350/. Accessed 07 May 2020
6. Hofer, C.W.: Conceptual Construct for Formulating Corporate and Business Strategies. Intercollegiate Case Clearing House, Boston (1977)
7. Kaplan, R.S., Norton, D.P.: The Balanced Scorecard: Translating Strategy into Action. Harvard Business Press, New York (1996)
8. Mescon, M.H., Albert, M., Heduri, F.: Fundamentals of Management. Business, Moscow (1992)

9. Mintzberg, G., Ghoshal, S., Quinn, J.B.: Strategic Process: Concepts, Issues, Decisions. Piter, St. Petersburg (2001)
10. Porter, M.E.: Competitive Advantage of Nations. Free Press, New York (1990)
11. RNC Pharma: Rating of Russian pharmacy chains. *KatrenStyle* (2020). https://www.katrenstyle.ru/articles/journal/news/opublikovan_reyting_aptechnykh_setey_po_itogam_2019_goda_tablitsa. Accessed 07 May 2020
12. Toymentseva, I.A., Karpova, N.P., Toymentseva, A.A., Chichkina, V.D., Efanov, A.V.: Methods of the development strategy of service companies: logistical approach. Int. J. Environ. Sci. Educ. **11**(14), 6820–6836 (2016)
13. Van Vliet, V.: Balanced scorecard (2010). https://www.toolshero.com/strategy/balanced-scorecard/. Accessed 18 Sep 2019
14. Vikhansky, O.S., Naumov, A.I.: Management. Economist, Moscow (1998)

Priority Forms of Building Communications in Organizing International Cooperation

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Abstract. Finding partners in the market of another country is a complicated task for any enterprise. This article is an example of the Serbian company Elitas, engaged in the production of advertising structures, and it describes the process of forming a partnership base of Russian companies. The following communication channels were selected to search for potential partners: direct e-mail, search for business partners on Internet sites (such as Sberbank partner, business partner, Partnersearch), participation in international exhibitions and fairs, participation in tenders for the supply, personal contacts and relations. The result of the work makes it possible to assess the effectiveness of each communication channel.

Keywords: International market · Partners · Marketing communications · Advertising constructions · Advertising signs · Marketing research

1 Introduction

Russia has an active international cooperation policy with many countries, including Serbia, which has very close trade relations with the Russian Federation. The features of the development of the Serbian economy are described by Dudic, Smolen, Dubic, and Mirkovic [5] and Iskenderov [6], which emphasize the stages of growth and decline, as well as ways of integrating the country's economy. At present, more than 20 intergovernmental agreements and protocols have been signed between Russia and Serbia, the most important of which is the free trade agreement, which has been in force since 2000 and the declaration on strategic partnership between Russia and Serbia (in force since 2013). According to the document, 95% of the goods that have joint Russian-Serbian production were exempted from customs duties.

According to Ru-stat [14], trade between countries is developing in leaps and bounds (Fig. 1). Trade turnover between Russia and Serbia amounted to $8.71 billion for the period 2014–2018. The lowest rate for this time was $1.26 billion, the highest is $2.12 billion. Import to Russia amounted to $4.55 billion for the period 2014–2018. The indicated dynamics leads to the fact that the development of relations between countries is highly dependent on the political situation. It is worth noting the advantages of economic agreements attracted Russian business, but not everyone is fully acquainted with them.

One of the companies set the goal of developing partnerships with Russia was Elitas, a Serbian company engaged in the production of advertising signs for domestic and foreign markets.
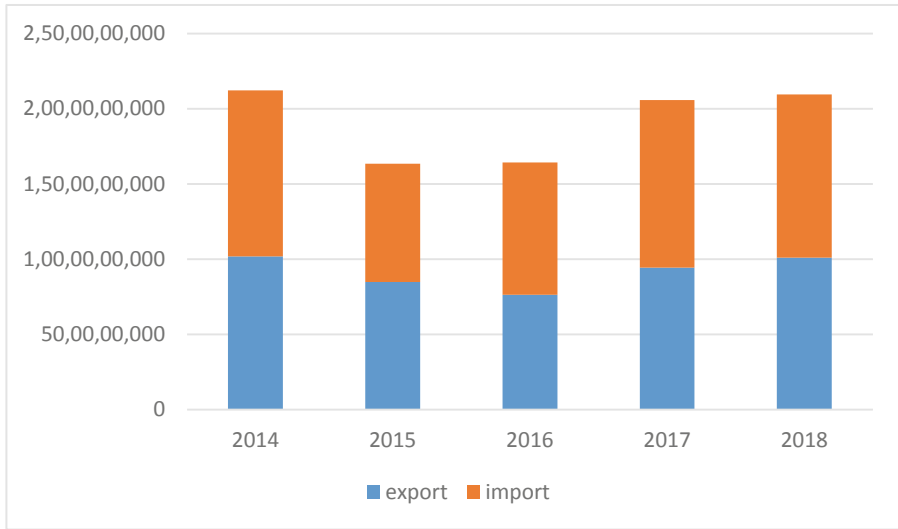
Fig. 1. Trade between Russia and Serbia in the "All Products" section, USD (Source: authors)

It is possible to find work on decorating gas stations, including LED screens, the appearance of large retailers and shopping centers, the internal and external equipment of the Belgrade airport, and other works in the company's portfolio. The company exports its products to 24 countries, mainly to European countries. The main competitive advantages of Elitas:

– favourable customs transport agreements,
– an available labour force,
– international quality standards: ISO 9001 [8], ISO 14001 [7] and OHSAS 18001 [13].

It allows the company to take a leading position the ratio "price-quality" on the market. Consequently, Elitas is attractive for the Russian advertising market, which today is experiencing clear difficulties.

The following negative phenomena inherent in the modern Russian advertising market are identified and reflected in the article by A.V. Shokhorov "Study of the characteristics of the advertising market in Russia" [16]:

1. The increase in the cost of advertising products due to the growth of the foreign component of materials for production.
2. The interruptions in the supply of materials for production associated with sharp surges in the exchange rate of the national currency.
3. The strong reduction in credit lines from suppliers, which leads to non-compliance with the deadlines for the execution of orders.

The above data demonstrate and prove the interest of both Serbian and Russian advertising industry enterprises in organizing mutually beneficial cooperation. The question remains open of choosing the form for the Serbian company Elitas to enter the Russian market.

The following classical forms of companies entering international markets are highlighted in works on foreign economic activity and international marketing by the authors Verbeke, Ciravegna, Lopez, and Kundu [18], Wirtz, Pistoia, Ullrich, and Göttel [19], Meyer and Peng [12], Mellahi, Frynas, Sun, and Siegel [11]: export, joint ventures, auction trading, international trading, international trading in licenses, international renting (leasing), franchising, foreign investment.

The works identified the advantages and disadvantages of the company's entry into the international market and then the authors express an opinion on which form is the most relevant and effective. Some of them give preference to such forms as franchising and joint ventures more often than others. So, for example, Korolev [10] notes that it is practically impossible to compete alone with small companies in highly competitive international markets, therefore, in his opinion, the most promising form of organization for cooperation is joint ventures. Thus, Elitas chose such a form of organization of interaction with Russian partners as the creation of joint ventures. An obligatory step in the step-by-step algorithm of organizing foreign economic activity is the stage of searching for partners. This stage is devoted to our research. The purpose of the present study is to search for business partners in the Russian market to establish joint ventures with the Serbian company Elitas.

2   Methodology

Initially, out of 86 constituent entities of the Russian Federation, regions with millionaire cities were selected. Then, the quantitative composition of manufacturers of advertising signs was determined in each of the selected regions according to AllCompanies. The data are presented in Table 1.

Table 1. Number of companies producing signs in different regions in 2018

Regions	Region number on the map (Fig. 2)	Companies producing advertising signs in the region (in pieces)	Million-plus cities in the region (population)
Moscow region	1	875	Moscow – (12.5 million people)
Leningrad region	2	342	St. Petersburg – (5.3 million people)
Novosibirsk region	3	65	Novosibirsk – (1.6 million people)
Sverdlovsk region	4	148	Yekaterinburg – (1.46 million people)
Novgorod region	5	72	Nizhny Novgorod – (1.25 million people)
Republic of Tatarstan	6	119	Kazan – (1.24 million people)
Chelyabinsk region	7	77	Chelyabinsk – (1.2 million people)
Omsk region	8	19	Omsk – (1.17 million people)
Samara Region	9	62	Samara – (1.17 million people)
Rostov region	10	104	Rostov-on-Don – (1.13 million people)
Republic of Bashkortostan	11	71	Ufa – (1.12 million people)
Krasnoyarsk region	12	34	Krasnoyarsk – (1.09 million people)
Perm region	13	40	Perm – (1.05 million people)
Voronezh region	14	43	Voronezh – (1.04 million people)
Volgograd region	15	53	Volgograd – (1, 013 million people)
Krasnodar region	16	142	Krasnodar – (1 million people)

Source: authors.

Logistics costs are high for joint ventures. In this connection, we have selected regions as close as possible to the Serbian border, as well as regions with the highest standard of living: Moscow region, Leningrad region, Sverdlovsk region, Rostov region, Krasnodar region and the Republic of Tatarstan. Although these regions are characterized by a high concentration of companies producing advertising signs (Table 1), which shows a high level of competition, we have chosen to do so. The high logistics costs will not allow the joint venture to establish competitive prices in regions with low levels of competition, which makes cooperation irrelevant.

Fig. 2. Selected regions for possible cooperation on the map (Source: authors).

It is necessary to choose cities where large international and Russian networks are represented so that logistics costs are justified. This is directly related to population density and living standards (Fig. 2). Accordingly, such a solution in the future may become not a single supply from country to country with expensive logistics, but a planned order to signs more than one network point. In this case, companies take the selection of a contractor seriously. European quality certificates and a company portfolio with market leaders can be decisive factors. In this case, Elitas has a significant advantage over Russian contractors in the manufacture of various types of signs both indoor and outdoor.

The main competitors cannot provide the signs for all possible customer's orders in the regions, especially when it is necessary to execute an individual and varied request. Elitas can offer technical novelties and a large volume of production on a turn-key basis. If the customer needs different kinds of works, then the Serbian company can process everything in a «single window» and one term. This allows the customer to reduce the risk of the number of contractors for different types of work. One contractor - all types of work.

The contact stage with potential partners comes after the regions have been identified. To begin with, a content strategy was developed to familiarize potential partners with Elitas, its capabilities and its offer of cooperation. The content was compiled from the following parts:

– history of the creation and development of the company,
– main competitive advantages of the company,
– description scales of production activity,
– description of production technologies and capabilities,
– key customer (Gazprom, Metro, Subaru, etc.),
– large completed projects (design of the entire Belgrade airport, etc.),
– possible ways of cooperation between Russian partners with Elitas,
– basic offers for potential partners and possible points of contact (Russian company's entry into the international market).

The site has become a platform for posting content. The next task for Elitas was to identify the channels for contacting potential partners and demonstrate them the created content on the site and gather contacts.

We have reached the conclusion that the following channels for the search for business partners abroad are being prioritized by all listed authors (Karagulian [9], Korolev [10], Vasilieva [17], Balakireva [3], Dorn, Schweiger, and Albers [4]): use of informal connections, use of the Internet, written appeal by mail (fax), participation in conferences, tenders, exhibitions, fairs and participation in international economic forums. We used almost all of them: sending of e-mails to potential partners for cooperation; search for business partners on Internet platforms (such as Sberbank partner, Business partner, Partnersearch); participation in international exhibitions and fairs; participation in tenders; personal relations. Such a channel as participation in international economic forums was not used, since the programs did not fit on the dates.

3   Results

3.1   Official E-Mail to Potential Partners

A database of 48 signage companies based on analysis of the regions of the Russian Federation, which could become potential partners of Elitas for further joint realization of large orders, was created. Table 2 presents the number of possible partner companies by region.

Table 2. Number of possible partner companies relative to the city

City	Number of possible partner companies
Moscow	8
Kazan	4
Tomsk	2
Novosibirsk	2
Nizhny Novgorod	2
Krasnodar	4
Anapa	2
Goryachiy klyuch	2
Surgut	9
Tyumen	2
Ekaterinburg	11

Source: authors.

The following information was collected on the websites of potential partner companies:

- information about the company itself,
- location, provided products and services of the company,
- general contact details,
- contact details of the director, assistant directors or development department.

The next step was the preparation of an official letter summarizing the company Elitas, the offer of cooperation and the enclosed file with a presentation and a link to the site containing the above-mentioned content.

Table 3 presents the statistics of the feedback received.

Table 3. Statistics of feedback received from potential partners of Elitas during the organization of e-mail newsletters

Target action	Number of actions
Number of companies	48
Number of emails	52
Number of replies to emails	5
Number of proposal reminder letters	47
Number of responses since last letter	1
Total number of companies responding to letters	6
Number of companies that have stopped communication through correspondence	3
Number of companies with which further contact is agreed	2
Number of companies with a Skype conference was held to discuss details	1

Source: authors.

The following conclusions can be made:

1. The e-mail distribution of letters brought the company 6 interested contacts out of 52, which is 13.63%.
2. Agreements were reached on cooperation in the process of business correspondence with 3 of 6 potential partners (6.81%). More details:

- the first company is ready to take joint large orders in Russia,
- the second company is ready to supply part of its products to Europe,
- the third company is ready to consider Elitas as a supplier of signage for federal orders.

The result of the communication channel - official emails, Elitas acquired 3 partners out of 48 possible, which is quite good for the results of cold mailing. The proportion of letters read to letters that received replies is 92.3% to 13.63%. A growth point for this communication channel is improving the content of the presentation and site.

3.2 Internet Platforms for Business Partner Search

The way to find business partners on specialized Internet platforms was chosen as one of the channels. The cooperation information was added in each announcement: a link to the Elitas partnership site and presentation materials detailing the activities of the Serbian company and its vision of partnership with Russian companies.

The following sites were selected for testing the effectiveness of this channel: Sberbank partner (https://bankofpartners.com/en); Business partner (http://www.businesspartner.ru/) and Partnersearch (https://www.partnersearch.ru).

The following results were obtained after 2 weeks:

Table 4. The results of the effectiveness of online platforms for finding business partners from 02.15.19 to 03.01.19

Source	Feedback	Target feedback	Negotiating
Sberbank partner	4	0	0
Business partner	7	0	1
Partnersearch	2	0	0
Total	13	0	1

Source: authors.

The business platforms are active today (Table 4). The main participants in such resources are companies seeking sponsors for their own projects. A potential non-target partner was found with an attractive interaction option for Elitas - the SvetoShow project. The Russian side proposed to produce patented products at Elitas facilities. In the future, such developments can be used as a creative form of advertising. SvetoShow's patent portfolio includes test works for Sberbank and several other companies. In conclusion, the effectiveness of business platforms as a communication tool has been proven. Such a method is worth using when prospective sponsors are being sought, but it is not to be expected that the response will be targeted.

3.3 Participation in International Exhibitions and Fairs

It was suggested to participate in professional fairs as one of the options for finding potential partners. This is an opportunity for Elitas to present and showcase their products, as well as to find targeted contacts. First of all, the Russian exhibitions were analyzed, and international exhibitions with similar topics were also found.

Potential exhibitions are presented below in Table 5 (Date of access to the site-February 2019, the information is current on this date).

Table 5. Relevant professional fairs for Elitas

№	Name of the exhibition	Country	Description	Site
1	European Sign Expo (ESE)	Germany (Munich)	Europe's largest exhibition of printed signage and visual communications	https://ese.fespa.com/
2	Design and advertising Next	Russia (Moscow)	Exhibition of marketing communications "Design & Reklama NEXT" has established itself as one of the most important and interesting specialized b2b-forums in Russia	http://www.design-reklama.ru/eng/about.html
3	Reklama, Polygraf, Obaly	Czech Republic (Prague)	26th International Exhibition of Advertising, Printing, Packaging and Innovative Technologies	http://reklama-fair.cz/en/
4	Central Asia Reklam	Kazakhstan (Alma-Ata)	5th International Exhibition of Advertising, Printing, Signage Technologies and Materials	http://reklamexpo.kz/?lang=en
5	Store Promotion Expo Summer	Japan (Tokyo)	Japan's largest exhibition of marketing and advertising products and solutions	https://www.reedexpo.co.jp/en/Exhibitors/207292/Store-Promotion-EXPO-July
6	Exposign	Argentina (Buenos Aires)	18th International Exhibition of Visual Communication	https://www.exposign.com.ar/en/
7	Reklama	Russia (Moscow)	Top industry event for manufacturers and customers.	http://www.reklama-expo.ru/en/

Source: authors.

3.4 Tendering

Tendering is an option to find potential partners and direct clients. It is possible to get a large order by participating in tenders, which supposedly could recoup Elitas logistics and production costs. But these expectations did not materialize during the analysis. Antonov and Kiseleva [2], Akhmetova [1],Shinkevich, Misbakhova, Bashkirtseva, Fedorova, Martynova, and Beloborodova [15] wrote about the public procurement system, and this issue is also regulated by the Federal Law of 2013. So that the international company Elitas could take part in tenders of the Russian Federation, we contacted the Interregional Tender Center (ITC) and consulted with them. This organization has provided us with the following data:

1. Current tenders related to the manufacture of signs. The most attractive options for the sum of a million rubles for the order (3 tenders out of 15) were highlighted in this list.
2. Elitas has two ways to participate in Russian tenders: directly (as a Serbian company with a registered office and registration not in Russia) and through a counterparty. The second option is the most attractive, as the circulation of documents will be easier.
3. However, the market is oversaturated by companies engaged in the production of signs, so participation in tenders gives no more than 10–15% of the net profit from the order. Therefore, taking logistics into account, the cost of the final product will not be as high as expected.

After examining all the tender information, it was concluded that this is a possible but rather complicated way of obtaining orders in Russia. In order to simplify the procedure, it was decided to enter into a partnership with Russian companies (similar to Elitas) that participate in the tenders. And in the future to realize a large order jointly.

3.5   Personal Relations

Personal acquaintances are a widespread tool of promotion in Russia.
The following can be attributed to personal interaction channels:

– personal account on Instagram/Vkontakte or other social networks,
– personal connections and contacts with people who may be interested in the Elitas offer.

Personal Instagram accounts showed the following results.
This communication tool can be considered relevant and effective. We speak about quick response, trust and careful examination of the conditions of the partnership. So, this channel is also targeted (Table 6).

Table 6. Efficiency of Personal Contacts channel

First step	Feedback	Process	Conclusion
2 stories posted on two Instagram personal accounts with Russian audience	2 contacts of Decision Makers have been received	Correspondence with potential partners	1 target contact received

Source: authors.

4   Discussion

The company's entry into the international market is a very complex issue. There are many ways of finding partners and organizing cooperation. The choice depends on the industry in which the company operates, the participating countries and the specific political and economic relations between them. In this regard, the forms of international cooperation described in the literature demonstrate varying effectiveness in each case. The example of Elitas company tested some of the methods in this article. In practice,

the most effective methods have been those described more frequently in the scientific periodical literature. Thus, the set of methods proposed in the article is not universal, but the most effective in most scenarios of organizing international cooperation.

5   Conclusion

In conclusion, we can draw the following conclusion:

1. The Serbian market is attractive to Russia. International partnerships are mutually beneficial.
2. Targeted cold mailing of official emails to potential partners gives a result and can be considered a working tool. Improving the content of the presentation and the site is the main condition for using such a channel.
3. The performance of business platforms as a communication tool has been proven. The drawback and at the same time the advantage of this channel is the unearmarked feedback can be potentially useful.
4. Participation in professional fairs can be seen as a channel of communication. The main condition is the convergence of topics and interests of the fair.
5. Participation in Russian tenders is a difficult way for international companies, which makes this channel of communication time-consuming and costly.
6. Personal connections can be considered the most targeted communication channel. It's about trusting relationships, understanding personal relationships, and reacting quickly.

References

1. Akhmetova, L.Ya.: Public procurement system (2010). http://www.audit-it.ru/news/finance/207237.html. Accessed 03 Mar 2019
2. Antonov, V.I., Kiseleva, O.V.: Foreign experience in regulating the placement of state orders and the possibility of its use in Russian practice. Mod. Probl. Sci. Educ. **3** (2013). http://www.science-education.ru/ru/article/view?id=9274. Accessed: 03.03.2019
3. Balakireva, S.M.: Principles and channels of searching for new foreign trade partners in a crisis. Russ. Foreign Econ. Bull. **4**, 63–72 (2016)
4. Dorn, S., Schweiger, B., Albers, S.: Levels, phases and themes of coopetition: a systematic literature review and research agenda. Eur. Manage. J. **34**(5), 484–500 (2016). https://doi.org/10.1016/j.emj.2016.02.009
5. Dudic, B., Smolen, J., Dubic, Z., Mirkovic, V.: Support for foreign direct investment inflows in Serbia. Econ. Ann. XXI **169**(1–2), 4–11 (2018). https://doi.org/10.21003/ea.V169-01
6. Iskenderov, P.: The role of diplomacy in the history of the Balkans. Hist. Questions **4**, 114–126 (2018)
7. ISO 14001. https://www.iso.org/iso-14001-environmental-management.html. Accessed 15 June 2019
8. ISO 9001. https://www.iso.org/iso-9001-quality-management.html. Accessed 15 June 2019

9. Karagulyan, E.A.: The work of the enterprise to enter the foreign market. Marketing research. Strategies for the company to enter the foreign market. Progress Group, Moscow (2015)
10. Korolev, V.I.: Problems of organizing a company's entry to the foreign market. Russ. Foreign Econ. Bull. **11**, 70–77 (2016)
11. Mellahi, K., Frynas, J., Sun, P., Siegel, D.: A review of the nonmarket strategy literature: toward a multi-theoretical integration. J. Manage. **42**(1), 143–173 (2016). https://doi.org/10.1177/0149206315617241
12. Meyer, K., Peng, M.: Theoretical foundations of emerging economy business research. J. Int. Bus. Stud. **47**, 3–22 (2016). https://doi.org/10.1057/jibs.2015.34
13. OHSAS 18001. https://www.lr.org/en-gb/ohsas-18001/?AspxAutoDetectCookieSupport=1. Accessed 15 June 2019
14. Ru-stat: Trade between Russia and Serbia « all products » (2018). https://en.ru-stat.com/date-Y2014-2018/RU/trade/RS. Accessed 15 June 2019
15. Shinkevich, M., Misbakhova, C., Bashkirtseva, S., Fedorova, T., Martynova, O., Beloborodova, A.: Institutional factors of micro, mezzo and macro systems' innovative development. J. Adv. Res. Law Econ. **8**(1), 229–236 (2017). https://doi.org/10.14505/jarle.v8.1(23).26
16. Shokhorov, A.V.: Study of the Characteristics of the Advertising Market in Russia. Bulletin of the Pskov State University. Series: Economics, Law, Management, vol. 1, pp. 92–100 (2015)
17. Vasilieva, A.: Search for foreign trade partners in the context of geopolitical tensions. Actual Probl. Innov. Econ. **13**, 213–218 (2016)
18. Verbeke, A., Ciravegna, L., Lopez, L.E., Kundu, S.: Five configurations of opportunism in international market entry. J. Manage. Stud. **56**(7), 1287–1313 (2019). https://doi.org/10.1111/joms.12355
19. Wirtz, B., Pistoia, A., Ullrich, S., Göttel, V.: Business models: origin, development and future research perspectives. Long Range Plann. **49**, 36–54 (2016)

Importance of International Entrepreneurship Skills Among MBA Students: Global Comparative Study

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Abstract. The paper tries to investigate what are the most important skills among MBA students, who are starting transnational entrepreneurship. In the context of globalization, the borders of the world for the professional career of students are open. Therefore, it is important to develop students' skills of multi-cultural communication, which will be promoted by the development of international relations through exchange programs, summer school programs, internships, and cooperation with international companies. Another important factor is economy development and the facts prove that both national and world economy development basically based on international entrepreneurial activities. The paper focuses on online technologies and blended learning methods as the ways of intensifying the educational practices in the issue. For the purpose of the paper, there have been conducted more than 400 questionnaires with MBA students in selected countries with emerging economies for the period of 2017-2018. Paper results indicate that flexible approach to international on-line project teams design helps students understand regulation ways of their on-line networking procedures and coordinate their activities with other participants of their distant team.

Keywords: Entrepreneurship · International business · Knowledge transfer · Networking

1 Introduction

Entrepreneurship has a social potential because it encourages to take into account the needs of potential customers (thereby improving their conditions, at least in principle), and also because doing business requires the creation and management of a team of people and the creation of jobs. Entrepreneurship can also promote social cohesion by increasing employment, economic rewards and job satisfaction. However, entrepreneurial education is still relatively immature and rarely adequately considered at the strategic level by universities or national policies. Kyrö [5] focuses on such features of entrepreneurship as the challenge of finding and grabbing the opportunities, setting

start-ups and their development, adopting risks and allocation of resources in order to find your segment at the market.

Many countries around the world are making efforts to modernize their human resources development systems in order to bring them into line with national and global economic requirements. Education and training systems are usually managed by government agencies, and most countries provide a framework for education and business cooperation in their legislation or strategies. Examples of educational and business cooperation in the field of higher education are in many countries. Factors potentially stimulating such cooperation: Presence of multinational companies; Technological advances in industry; Educational programs.

The concept of the "triple helix" focuses on the distinctive role of the university in economic and innovation development through more close cooperation of three main powers: university, business and government.

What are the relationships between the components of the triple helix?

– technology transfer,
– collaboration, leadership and moderation of conflicts,
– network interchangeability.

Universities are increasingly generating and transferring technology. Being previously considered as the source of humanresources and knowledge now they have got the status of key stakeholders of innovation, with constantly growing internal organizational mechanisms and resources. The World Economic Forum global competitiveness report highlights such future competences as design thinking, communication (especially crosscultural one) and entrepreneurial skills to be the core competences for the competitive professional [9]. The issues of development of the international entrepreneurship education concept in Central and Eastern Europe inspired the authors for making the research.

2 Methodology

For the purpose of this applied research the learning cycle of Kolb as a method in entrepreneurship studying was used, also some methods of statistical analysis and expert analysis were implemented. We suggest that entrepreneurship education for cross-border entrepreneurship can apply several modifications of the experiential learning cycle. Stages of the research work:

– the first stage included the theoretical analysis of various approaches to international entrepreneurial education at the targeted countries,
– the second stage was performed through monitoring and statistical analysis of master students interviews about their entrepreneurship skills,
– the third stage was focused on blended learning technology as the instrument of international entrepreneurial education intensification.

3   Results

Cooperation between universities and business environment in the sphere of entrepreneurship might be performed in several functions:

– training of entrepreneurs in order to acquire skills in the field of digital marketing, innovative, financial, operational management, business planning, legal regulation in the field of copyright protection, etc.,
– generation of ideas and team building, preparation for participation in relevant contests,
– providing a variety of services with the assistance of experts in business planning, product design, marketing research, motivation system, legal support,
– organization of interaction with investors, including venture funds, business angels, strategic partners, participation in international events, interaction with funds.

The university participates in the formation of the business environment and interacts with the business, creating open innovation programs for various sectors of the economy or certain business representatives. The result of international cooperation in the entrepreneurship education is the European project EU-XCEL for startups. During the week, intensive entrepreneurship training is conducted for participants in business incubators of six European universities in Ireland, Denmark, Germany, Greece, Poland, Spain. This is a summer school for startups. In accordance with the terms of the project, 30 students are sent to foreign universities, 30 students come to Athens. Each team must include at least three countries. Teams work for 12 weeks under the supervision of one coach. Every second week, results and plans are discussed. The program was funded by the European Union and the program was completed in 2017.

Various approaches to international entrepreneurship education summarize main competences which are necessary for successful entrepreneurship at the global market. Morris, Neumeyer, & Kuratko [8] explain that potential entrepreneurs should possess primarily business competencies, since the functional responsibilities of specialists are associated, first of all, with the development of the university's affiliate network, negotiating and concluding transactions, forming value offers that are competitive in the eyes of business partners. Ramoglou and Zyglidopoulus [10] continue discussion of professional readiness to recognize your business opportunity and develop it into the efficient and effective business. Learners also need reflective learning based on gamification methods or diversionary analysis in order to recognize critical events [6] that reflect risk and uncertainty related to transnational business. Kwong & Thompson [4] have pointed out that students focused often prefer to learn from experience of successful entrepreneurs, seek for future financing of their ideas and set the network before starting their own business in practice. The global comparative study in the paper was based on the collected 405 answers from the master students from the selected countries with the applied regression analysis as follows:

– Number of strata = 1
– Number of obs = 405
– Number of PSUs = 8

– Population size = 405
– Design df = 7
– F(7,1) = .
– Prob > F =
– R-squared = 0.0828

Then, after applying the correlation analysis in the accumulated countries analysis (Table 1) we have come up with interesting results that the master students in Estonia posses more comprehensive entrepreneurship skills than the rest of the countries.

Table 1. Regression analysis of master students entrepreneurship skills (Linear regression)

Country	Param.	Std. err	.t	P > |t|	[95% Conf. interval]
Estonia	.0226114	.1219853	.0.19	0.858	–.2658381 .3110608
Poland	–.1394425	–.1394425	.–1.50	0.176	–.3587661 .0798811
France	.09363	.09363	0.90	0.400	–.153361 .340621
India	.1285541	.1285541	0.95	0.372	–.1899028 .447011
Israel	–.2127932	–.2127932	–1.78	0.118	–.4947808 .0691944
S.Korea	–.0934428	–.0934428	–0.81	0.445	–.3667347 .1798491
Russia	.1437891	.1288485	1.12	0.301	–.1608892 .4484674
Czech Republic	.0666806	.3081904	0.22	0.835	–.6620739 .7954351
_cons	3.971759	. 3.12789	1.27	0.245	–3.424527 11.36804

Source: authors.

Liu [7] has demonstrated that network-learning has to deal with experience, dialogue, articulation of needs of learners, and pollination, meaning combination of diversified knowledge sources. Online networking offers opportunities for cognitive diversity that enables innovative learning, but it can also lead to communities where like-minded persons repeat and reinforce the narrow-minded views of each other. This danger is relevant for closed communities that do not have people in the role of "gatekeepers" looking for ideas from other communities. Widespread peripheral participation helps "gatekeepers" to transfer information between different communities. Face-to-face learning in classroom can be interactive knowledge sharing and team building experience for students involved but convergence of e-learning ad face-to-face learning is an essential tool for increasing international networking and knowledge sharing opportunities with students from different cultures [2]. Blended learning has mainly been defined as systems combining face-to-face and on-line educational approaches. Blended learning can be arranged as a multi-stage process rather than a single time and place bounded event in order to encourage students to be independent learners outside the classroom Bidder et al. [1] stress that blended learning is a flexible approach that overcomes time, location and cultural constraints. Blended learning involves combination of face-to-face classroom learning activities with asynchronous and/or synchronous online learning. In the context of cross-border entrepreneurship readiness it is important that blended learning helps students to develop their networking skills and get familiar with students in other countries. There are several

questions to answer, when searching for blended learning options that enhance cross-border learning readiness:

1. Is blended learning focused on conceptual knowledge sharing or does it also involve learning by doing and reflection of joint experience?
2. How learner-centred is the learning process – how independent are students to search online knowledge sources and to involve other learners to virtual or class-room teams?

In 2019–2023 global EdTech will grow at more than 5% per year. Today it is measured in the amount of about $ 165 billion. Eastern Europe is in among the fastest growing regional markets in online education. In turn, the driver of Eastern Europe is Russia. In the most conservative scenario, the average annual growth of the Russian

Online education in the next five years will be at 20%. The fastest growing companies involved in digital educational solutions are those based on game mechanics (+22.4% per year until 2021) and on the simulation of real processes (+17%). But our X-Culture virtual teamwork practice has also indicated that experience of using online collaboration platforms is not similar in different countries and universities. And blended - learning is the best variant for some educational areas. In Russia blended learning is characteristic primarily for long-term, comprehensive programs involving the acquisition of complex professional skills.

Another way of implementing blended-learning approach and it's especially essential for entrepreneurial education is performing it in mixed aged groups with mature professionals in some spheres and young students. This way young people being digital natives might share their experience of online networking and social media activities with older generation and older generation might share their offline experience of communicating with investors, developing business in real economic environment.

Globalisation trends also influencing greatly in composing national approaches to entrepreneurial education. It is not self-evident any more that all students will start an export-oriented business in the country of their birth and/or education without involving to their start-up teams founders from other countries or transfer his/her enterprise to a new location outside the country, where the business was at first launched. Digital entrepreneurship through innovative business models was greatly influenced by the global trend of sharing economy and they changed greatly the established rules at many modern markets [3, 11].

4   Discussion

Several researches studying the experience of project-based work-integrated learning for international students presented evidence that such projects are valuable both for developing conceptual and problem-solving skills and for self-management in a new business environment. Erasmus student exchange in Europe has created opportunities for educational practices that support learning about cross-border entrepreneurship and for entrepreneurship, although involvement of international students in the longer learning cycle than one semester is more suitable for learning through a student

enterprise practice in order to contribute to more stages of enterprise creation and development processes. Cross-border networking skills increase readiness for entrepreneurial project work in international teams and ability to understand added value of team members from other cultures and business environments. Understanding knowledge sharing and project work style differences in face-to-face and online communities is also an important learning outcome of networking practices. Networking is a tool for creating knowledge base for ambitious entrepreneurship initiatives that are driven by diversity of creative ideas and may create scalable and sustainable start-up opportunities that are not limited to local markets and locally available knowledge, human and financial capital.

5   Conclusion

The current goal of any university if it's going to stay competitive at the educational market is to identify and develop young leaders based on experience in the development and implementation of real student entrepreneurial projects, including social, innovative, educational ones. Main activities which can be performed are:

– attracting active students to enter international entrepreneurial programs,
– development of students' leadership skills, business communication skills, ability to work in an independently created team,
– development of entrepreneurial and critical thinking,
– gaining experience in creating and managing real projects,
– creation of a mechanism for the replication of successful projects in the social, innovative and educational fields,
– creation of a platform for the exchange of experience between beginners and established entrepreneurs,
– formation of career opportunities for students: access to the best employer companies interested in leading students,
– creation of a student communication platform to discuss the possibilities of implementing entrepreneurial initiatives.

University students develop and implement projects to solve pressing social, innovative, educational problems, improve well-being and living standards of the population in the regions. During the implementation of their projects, students develop project, social and entrepreneurial competencies and among them the ability to address to adequate online resources or social media resources and networks as well as intercultural communication and transnational cooperation might be the most essential competences. Vakkayil and Chatterjee [12] describe four globalization routes of business schools: moving from local distinctiveness to global patterns, infiltration of global norms, global expansion and moving from global patterns to pursue distinctiveness. Implementing entrepreneurial education in regional communities of Russian Federation or in small economies like Czech or Estonian ones does not allow to implement the global expansion strategy but the development of EdTech or MOOCs and concentration on trans border contacts might open new business opportunities for students in the areas. For example, the Volga region is traditionally a contact zone of

Indo-European Slavic, Finno-Ugric and Turkic-speaking peoples, which represents miniature model of Eurasia. The region is multi-confessional character, which allows us to consider its experience as an example of successful integration of various crosscultural practices. The significant feature of the Samara region in the Volga region is the role of transfer region - the territory of economic, legal, cultural, linguistic communications between the West and the East. The cross boarder educational program, aimed at studying Eurasian cultural and economic integration, will allow accumulating and broadcasting the experience of intercultural interaction in the region in the educational space of the countries of Eurasian continent.

References

1. Bidder, C., Mogindol, S.H., Saibin, T.C., Andrew, S.A., Naharu, N.: Students' perceptions of blended learning and achievement. In: Luaran, J.E., Sardi, J., Aziz, A., Alias, N.A. (eds.) Envisioning the Future of Online Learning, pp. 213–225. Springer, Singapore (2016)

2. Bleicher, J., Forrester, P., Honal, A., Velinov, E.: Virtual business projects in the classroom: enhancing intercultural and business skills of students. In: Gonzalez-Perez, M., Lynden, K., Taras, V. (eds.) The Palgrave Handbook of Learning and Teaching International Business and Management, pp. 747–768. Palgrave Macmillan, Cyam (2019)

3. Kelley, D., Singer, S., Herrington, M.: Global entrepreneurship monitor. 2015/16 global report (2016). http://www.gemconsortium.org/report/49480. Accessed 03 Jan 2020

4. Kwong, C., Thompson, P.: The when and why: student entrepreneurial aspirations. J. Small Bus. Manage. **54**(1), 299–318 (2016)

5. Kyrö, P.: The conceptual contribution of education to research on entrepreneurship education. Entrepreneurship Reg. Dev. **27**(9–10), 599–618 (2015)

6. Lindh, I., Thorgen, S.: Critical event recognition: an extended view of reflective learning. Manage. Learn. **47**(5), 525–542 (2016)

7. Liu, R.: Management learning in business networks: the process and the effects. Manage. Learn. **46**(3), 337–360 (2015)

8. Morris, M.H., Neumeyer, X., Kuratko, D.F.: A portfolio perspective on entrepreneurship and economic development. Small Bus. Econ. **45**(4), 713–728 (2015)

9. Penaluna, K., Penaluna, A., Usei, C., Griffiths, D.: Enterprise education needs enterprising educators: a case study on teacher training provision. Educ. Training **57**(8/9), 948–963 (2015)

10. Ramoglou, S., Zyglidopoulos, S.C.: The constructivist view of entrepreneurial opportunities: a critical analysis. Small Bus. Econ. **44**(1), 71–78 (2015)

11. Richter, C., Kraus, S., Syrjä, P.: The shareconomy as a precursor for digital entrepreneurship business models. Int. J. Entrepreneurship Small Bus. **25**(1), 18–35 (2015)

12. Vakkayil, J., Chatterjee, D.: Globalization routes: the pursuit of conformity and distinctiveness by top business schools in India. Manage. Learn. **48**(3), 328–344 (2016)

The Process Approach to Cost Management in Project-Oriented Enterprises of Engine Building

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Abstract. Improving the competitiveness of domestic enterprises of engine building is an urgent task in the country. The key factors of competitiveness are the cost and quality of products. The purpose of the article is to justify the possibility of applying a process approach to cost management in project-oriented enterprises of engine building. This approach allows you to distribute direct and indirect costs per unit of output, this allows you to correctly justify its cost and market price; optimize the value chain, eliminate unnecessary time and other resources; to increase the qualitative and quantitative indicators of products manufactured by engine building enterprises. The proposed project and process approach to cost management at the enterprise is based on modern systems and information technology for managing quality and business processes. The article proposes a scheme for implementing the project-process approach to cost management at the enterprise, describes the key rules for its implementation, and identifies its key advantages.

Keywords: Cost management · Information technology of process management · Process management · Process approach · Project management · Project and process approach

1 Introduction

Engine building in Russia is one of the leading manufacturing industries. A significant share of engine manufacturing enterprises is high-tech. High-tech products (innovative products, the production of which uses the results of research and development work corresponding to the priority areas of development of science, technology and technology of the Russian Federation) [2] are closely associated with a significant level of costs for their production.

This fact necessitates increasing control over the level of costs throughout the production cycle of products (works, services), improving and expanding the methods and tools used to manage costs. Proper management of innovation costs, taking into account the particular development of industries, will reduce the risks of innovation; improve the competitiveness of domestic enterprises.

An important tool for cost management in the enterprise engine is a competent system for accounting and cost allocation by product. Traditional approaches to cost management in industrial enterprises have ceased to meet modern requirements.

It happened because has changed the ratio of overhead costs. In the days of Henry Ford, it was the interest, and now can exceed half the cost.

As in the allocation of direct and indirect costs, and the application of the method direct-costing unit costs per unit of output are distorted. It doesn't justify the cost of the final product and establish a competitive price on the market. Large industrial companies around the world are currently increasingly widespread method of cost control based on process-oriented accounting [1, 6].

The essence of the process approach to cost management is that the product (product) is considered as a complex of interrelated processes (functions) from the point of view: usefulness, effectiveness, necessity, etc. The costs of the enterprise are distributed by function, process, and then by type of product according to the principle of involvement.

The basis of this approach rests the method of Activity-Based Costing. In the United States rapid spread of this method became in the 1980's thanks to the work of Johnson [4], Kaplan [7]. This method for the 1990-th years used about 10% of large companies, including USA, UK, continental Europe, Australia, started using it in Japan [10]. This wide acceptance of this method is obtained thanks to the possibility of its application not only in industrial but also in the trade and service industries [12].

In Russia, a partially similar method, a functional-cost analysis (hereinafter referred to as FCA), has developed almost simultaneously in parallel. This method fits perfectly into the concept of process cost management in industrial enterprises, in particular in the production of innovative products. It allows you to:

- increase the number of functions and usefulness of an innovative product, improve its quality,
- identify the correspondence between the significance of the function performed by the product and the costs of its creation,
- eliminate unnecessary functions, therefore, operations or individual processes,
- rationally and cost-effectively set the selling price for this product, taking into account the functions included in it,
- activate the creative thinking of the team,
- upgrade production technologies,
- increase the competitiveness of products and the enterprise as a whole.

The use of functional-cost analysis is aimed at minimizing costs at the stages of project, production and operation of the product. Practice shows that companies using this method of analysis were able to reduce production costs by 20–25% [3].

The result of the FCA should be a reduction in costs per unit of beneficial effect, which is achieved by: reducing costs while improving the consumer properties of products; improving product quality while maintaining the level of costs; cost reduction while maintaining the level of quality; cost reduction with a reasonable reduction in technical parameters to their functionally necessary level.

The introduction of a process approach to cost management is fraught with significant difficulties. For an engine company, project management is an urgent need, as these enterprises belong to the so-called "project-oriented" organizations, whose activities are closely associated with the implementation of complex innovative projects for the development and organization of production of new engines and

components for aircraft. At the same time, the application of the project approach is often insufficient, because project documentation describes the goals, but it does not pay enough attention to reflect changes in the business processes of the organization. Given the project focus of the engine building enterprises, as well as the proven effectiveness of the process approach to cost management and the enterprise as a whole, the task is to justify the possibility and effectiveness of the project and process approach to cost management in the engine building enterprises.

2 Methodology

Modern process control systems are based on the following main approaches:

– TQM (Total Quality Management) – a system of universal quality management,
– PIQS (Process Integrated Quality System) – a quality management system integrated with business processes,
– ISO standards 9000 series - standards governing the requirements for quality management systems [3],
– BPMS (Business Process Management System) – a business process management system,
– ERP (Enterprise Resource Planning) – a comprehensive system for planning and managing the resources of the organization.

Structural and functional modeling, which allows to visually describe a static system of business processes, is performed using modeling standards (SADT, IDEF, DFD) and software tools (BPWWin, Business Studio, ARIS).

Over the past decade, information technology has developed significantly, a number of tools for process simulation have been developed: tools for discrete-event simulation (Service Model, SimProcess, etc.); dynamic modeling tools (ReThink, PowerSim, ItThink, etc.); simulation tools based on flowcharts (Process Charter, Optima, ARENA, etc.).

3 Results

The main differences of the project and process approach to cost management are:

– main and auxiliary processes are allocated for each project separately, owners of these processes are appointed,
– the resources, parameters and consumers of processes are determined, process inputs and outputs,
– formalization of process control rules is carried out within the project in order to maximize customer satisfaction at the exit.

The advantages of the project-process approach to cost management at the enterprises of engine building include the following:

– within the project it is easier to ensure the coherence of the actions of process performers, to optimize the value stream,
– the project-process approach to cost management at the enterprise harmoniously fits and is easier to implement in the already existing matrix project management system at the engine-building enterprise.

An important factor in the application of the project and process approach to cost management in the enterprise is the determination of the sequence of stages of its implementation. The author proposes the following scheme for the implementation of the project-process approach to cost management at the enterprise (Fig. 1).

Identification of activities to which a project-process approach to cost management will be applied	Product List
Allocation of the main and auxiliary processes within each project using software tools based on the value chain	Project documentation
Assigning process owners, identifying resources, inputs and outputs of processes	Project documentation
Development of a balanced scorecard (MTP) to assess the effectiveness of the design process approach to cost management	Balanced scorecard
Project implementation and evaluation of the results of the BSC	Conclusions
Correction of actions and implementation of the project-process approach to cost management in other projects	Organizational Standards and Rules

Fig. 1. Organization of the project and process approach to cost management in the engine building enterprise (Source: author).

It is advisable to apply the project and process approach to cost management to all ongoing projects at the enterprise, testing the approach on one or two relatively short-term projects. When selecting processes, it should be borne in mind that the main processes should be no more than 7 ± 2. This figure comes from the fact that the top leader, like any person, cannot effectively manage and perceive information from more main areas of activity. The number of auxiliary processes should not be more than 5 ± 2. Otherwise, the top manager loses control of the organization for the same reason.

The main business processes should be represented as a value chain, highlighting the main stages of creating results. It is important to start at the end of the chain: from the result provided to the consumer. Results can be created by one or different value chains, while chains at different stages can be combined and disconnected.

A general example of a value chain on the example of an industrial enterprise, including an engine manufacturing enterprise producing innovative products, is presented in Fig. 2. The consolidation of process owners should be documented, which will improve the efficiency of process management within the project. The balanced scorecard should include economic and non-economic indicators. To assess the effectiveness of the cost management system, economic indicators must include, for example, the cost of products, the cost of a ruble of marketable products, the share and amount of direct and indirect costs. Non-economic – the duration of the production cycle, tact time, indicators of product quality.
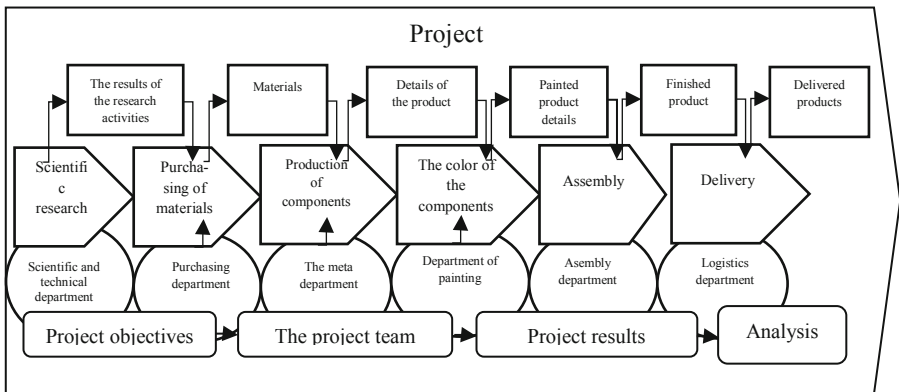
Fig. 2. The value chain of the project on the example of an industrial enterprise (Source: author).

According to the results of the project, conclusions should be drawn based on a comparison of planned and actual indicators for a reasonable system of balanced indicators. Based on the findings, adjustments are made with the further implementation of the project-process approach to managing costs on other projects. Process modeling is effectively carried out using modern information technologies. The most popular in Russia were the ARIS software product, mainly due to the ease of use.

4   Discussion

The introduction of a project and process approach to cost management is justified and feasible in project-oriented enterprises, with an already established and not amenable to adjustment in the short term organizational structure. The project approach to the implementation of core business at the engine-building enterprises has shown its effectiveness. It allows you to significantly improve the qualitative and quantitative indicators of the project (produced products) by securing responsibility for specific performers. The project approach has been widely used for several decades both at domestic and foreign enterprises [11].

However, it does not allow solving the problem of calculating the cost of a unit of production with a significant share of overhead indirect costs. Justify the involvement of overhead costs to specific types of products just allows the process approach to cost management. That is why the symbiosis of the project and process approach in such cases is justified and effective.

These judgments are confirmed by the work of Mikhailova & Sbitnev [9]. The main strengths of the project process approach to cost management in the enterprise are:

– interest of project managers in its high efficiency,
– simplification of internal relationships between departments and individual per-formers due to documenting process owners and concretizing performers, which will increase the flexibility of the project as a whole [8],
– acceleration of decision-making (for the same reasons),
– improving project performance by limiting its scope, setting specific goals, and concretizing the list of participatory processes,
– increased responsibility for the performance of the project not only of its leader, but also of the owners of all involved processes,
– control of the project budget, reduction of costs for its implementation [5],
– the correct distribution of indirect costs per unit of production, which allows you to correctly justify the cost and market price of the product, as well as develop a marketing policy of the enterprise.

5   Conclusion

The project and process approach to cost management in the enterprise proposed in the article is relatively similar to the process approach, but in contrast, it is used within individual projects of the enterprise. This greatly simplifies the implementation and application of this approach, does not require a significant reorganization of internal corporate relations and organizational structure. It harmoniously fits into the matrix system of project management at the engine-building enterprise.

This solves the key problem of the process approach to cost management in the enterprise - the problem of its implementation. The company has the opportunity to test the process approach to managing costs for individual projects, bring it to a high level and then scale it to other projects. The proposed project and process approach to cost management at engine building enterprises is copyrighted and is currently being implemented

at one of the leading engine building enterprises in Russia (PJSC Kuznetsov). The main advantages of the project-process approach to cost management at the enterprise is that it allows you to correctly distribute direct and indirect costs per unit of production, which allows you to correctly justify its cost and market price; optimize the value chain, eliminate unnecessary costs; to increase the qualitative and quantitative indicators of the project as a whole.

References

1. Duran, O., Pereira Afonso, P.S.L.: An activity based costing decision model for life cycle economic assessment in spare parts logistic management. Int. J. Prod. Econ. **222**, 107499 (2019)
2. Iskoskov, M.O.: Problems of cost management and methods of their reduction in the conditions of innovative economy. Kazan Sci. **9**, 60–64 (2011)
3. ISO 9000. Quality management principles and guidelines on their application. Fort Myers, Florida. https://docplayer.net/9314898-Iso-9000-quality-management-principles-and-guidelines-on-their-application.html. Accessed 12 Feb 2020
4. Johnson, T.: Activity-based information: a blueprint for world class management accounting. Manage. Account. (June), 23–30 (1988)
5. Jørgensen, L., Åsgård, T.: Trust and control in project management. Procedia Comput. Sci. **164**, 397–406 (2019)
6. Kaiser, M.J.: Activity-based costing. In: Kaiser, M.J. (ed.) Decommissioning Forecasting and Operating Cost Estimation, pp. 489–522. Gulf Professional Publishing, Houston (2019)
7. Kaplan, R.S.: One cost system isn't enough. Harvard Business Review (1988). https://hbr.org/1988/01/one-cost-system-isnt-enough&cm_sp=Article-_-Links-_-Top%20of%20Page%20Recirculation. Accessed 12 Feb 2020
8. Loiro, C., Castro, H., Ávila, P., Cruz-Cunha, M.M., Putnik, G.D., Ferreira, L.: Agile project management: a communicational workflow proposal. Procedia Comput. Sci. **164**, 485–490 (2019)
9. Mikhailova, E.O., Sbitnev, S.N.: Project and process approach to management at an aircraft engine company. Proceedings of MAI **67**, 23–37 (2013)
10. Tibor, L.C., Schultz, S.R., Menaker, R., Weber, B.D., Young, P.M.: Improving efficiency using time-driven activity-based costing. J. Am. College Radiol. **14**(3), 353–358 (2017)
11. Toledo, R.F., Junior, H.L.M., Filho, J.R.F., Costa, H.G.: A scientometric review of global research on sustainability and project management dataset. Data Brief **25**, 104312 (2019)
12. Tsai, W., Jhong, S.: Production decision model with carbon tax for the knitted footwear industry under activity-based. J. Clean. Prod. **207**, 1150–1162 (2019)

Logistic Foundations of Conducting Transnational Business in the Regional Market

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Abstract. The article views the adaptation of transnational corporation logistics solutions to the conditions of the national market. Methodological approaches to revealing of problems in the sphere of logistics are presented and indicators of logistics problems are proposed on the example of Coca-Cola Company functioning in the Russian market. Methods of product range analysis from the standpoint of demand and cost of production stability are presented. On the basis of the proposed assortment analysis methodology recommendations are given on stock management in order to minimize storage costs. It is suggested carrying out stock regulation in the retail sales system on the basis of sales promotion measures. A recommendation is considered to reveal the correlation and regression dependence of sales on price as a tool for demand forecasting and stock level maintaining.

Keywords: International business · International logistics · Logistics · Logistic expenses · Markets · Stock

1 Introduction

International business is an integral part of the development of national entrepreneurial structures and is an essential driver of growth of both national and global economies. The most prominent role in the global economy is played by transnational corporations which in total create up to 40% of the world trade. An essential part of this type of activity is logistics implemented on the international scale. The issues of organizing of logistics on the international scale are the subject of scientific research of a number of specialists [3, 5–10]. At the same time, the problems of adapting of transnational companies logistics solutions to the conditions of the countries where production units are located remain unresolved. It is important to take into account the specific characteristics of functioning of transnational corporations that use production units abroad and function to serve local markets. In this regard, international logistics may be of a limited nature because of the need to supply specific units and components for organizing of completed process of consumer value creating. Logistics is a key factor in the development of international trade; it forms a new level of competitiveness [7]. As an object of the research we took the company Coca-Cola HBC Eurasia Samara which has been working in the Russian market since 1994. In total, Coca-Cola Company, having the ownership of the recipe of drinks, forms the marketing policy of the entire company, and the partners of the company located throughout the world, including ten

regions of the Russian Federation, are engaged in the production, bottling of drinks, logistics and sales. The specific features of the organization of Coca-Cola Company divisions logistics activities, the assessment of the state and functioning of the logistics system are of particular scientific interest. For the analysis we used only open sources of information from the Internet concerning the performance of Coca-Cola HBC Eurasia Samara LLC [4].

2   Methodology

The penetration into the Russian market was carried out by the method of gradual construction of plants for bottling of soft drinks, first in Moscow, then in a number of regions, including the Samara region, bringing the number of such enterprises to 13. According to the reports of the company, the Samara region provides about 11% of the total sales in Russia [2]. The structure of the products manufactured by Coca-Cola HBC Eurasia Samara LLC includes a variety of products, such as: carbonated drinks (42%) bottled water (29%), juices (25%), tea drinks (2%) and energy drinks (1%). Such sales structure was reported in 2019. The analysis of the current management structure showed the presence of all departments dealing with the regional market research and the emerging demand satisfaction. That is, in the management structure of the company, marketing and logistics services functioning within the regional market with a certain degree of independence are highlighted. The assessment of the financial situation and the development trends of the company was carried out for the period of 2017–2019 [11] and its results are presented in Table 1.

Table 1. The dynamics of relative economic indicators of Coca-Cola HBC Eurasia Samara LLC

Commercial performance indicators	Indicator growth rate 2018/2017, %	Indicator growth rate 2019/2017, %
Revenues from product sales	96.53	94.07
Production prime cost	92.15	91.83
Gross profit	102.98	97.37
Commercial expenses	112.87	115.39
Management expenses	202.63	193.68
Sales profit (loss)	36.24	2.14
Stock	88.16	143.26

Source: author based on [2].

The presented dynamics of changes in commercial indicators shows deterioration in the situation in the company, judging by the indicator of a sharp decline in profits. The profit of 2018 was only 36. 24% of the indicator of 2017 and became even less by 2019. This fact is associated with the decrease in the revenues from sales of products, while the growth rate of the prime cost is slightly behind the parameters of revenues decreasing. Therefore, it is necessary to find out the reasons for such a situation in the field of sales and logistics. The need to find problems in the field of logistics is

stipulated by the growth of the indicator of the state of the stock. During the period from 2017 to 2018, the stock decreased by 12%, and by 2019 it increased by 43%. As you know, stock is a key indicator of management in the field of logistics and optimization of stock level is a source of increasing of management efficiency in the company. Logistics management methods are aimed at optimizing costs when performing any process, taking into account the given parameters [8]. An important addition to the analysis of the situation was the study of profitability indicators of Coca-Cola HBC Eurasia Samara LLC. In particular, according to the company's reports, sales profitability for the period from 2017 to 2019 decreased from 7.5% to 1.3%. That is why a detailed analysis of the state of stock and an assessment of the functioning of the company's logistics system are necessary.

3   Results

Taking into account the profile of the researched organization specializing in the production and sales of soft drinks, commodity circulation, stock turnover and the duration of one turnover were studied in detail. The identified parameters of stock status became the basis for management decisions in the logistics of Coca-Cola HBC Eurasia Samara LLC. The general analysis of the state of stock showed an increase in the share of stock in the total turnover from 6.2% in 2017 to 8.0% in 2018 and 9.5% in 2019. This indicates a slowdown in the sales and an increase in the stock, and, as a result, an increase in the cost of the stock maintaining. For a more accurate assessment of the situation during the research, additional calculations were carried out, the results of which are presented in Table 2.

Table 2. Indicators of stock state of Coca-Cola HBC Eurasia Samara LLC product groups

Product group	Stock structure, %			Turnover coefficient		Turnover duration, days	
	2017	2018	2019	2018	2019	2018	2019
Fizzy drinks	35.8	49.0	55.5	22.9	15.0	16	24
Juice	34.9	27.7	23.1	8.5	9.0	43	41
Bottled water	23.5	17.7	15.1	4.2	5.0	87	73
Energy drinks	2.3	2.5	3.0	7.9	3.6	46	101
Tea drinks	3.5	3.2	3.4	7.9	5.8	46	63
Total	100	100	100	13.8	11.3	26	32

Source: author based on [11].

The table allows making a number of conclusions. Firstly, fizzy drinks occupy the largest share in the stock structure; their share is gradually increasing from 35 to 55%. This is a traditional range of products that is most popular with customers. Juice occupies the second position, but their stock share began to decline from 34.9% to 23% by 2019. Bottled water closes the top three in the structure of the company's range,

having a decrease in the stock level from 23.5% to 15.1%. It should be noted that the increase in the stock level indicates a decrease in demand, while the reverse trend reflects a favourable situation. Thus, an increase in the share of fizzy drinks stock reflects sales problems and increased storage costs.

Secondly, the analysis of the indicator of stock turnover coefficient confirms the noted trend of decline in sales of fizzy drinks, which is confirmed by the decrease in its values from 22.9 in 2018 to 15 in 2019. Thus, the number of production turnovers decreased markedly and the production volumes remain at the same level. A similar trend is noted for energy drinks, where the turnover ratio fell almost 2 times. The sales of tea drinks also became worse, though not so markedly, and the turnover coefficient decreased from 7.9 to 3.6 turnovers per year.

Thirdly, the duration of the products turnover in general for all items was 26 days in 2018 and 32 days in 2019. These figures are acceptable for a manufacturing company. However, there are three product groups (bottled water, energy drinks and tea drinks) where the indicators for the duration of one turnover are significantly higher and reach parameters of 60–100 days. These values are a signal for making decisions on stock management and eliminating of wasteful costs. The current situation with the level of stock is stipulated by the complexity of the functioning of the company's management structure and the presence of centralized management on the part of the regional branch of the multinational company. The general scheme of production and sales planning for Coca-Cola HBC Eurasia LLC includes a number of successive steps:

1. Regional subdivisions make a sales forecast for each month, in the context of range groups.
2. Regional subdivisions carry out planned calculations of required stock, production plans and other indicators for organizing of logistics activities of a regional subdivision.
3. The range production is organized in volume and quantity, according to the proposed forecasts.
4. Operational management of the logistics system for the organization of supplies and control over the level of stocks by regional subdivisions.

The sales process is carried out through various sales channels, including: modern trade, traditional trade, immediate consumption and wholesale. The organization of interaction between partners is carried out through the transfer of the order to the manufacturer, taking into account the demand for a particular market participant. At the same time, it is important to take into account changes in consumer preferences to make adjustments to production plans, avoiding the creation of excess stock. For these purposes, ABC and XYZ analysis was used in the research, which allows identifying the most popular range positions and positions which are not in demand. As initial data, the annual sales volumes of drinks in 2019 of various brands in packages from 0.33 to 2 L were used. The results of the comprehensive analysis are presented in Table 3.

The obtained results make it possible to give recommendations on the company's product lines, in dependence with the position in the quadrant of the matrix. The products in the AH quadrant include the products that are in steady demand and do not need reserve stock creation.

Table 3. ABC + XYZ analysis matrix of the main brands of Coca-Cola HBC Eurasia Samara LLC for the year 2019

Category	X	Y	Z
A	Coca-Cola 1.0 Coca-Cola 2.0 Coca-Cola 1.5 Coca-Cola 0.5	Coca-Cola Zero 1.0 Coca-Cola Zero 0.5 Dobryi 1.0 Dobryi 2.0 Bonaqua Still 0.5	
B	Rich 1.0	Coca-Cola Zero 0.33 Sprite 1.0 Sprite 0.5 Fanta 1.0 Bonaqua Highly Carbonated 1.0 Bonaqua Still 2.0 Bonaqua Still 1.0 Bonaqua Viva 0.5	Bonaqua Still 5.0 Sprite 1.5
C	Shweppes Lemon 1.5	Nestea Lemon 0.5 Fanta 2.0 Fanta 1.5 Fanta 0.5 Burn 0.5 Burn 0.33 Bonaqua Highly Carbonated 2.0 Bonaqua Highly Carbonated 0.5	Sprite 2.0 Nestea Wildberry 0.5 Dobryi 0.33 Nestea Green Tea 0.5 Nestea Wildberry 0,5 Shweppes Pomegranate 1.5 Fanta Strawberry 1.5

Source: author.

Products in the quadrant AY have low reliability of consumption and an average price level. These products require stock because of the possible fluctuations in demand. Products of the BX category have high price and unstable demand. The group of BY category products forms reliable revenues for the company, but is characterized by unstable demand. For a guaranteed level of sales stock should be created and maintained. Products of the BZ category are in steady demand but have seasonal fluctuations in demand, which requires special stock management during certain periods of the year. The CY category products are characterized by stable demand, which allows planning production and sales volumes clearly without creating reserve stock. The main disadvantage of this product group is its low profitability. The CZ category includes the products that should be produced in a minimum quantity to maintain the breadth of the range. The revenue from this product is very low and the sales are unpredictable. The presented range analysis methodology and recommendations for managing production items are a reliable tool for reducing unproductive stock and the corresponding costs for logistics processes.

4   Discussion

Logistics management is aimed at optimizing of the total costs stipulated by the movement of material flows. The key logistics tools are stocks and their movement to maintain sales and meet consumer demand. If we talk about the production of soft drinks, which the organization under the research specializes in, the optimization possibilities are connected with the postponement of the production process and the creation of goods in anticipation of future sales. That is, maintaining stocks is one of conditions for the stable functioning of the logistics system. Any improvement of the entrepreneurial structure and the processes of its functioning should be aimed at improving the efficiency and, above all, the efficiency of economic activities [1].

To overcome possible problems concerning the reduction of the profitability of business, you can use a number of recommendations:

– increasing of control over the level of stocks of finished products in retail trade and establishing a monitoring system,
– introducing of ABC-XYZ stock analysis into practice on ongoing basis,
– the development of measures to stimulate demand for products with unstable demand, often of a seasonal character.

The products of Coca-Cola HBC Eurasia Samara LLC are sold to the final consumer more often through the retail sales channel. Therefore, it is important to include measures to stimulate demand in the programme of activities, using a set of tools, such as outdoor advertising, mobile billboards, advertising modules in magazines and the Internet, banner and contextual advertising, mass media, television and promotion activities. In addition, it is necessary to take into account the peculiarities of purchasing behaviour of Russian customers as well as the low level of income caused by the depreciation of the national currency. In this situation, it is important to understand the relationship between price and sales. The study of this issue was carried out on the basis of actual observations of sales at different prices, with the use of correlation and regression analysis on the example of one of the brands of products on the basis of Microsoft Excel programme. According to the calculation results, the values of regression indicators, presented in Table 4, were obtained.

Table 4. Regression statistics of sales and price level of the sprite brand, 1 L

Indicators	Value
Multiple R	0.662
R-square	0.439
Normalized R-square	0.383
Standard error	7.464
Observations	12
Regression level	y = − 331.9 x + 45899.8

Source: author.

This table presents the results of the study of the linear dependence of sales on price. For estimation, the least squares method was used, and the statistical significance of the parameters of the equation was checked with the use of the coefficient of determination. The calculations make it possible to conclude that in the situation under research 43.9% of sales variability is due to the impact of prices. The obtained calculated indicators confirm the statistical significance of the model parameters. The regression equation can be used to predict sales when planning incentive programs. This will allow estimating the necessary volumes of stocks and satisfying the demand with optimal logistics costs.

5   Conclusion

The research considers measures for demand management based on the assessment of the impact of price factors. At the same time, it is necessary to take into account non-price demand factors, which include: tastes of consumers, total number of consumers, customer income, availability of substitute products, seasonal character of consumption of goods, the influence of fashion trends on consumption and general expectations of customers. The recommendations on stock management proposed in the work, aimed at logistics costs reduction, will generally increase the use of stock of finished products for stable satisfaction of demand; improve range conformity of goods in retail trade and optimize the volume of stocks maintained for stable functioning of the logistics system. The development of international trade in the context of globalization asks for the creation of an effective logistics system in the countries that has a set of competitive advantages: the volume of storage space, terms of cargo handling and transportation costs [6]. The functioning of multinational corporations in the regional markets requires serious work, on the one hand, to maintain accepted standards of customer service and, on the other hand, to adapt them to the conditions prevailing in the regional markets.

References

1. Ashmarina, S.I., Kandrashina, E.A., Streltsov, A.V., Yahneeva, I.V.: The peculiarities of the organizational changes in entrepreneurial structures. Econ. Bus. **7**(84), 1085–1089 (2017)
2. Audit-It: Coca-Cola HBC Eurasia LLC: Accounting reports and financial analysis (2019). https://www.audit-it.ru/buh_otchet/7701215046_ooo-koka-kola-eychbisi-evraziya. Accessed 27 Apr 2020
3. Blyde, J., Molina, D.: Logistic infrastructure and the international location of fragmented production. J. Int. Econ. **95**(2), 319–332 (2015)
4. Coca-Cola Company: Our company (2019). https://www.coca-colacompany.com/company. Accessed 27 Apr 2020
5. Hallberg, N.L.: The micro-foundations of pricing strategy in industrial markets: a case study in the European packaging industry. J. Bus. Res. **76**, 179–188 (2017)
6. Kirillova, L.K.: International logistics. Samara State University of Economics, Samara (2016)

7. Kirillova, L.K.: Globalization factors and their influence on logistics development. In: Khasaev, G.R., Ashmarina, S.I. (eds.) Proceedings of the 16th Scientific and Practical Conference Problems of Enterprises Development: Theory and Practice, pp. 176–178. Samara State University of Economics, Samara (2017)

8. Kirillova, L.K., Evtodieva, T.E.: Logistics principles of international multi-modal transportation of dangerous goods. Bull. South Ural State Univ. Ser.: Econ. Manag. **13**(3), 184–192 (2019)

9. Lyapin, S., Rizaeva, Y., Kadasev, D., Sysoev, A.: Methods to analyze traffic demand formation in intelligent transportation and logistic regional network. Transp. Res. Proc. **45**, 522–529 (2020)

10. Pečený, L., Meško, P., Kampf, R., Gašparík, J.: Optimisation in transport and logistic processes. Transp. Res. Proc. **44**, 15–22 (2020)

11. Test Firm: The financial state of Coca-Cola HBC Eurasia LLC (2019). https://www.testfirm.ru/result/7701215046_ooo-koka-kola-eychbisi-evraziya. Accessed 27 Apr 2020

Latin America Face Global Threats: Movement of Capital and Investment Attractiveness

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Abstract. In modern conditions, investment attractiveness determines the level of the countries' participation in the movement of capital, the rate of economic growth, the position of national economies in the structure of the world economic system. The article presents theoretical and methodological foundations of the process of forming the investment attractiveness of Latin American countries as the main factor in attracting capital under conditions of action and development of global threats. It is proposed to use systematic and structural-logical approaches to develop and justify stages and factors of the process of forming investment attractiveness of Latin American countries in the context of the growing impact of non-economic processes on the nature and level of trends in the world economic development. These stages and factors allowed the author to create model for the development of competitive advantages of Latin American countries to foster the participation of countries in the international capital movement. That will determine the competitiveness of these countries on the world stage.

Keywords: Global threats · Investment attractiveness · Latin America

1 Introduction

To date, there is quite a large number of studies on international capital flows, investment attractiveness of countries and regions of the world in the context of traditional overproduction crises, financial crises, and other types of crisis related to economic and political factors, demographic, social, and environmental processes. Modern challenges are not just international, country-specific, regional factors of global crises, but also global factors and threats that affect all countries in one way or another, regardless of country differences, differences in the level and quality of life, socio-economic development and potential. On the agenda of many economic studies is the research of the impact of modern types of threats and possible counteraction to them. Despite the initial predictions of possible changes in the global architecture of the international capital movement, the state of the capital markets, changes in the investment attractiveness of countries and regions of the world under pandemic conditions (coronavirus) there are not still enough informed and structured

recommendations on the formation of investment attractiveness of regions in the world, including Latin America.

Therefore, research on the process of forming investment attractiveness of Latin American countries in the context of the action and development of global threats is an extremely relevant area for analysis of international capital flows at the present stage.

We conducted a review of research on features and trends in capital flows and investment attractiveness of country groupings and individual national economies. The assessment of the development level of the problem of the capital movement and investment attractiveness of economic systems in the face of global threats of both economic and non-economic nature was carried out. It is revealed that the development genesis of international economic relations in the context of regional economic groupings on a global scale are influenced by general trends caused by the action of global threats, regardless of the economic development level, investment attractiveness, technology development, or the financial system of a particular state. Therefore, general principles and recommendations for creating and improving the investment attractiveness of country groupings and individual national economies simply do not work in these new conditions. As a result, at the second research stage, general approaches and principles were studied to understand the category of investment attractiveness, factors and conditions for its formation in order to identify stages and factors of forming and increasing the investment attractiveness of national economies in the face of new global threats. The critical analysis revealed that there is practically no research on stages and factors of the process of forming the investment attractiveness of Latin American countries in the context of the action and development of global threats.

2   Methodology

The main issues raised in this study were solved using such methods as: system and institutional approach, method of structural and logical analysis, analysis and synthesis, and evolutionary analysis. The use of systemic and institutional approaches allowed us to reveal the nature and essence of the category «investment attractiveness». The use of structural and logical analysis helped to identify and justify stages and factors in the process of forming investment attractiveness of Latin American countries as the main factor in attracting capital.

General scientific methods of analysis and synthesis, elements of evolutionary analysis, allowed us to identify and describe the main stages and factors in the process of forming the investment attractiveness of Latin American countries as the main factor in attracting capital in the face of the action and development of global threats.

The analysis of components and trends of forming the investment attractiveness in Latin America countries has allowed to determine key competitive advantages of the countries in this region under conditions of action and the development of global threats and to shape the author's position on the development of a model to counter global threats in the Latin America countries, increasing their investment attractiveness and their participation in the international capital movement.

3 Results

Investment attractiveness is a complex category, generalizing a set of economic and non-economic factors, conditions, principles, methods, and tasks for attracting investment to a certain territory. According to Grishina, Shakhnazarov, Roizman the concept of investment attractiveness at the regional level is a set of objective features, means, opportunities and restrictions that determine the intensity of attracting investment to a certain territory [7]. Tumusov determines the investment attractiveness of a region as a set of investment resources that make up a part of accumulated capital that is represented in the investment market in the form of potential investment demand and has the ability to turn into a real investment demand meeting material, financial and intellectual needs for capital reproduction on a certain territory [16].

Developing this point of view, Tumusov identifies potential investment demand and specific investment demand as the real supply of capital, the first of them occurs in the absence of the intention of a subject of investment demand by the presence of available income or profit to direct it to the accumulation [16]. Calling this approach «formal», researchers define the investment attractiveness of a region as a source of future investment in a certain territory [3, 4, 11].

Based on scientific positions of Tumusov, the investment attractiveness of a certain national-state territory is a set of investment resources that characterize a part of the capital in the form of potential investment demand, ready and able to turn into a real investment offer [16]. According to Golovikhin, Nezhivenko, the investment attractiveness of a national-state territory is considered from the perspective of supply: it is a set of characteristics that determine the potential offer of a socio-economic system for the development of investment resources and providing conditions for their development [6]. Elsukov, Mayevsky, Cheberko [5] identify the investment attractiveness of a national-state territory with the investment capacity of the region. For example, according to Konyagina [9], investment attractiveness of a region or investment capacity of a territory is a sum of objective prerequisites of a national-state territory for investment, depending both on the availability and diversity of areas and objects of investment, and on their economic efficiency.

The third approach to determining the investment attractiveness of a national-state territory is based on the theory of comparative and absolute advantages [18], and the starting point of this theory is a condition of limited resources for functioning of national-state territory, which leads to the fact that each of the regions has certain advantages. Thus, the level of investment attractiveness of a national-state territory is a constant dynamic process for distributing absolute and relative advantages [1, 2]. Anticipating such changes opens up additional opportunities for any national-state territory to attract investments to the territory. The reviewed scientific sources have a common point: the concept of investment attractiveness of a region is often considered as «a set of conditions and resources, factors and advantages».

The definition of investment attractiveness of a national-state territory through a set of conditions and resources, factors and benefits is appropriate, therefore, for purposes of further research, the following interpretation of the term is suggested: investment attractiveness of a region is a collection of investment resources located in a territory

and having high importance for attracting investment into the economic system of the national-state territory.

Investment attractiveness of a national-state territory, based on the semantic content of the word "attractiveness", is a subjective concept, in other words, it reflects a subjective attitude of a potential investor to the object of investment. Investment attractiveness of a region includes a specific set of characteristic properties and conditions that promote investment, which reflects the objective state of the investment object.

Thus, the investment attractiveness of a national-state territory in Latin American countries is a view of a specific investor on the potential object of investment. In contrast, the category «investment potential of a region» does not depend on characteristics of the subject of investment, which excludes the subjectivity of opinions. As a result, we can conclude that the investment attractiveness of Latin American countries is different for different categories of investors, and the investment potential remains unchanged for all investors.

The problem of attracting investment is the main issue of the socio-economic development of the Latin American countries, territories, industrial and economic entities in the current market conditions and an increasingly urgent task. The system of investment attractiveness of a region as a whole consists of a set of interrelated subsystems, processes and components. As in any general system, the system of investment attractiveness of the Latin American countries contains a subject, an object of management, a mechanism for implementing the process of forming the investment attractiveness of a region, the input and output of the investment attractiveness system in the Latin American countries, and at the moment – global threats.

Figure 1 shows a general diagram of the process of forming the investment attractiveness of Latin American countries in the face of global threats. The external environment for the investment attractiveness formation of Latin American countries in the face of global threats includes resources, conditions, markets and technologies, political, economic, social, and environmental factors. The development strategy for the formation of investment attractiveness in these countries should reflect the main criteria, goals and objectives of the investment attractiveness formation. The main goal of developing the investment attractiveness in the Latin American countries is to increase the level of investment attractiveness in the region in comparison with other regions of the world and the share of global capital flows, which are the main driver of the economic development. Kostyunina, Baronov notes that in some developing countries investors are guaranteed protection of their rights and interests, including protection from nationalization or expropriation (direct or indirect), which is possible in the interests of the state or citizens of the country [10].

There are some tasks of the investment attractiveness formation at the regional level in the context of global threats:

– to improve regional legislation in the field of investment attractiveness of a region;
– to improve the efficiency of investment projects in a region;
– to reduce administrative barriers and procedures in the implementation of investment projects in a region;
– to increase the level of counteraction to global threats.
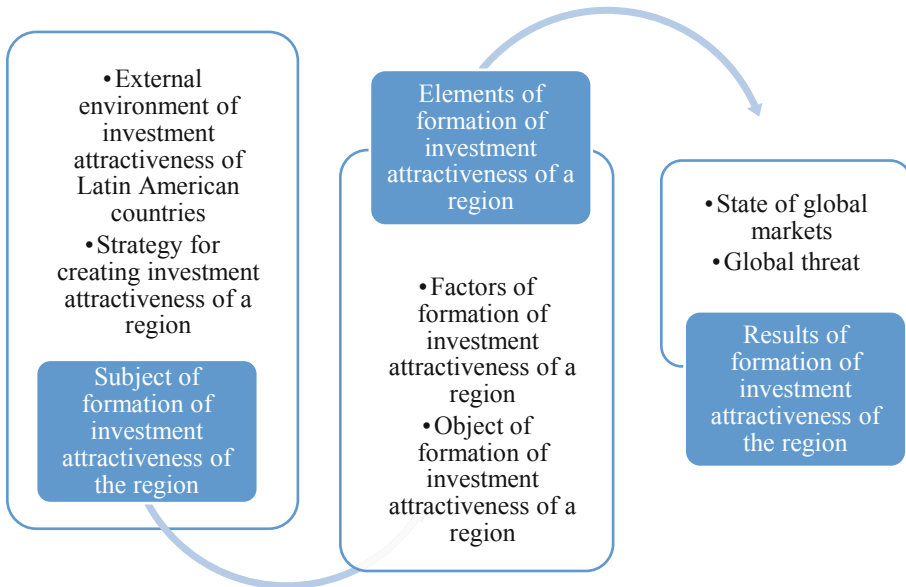
Fig. 1. General scheme of the formation process of investment attractiveness in the Latin American countries in the context of global threats. (Source: author)

Subjects of forming the investment attractiveness of the Latin American countries in the face of global threats are all economic entities and processes whose tasks are to develop and implement measures to improve the investment climate in the region, attract capital, and develop business initiatives. The stages of the process of forming and managing the investment attractiveness in these countries in the context of global threats are shown in Fig. 2.

Let's consider in more detail stages of the formation process of the investment attractiveness in the region under conditions of global threats. The external environment, and the market conditions (for which measures are being developed to create investment attractiveness of Latin American countries) are the starting point in terms of countering global threats. It is the current situation which includes trends and prospects for the development of the investment market that serve as the main criteria for selecting an investment object, the basis for formulating goals and objectives to create investment attractiveness of the region in the face of global threats. The main subject of forming the investment attractiveness of the region together with the political leadership is big business.

Depending on a type of investment project, market type, and product, the investment market is analyzed and evaluated in the context of global threats – the market is very dynamic and unpredictable – and it is necessary to constantly monitor needs and target consumers of this market, its capacity and geography. Assessment of the region's competitive advantages in the face of global threats is an important component of forming the regional investment attractiveness, since it is difficult to predict demand
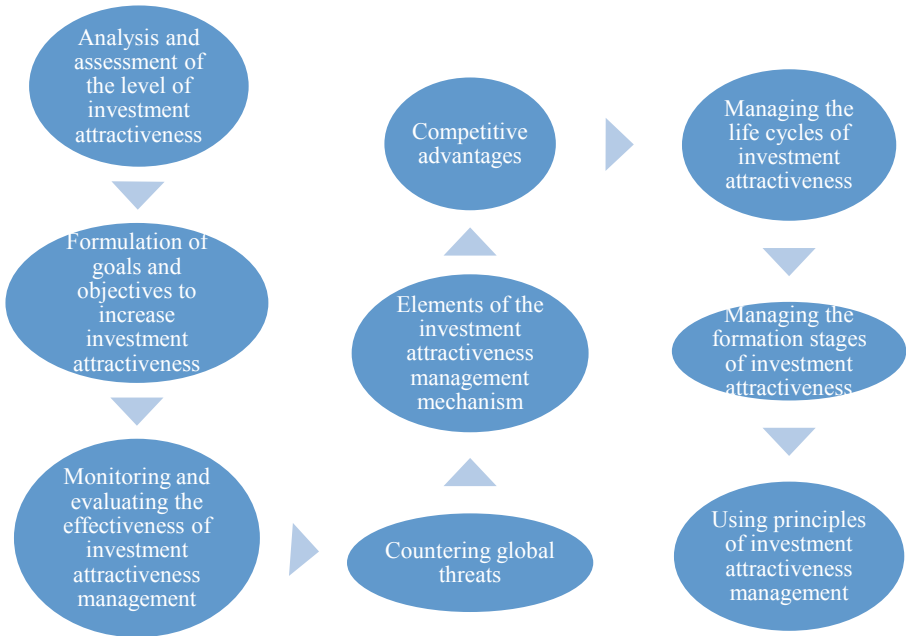
Fig. 2. Stages of the formation process of the investment attractiveness in Latin American countries in the context of global threats. (Source: author)

forecasts for a particular product, which is the basis for making decisions on investment in a region and choosing priorities in the development of industries and economy sectors.

There are objective prerequisites for the movement of capital on a global scale. First of all, the reasons for this are the excess of capital and the lack of acceptable investment objects in one region and the opposite situation in another: the lack of capital and a favorable investment climate in another region.

Among the significant reasons for the capital movement between countries and regions in the face of global threats there are the following ones:

– lack of a balance between supply and demand of capital in the region;
– formation of new commodity markets and regression of existing markets in the face of global threats;
– availability of cheap labor and raw materials in the region where the capital is exported to;
– a favorable investment climate in the region, accompanied by a stable political situation;
– availability of a preferential investment regime in special economic zones;
– low environmental standards in the host region;
– a strategy for expanding participation in new markets.

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And in modern conditions, a factor of global threats is also the coronavirus pandemic, which has brought down the markets for energy resources and many types of industrial products. Therefore, the main motive for the export and import of capital is now the epidemiological situation in countries and regions of the world. Global threats determine the global demand, dramatically destabilizing global capital flows, and changing the level of investment attractiveness in different regions.

The formation of the investment attractiveness in Latin American countries is always associated with risks and factors that shape it. In the process of forming the investment attractiveness in this region, the least predictable and often the most important elements are identification, assessment and management of countering global threats that are currently forming the level of investment attractiveness.

At the moment, we can distinguish two groups of factors that form the level of investment attractiveness of Latin American countries: financial factors that shape the level of investment attractiveness in the region; strategic factors that shape the level of investment attractiveness of the region as a whole. Let's consider these factors that form the level of investment attractiveness of Latin American countries in more detail. Figure 3 shows factors that form the level of investment attractiveness of these countries, which can be included into the group of financial factors.
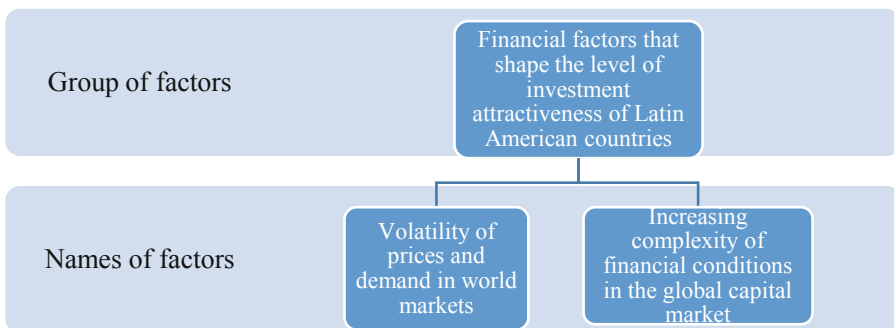
Fig. 3. Group of financial factors that form the level of investment attractiveness of Latin American countries. (Source: author)

The instability of prices and demand on international markets because of global threats is perhaps one of the most significant factors shaping the level of investment attractiveness of Latin American countries in modern conditions. Falling prices for oil and gas products and other industrial products on international markets not only leads to a reduction in revenues, but also reduces the ability of regions to provide additional financing. Financial conditions in the global capital market are becoming more complex. This factor is related to the first one, since a sharp decline in demand on world commodity markets inevitably leads to a similar deterioration of the capital market.

The second group of factors that form the level of investment attractiveness in Latin American countries is presented in Fig. 4. The group of strategic factors that form the level of investment attractiveness in the considered region includes two types of factors: factors of a political nature and global threats. Political factors that have traditionally been the main limiting factor for increasing the investment attractiveness in these countries for several decades are added to the effect of global threats that reduce demand for products, raw materials and materials which are used in the production and exported from the region.
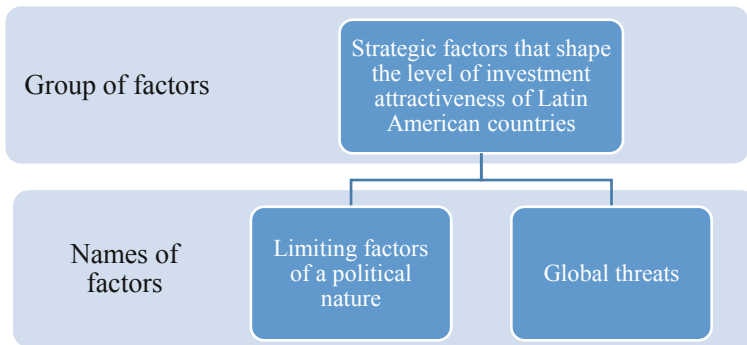
Fig. 4. Group of strategic factors that form the level of investment attractiveness of Latin American countries. (Source: author)

In these conditions, it is necessary to use other competitive advantages, in addition to those traditionally used in Latin American countries (the availability of extensive energy resources and cheap labor forces). When the demand for industrial products and energy resources decreases, it is necessary to re-focus on the production increase of food products taking into account that there are resources and conditions for this in the region. The demand for food products in the context of a pandemic, as any global threat, will be stable and may even grow. Therefore, in the face of global threats, the main factor in the investment attractiveness of Latin American countries should be the maximum use of the agricultural potential of countries in this region to increase production and export of food products to other countries and regions of the world.

The use of agricultural potential of the considered countries is impossible without entrepreneurial initiative and support from state authorities, without attracting additional financing for the production and export of food products to other countries and

regions of the world. Therefore, the development of this competitive advantage of Latin American countries in the face of global threats, the coronavirus pandemic, instability and a sharp drop in activity in the financial markets and industrial goods markets is possible with the development of entrepreneurial initiative, the search and use of sources to attract investments and capital. This is possible thanks to the use of digital FINTECH technologies, access to markets not only for large private and public capital, but also for small-scale capital, funds of individuals, and small businesses.

Thus, Santos, Fernandes and Ferreira [14] determined that the financial crisis and recession returned the intermediary effect between socio-demographic characteristics and informal entrepreneurship at the current stage of economic relations development. Williams and Kedir [17] note that in the World Bank's survey of 67515 enterprises in 142 countries, it was found that one in five (19.9%) of the official enterprises started their activities without registration, although this varies in some countries (for example, in Pakistan, Slovakia). Reasons for these trends are:

- insufficient economic development and lower quality of management (modernization theory),
- too much state intervention (neoliberal theory),
- too little state intervention (theory of political economy),
- inconsistency between laws and rules of formal institutions and beliefs, values and norms of informal institutions (institutional theory).

In addition to insufficient economic development, the lack of registration is related to too little state intervention and rules of formal institutions that are incompatible with the socially shared beliefs of entrepreneurs [8, 13]. According to the research by Mac an Bhaird, Owen, Freel [12], to increase the efficiency of providing financing from alternative sources, it is necessary to improve the supply of finance in the private investment and equity markets and to provide greater diversification and depth in the financial markets.

Taking into account these aspects, the following model of forming the investment attractiveness of Latin American countries in the context of global threats is proposed (Fig. 5).

According to this model, the global scale and volume of global threats' impact on processes of capital movement and investment attraction negatively affect the level of investment attractiveness in Latin American countries, their participation in the capital movement. In these conditions, it will not be possible to simply wait for changes in the global market environment due to the high uncertainty in terms of timing and recovery parameters for goods and capital markets, possible changes in the trends of the world economy, the increasing role of digital technologies in processes of the capital movement and the implementation of business activities themselves.

It is necessary to search for and implement other competitive advantages that will work in new difficult economic conditions. That determines the expediency of choosing resources, conditions, markets and technologies for implementing these competitive advantages. For the Latin American countries, such resources, conditions, markets and technologies for implementing competitive advantages in the production and export of
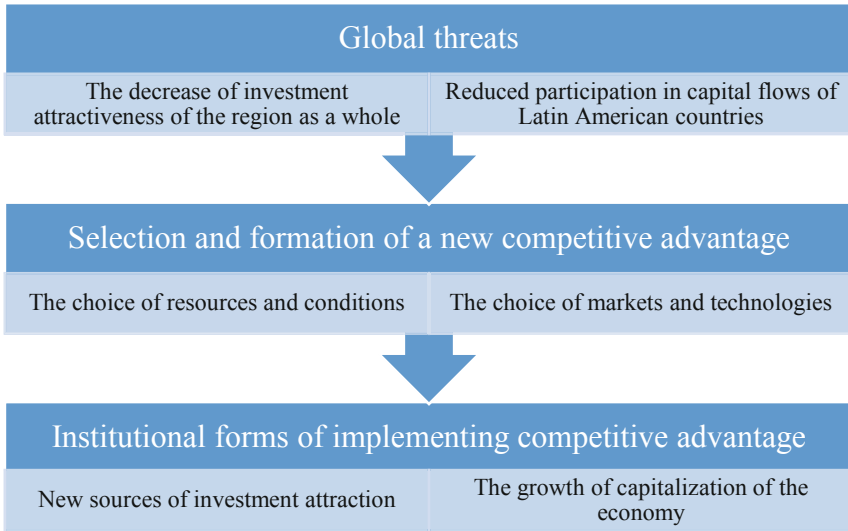
Fig. 5. Model of investment attractiveness formation for Latin American countries in the context of global threats. (Source: author)

food products to other countries and regions of the world will be natural resources of plant and animal origin, climate conditions, small and medium-sized capital markets, and modern digital FINTECH technologies, which are already actively developing in most countries of this region.

Nowadays it is needed to move from such institutional forms of attracting and developing investment in Latin American countries as large integrated business structures with broad involvement of state and foreign banking capital, TNC capital, to more flexible and mobile institutional structures, such as small and medium-sized businesses. So, Tsigelkova, Platonova, Frolova note that in China, working closely with large firms in the structure of global value chains, small businesses can be credited by a specially created financial institution or take advantage of cross-border investments [15]. Such structures may well attract investment in the markets of individuals' funds both within the Latin American countries and abroad, especially since modern digital FINTECH technologies allow this to be done with lower costs and terms of their attraction without losing economic independence and simultaneously forming pre-orders for their products. The systemic effect of actively using new sources of investment attraction without deviating from the traditional schemes of forming investment attractiveness will allow the countries of the region to overcome the next larger-scale global crisis in the face of global threats, but also use their own competitive advantages, to improve the level and quality of life in the countries of the considered region.

4   Discussion

Research on the development of the world economy and the international movement of capital in the works of domestic researchers, such as Kostyunina, Baronov [10].

Studies of regional aspects of investment attractiveness, institutional aspects of attracting investment and financial entrepreneurship are marked in the works of such scientists as Buzyrev, Polyakov [2], Zhukov [18], Santos, Fernandes, Ferreira [14], Tumusov [16], Chub [4], Mac an Bhaird, Owen, Freel [12] and other authors.

The analysis of components and trends of the investment attractiveness formation of a region as a whole has allowed to identify the key competitive advantages of the countries in the considered region in the conditions of action and the development of global threats and to shape the author's position on the development of a model for countering global threats, increasing the investment attractiveness of Latin American countries and increase their participation in the international capital movement.

5   Conclusions

The author's model of the investment attractiveness formation for Latina Americans countries in the conditions of global threats is proposed. In general, the obtained research results are necessary and in demand in terms of finding and implementing other competitive advantages of the considered countries that will work in the new difficult economic conditions.

Directions of further research are related to the justification of the choice of resources, conditions, markets and technologies for the formation of investment attractiveness in Latin Americans countries and will concern the detailed development of institutional factors for the use of new sources of investment attraction based on modern digital technologies in the face of new global threats.

References

1. Abykaev, N.A.: Investment potential and economic growth (methodological aspect). Economist **6**, 58–66 (2000)
2. Buzyrev, V.V., Polyakov, V.G.: Identification of the degree of influence of functional factors of the territorial organization of the region's economy on its investment attractiveness. Bull. TOGU **2**(17), 147–156 (2010)
3. Cheberko, E.F., Mayevsky, A.V.: Development of recreation and tourism as a factor of increasing the investment attractiveness of the region. Manag. Consult. **9**(105), 82–91 (2017)
4. Chub, B.A.: Assessment of the investment potential of Russian economic entities at the meso-level. Betony, Moscow (2001)
5. Elsukov, M.Yu., Mayevsky, A.V., Cheberko, E.F.: Investment climate and investment attractiveness of Russian macro-regions. Manag. Consult. **12**(132), 70–89 (2019)
6. Golovikhin, S.A., Nezhivenko, E.A.: Competitiveness of Russian regions: monograph. Classical University, Chelyabinsk (2017)

7. Grishina, I., Shakhnazarov, A., Roizman, I.: Comprehensive assessment of investment attractiveness and investment activity of Russian regions: methods for determining and analyzing relationships. Invest. Russia **4**, 5–16 (2001)
8. Kistanov, V.V., Kopylov, N.V.: Regional economy of Russia. Finance and Statistics, Moscow (2009)
9. Konyagina, M.N.: Russian investor's portfolio: current management issues. Mod. Sci.: Actual Probl. Theory Pract. **9**, 56–61 (2018)
10. Kostyunina, G.M., Baronov, V.I.: Investment regulation in Myanmar. Southeast Asia: Curr. Dev. Issues **3**(40), 122–141 (2018)
11. Litvinova, V.V.: Investment attractiveness and investment climate of the region: monograph. Financial University, Moscow (2013)
12. Mac an Bhaird, C., Owen, R., Freel, M.: The evolution of entrepreneurial finance – 10 years after the global financial crisis. Int. J. Entrep. Innov. **20**(4), 235–238 (2019)
13. Pierrakis, Y.: Peer-to-peer lending to businesses: investors' characteristics, investment criteria and motivation. Int. J. Entrep. Innov. **20**(4), 239–251 (2019)
14. Santos, E., Fernandes, C.I., Ferreira, J.J.: The driving motives behind informal entrepreneurship: the effects of economic-financial crisis, recession and inequality. Int. J. Entrep. Innov. (2020). https://doi.org/10.1177/1465750320914788. Accessed 07 May 2020
15. Tsigelkova, E., Platonova, I.N., Frolova, E.D.: Comparative analysis of support for small and medium-sized enterprises in the EU and China in order to increase their added value. Econ. Region **15**(1), 256–269 (2019)
16. Tumusov, F.S.: Investment potential of the region: theory, problems, practice. Ekonomika, Moscow (1999)
17. Williams, C.C., Kedir, A.: Evaluating competing theories of informal sector entrepreneurship: a study of the determinants of cross-country variations in enterprises starting-up unregistered. Int. J. Entrep. Innov. **19**(3), 155–165 (2018). https://doi.org/10.1177/1465750318782766
18. Zhukov, L.M.: The role of regions in shaping the investment climate in Russia. Russian Foreign Econ. Bull. **5**, 44–50 (2006)

International Organizations' Approaches to Digital Assets Legalization (Monetary Policy and AML/CFT)

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Abstract. The article investigates doctrinal approaches of international organizations to the legalization of digital assets in the light of monetary policy and Anti-Money Laundering/Combating the Financing of Terrorism (AML/CFT). The purpose of the research is to study current aspects of digital assets legalization at the international level in the context of the monetary policy and AML/CFT. This study is predominantly based on analytic papers and documents issued by Global Financial Regulators – IMF, FATF, BIS. The author pays attention to the regulation of crypto-assets by the EU authorities, especially the European Banking Authority (EBA), develops a concept of international legal personality of the FATF as a vivid example of an informal intergovernmental organization. The analysis of legal and other documents of the EAEU bodies plays a very important role. The study also focuses on the position of the FATF in relation to virtual assets and virtual asset service providers (VASP), as well as the monetary taxonomy of the IMF and the BIS, the relationship between the FATF and the FATF-style regional bodies, the contribution of such organizations to the regional economic integration in comparison with formal intergovernmental organizations. The methodology of the research comprises historical, comparative, formal-legal and functional methods, systemic approach.

Keywords: Crypto-assets · Digital assets · Eurasian economic union · Monetary policy · Stablecoin · Virtual currencies

1 Introduction

The world community emphasizes the issue of developing optimal (that is, balancing risks and opportunities) models of legalization of new digital entities both via global financial regulators and the main analytical centers: primarily crypto assets (digital assets, virtual currencies), and activities related to them (mining, exchange, trading, custody, etc.). At the international level, the Twenty Group, the FATF, the Bank for International Settlements, the IMF, the Financial Stability Board, the IOSCO (International Organization of Securities Commissions) and European regulators (European Commission, EBA, ESMA, ECB) focus on the regulation of digital assets. Key institutions that determine trends in the development and regulation of digital technologies are the summits of the Group of Twenty and the Group of Seven.

In the final Declaration of the G20 Summit (Osaka, June 28–29, 2019), at the highest level of interstate interaction, it was stated: "Technological innovations can provide significant benefits for the financial system and, more broadly, for the economy. While crypto assets do not jeopardize global financial stability, we remain sensitive to existing and emerging risks. We reaffirm our commitment to apply the FATF Recommendations, recently supplemented with provisions on virtual assets (VA) and virtual asset service providers (VASP), to combat ML/FT (money laundering and terrorism financing). We welcome the adoption by the FATF of the Interpretive Note and Guidelines [26].

The finance ministers and central bank governors of G7 countries in July 2019 agreed to develop and disseminate cryptocurrency control rules throughout the world [29]. By the Osaka Summit of G20, the FATF prepared a new Guidelines for a Risk-Based Approach to Virtual Assets and Virtual Asset Service Providers [20], which, together with the amendments to Recommendation 15 ("New Technologies") and the FATF Glossary, as well as the Interpretive Note to Recommendation 15 were approved at the FATF Plenary Week, held in Orlando (USA) on June 16–21, 2019. Two new terms were included in the FATF Glossary: "virtual assets" (VA) and "virtual asset service providers" (VASP). In the Recommendation 15, as amended, the new requirements were established which state that VASP should be regulated for AML/CFT (anti-money laundering and countering the financing of terrorism), licensing or registration, and should be subject to effective control or surveillance systems.

The Interpretive Note to Recommendation 15 further explains how the FATF requirements should apply to VA and VASP. In particular, it deals with a risk-based approach to activities and operations related to VA, and VASP; monitoring or control of VASP for AML/CFT purposes; licensing or registration; preventive measures, including customer due diligence, storage of records and documents, and reporting of suspicious transactions; sanctions and other enforcement measures; international cooperation. The above Guidelines clarifies that countries and VASPs, as well as other entities involved in activities with VA have to understand the ML/FT risks associated with their activities and take appropriate measures to mitigate them. In particular, the Guidelines provides examples of risk signs that should be especially taken into account in virtual assets, and also focuses on factors that can be additional disguise for operations or limit the ability of VASP to identify customers [20].

2 Methodology

In this article, the author uses the concepts of "monetary policy" and "monetary sphere" as the basic ones ("monetary sphere" is used in the works of Abramova [1], Golovnin [23], Guseva [24] and other authors). The "monetary sphere" is an artificially constructed structure (like other economic spheres: monetary, credit, financial, etc.), which aims to expand the object of legal regulation beyond one of the traditional systems (in our case, monetary). In this case, "monetary sphere" includes elements of banking, payment systems, financial market.

Moreover, the set of tools that influences monetary relations fits into the toolbox of monetary policy, but the author goes further beyond the research of traditional target

package of this policy. The author believes that today the relations between the traditional types of stability targeted by monetary policy (price, exchange rate, stability of monetary aggregates/money supply) with financial stability and financial security are essential, to which monetary policy makes a significant contribution. This is more important aspect among digital challenges, as well as fintech lending, cryptocurrencies, cryptocurrency crowdfunding, digital payments, etc.

The key standard setters in the monetary sphere are BIS, IMF, FSB and FATF. The first two organizations influence monetary policy and banking supervision, as the politicians that have the greatest impact on the monetary sphere. The FATF addresses the issues of financial security in the monetary sphere regarding combating the laundering of illicit incomes using various types of money and monetary instruments. The Financial Stability Board, which implements macroprudential policies and is in close collaboration with the IMF and BIS, plays a crucial role in ensuring global financial stability.

3   Results

The vigorous activity of American and European regulators resulted in the publication of several consulting documents, reports, strategies, in which the emphasis is the taxonomy in the field of crypto assets, as well as their classification.

As a basic definition can be used the one given by the European Banking Authority (EBA) in its Report [18] of January 2019: "Crypto-asset is an asset that:

a)   is determined mainly by cryptography and distributed ledger technology (DLT) or similar technology;
b)   is not issued or guaranteed by the central bank;
c)   can be used as a mean of exchange and/or for investment purposes and/or for access to a product or service".

As the basic (accepted by many regulators) classification, the following one can be specified:

1.   Exchange (payment) tokens, they are also cryptocurrencies.
2.   Security tokens.
3.   Utility tokens.

The IMF also has some findings in the field of taxonomy of digital money. In July 2019, it launched a series of reports entitled FinTech Notes, the first report of which was "The Rise of Digital Money" from IMF experts Adrian and Mancini-Griffoli [3], which, however, studies mainly how cash and bankmoney compete with electronic money. The document also highlights the risks associated with electronic money: new monopolies; threats to weak currencies; consumer protection and financial stability; and the risk of encouraging illegal activities. The essential element of the report is the taxonomic "money trees" proposed by the authors to understand the types of modern money, their relationship to each other (including CBDC, cryptocurrencies, investment money, etc.). The issue of stablecoins has to be studied in detail, they are not so risky in comparison with ordinary cryptocurrencies.

On October 18, 2019, the Financial Stability Board issued the report, "Regulatory issues of stablecoins", which gave a definition of stablecoins and global stablecoins. The Board refers stablecoins to a crypto asset that maintains its stable value by linking to another asset or basket of assets. They can be provided with fiat currency, goods or supported by algorithms. The "global stablecoins", are referred to stablecoins with potential global reach and the ability to quickly scale from the point of view of users/holders of crypto assets [21].

The Board makes a point that the nature of stablecoins requires careful research, as well as the legal mechanisms to minimize the risks of stablecoins.

In October 2019, the G7 issued the Report on stablecoins [22], which indicated that:

– global stablecoins, although not risk free, can solve the problem of slow and expensive money transfers,
– on the other hand, stablecoins also do not yet have global regulation and can be unstable, on the conditions of rules' observance, "stable coins" can be convenient as a mean of payment and savings,
– conventional cryptocurrencies cannot be an effective solution, since they are "extremely unstable", difficult to use, have scalability limitations and problems with management and regulation.

On October 18, 2019, the FATF also gave its opinion about stablecoins. According to the regulator, new assets, so-called "global stablecoins", and offered global networks and platforms can potentially cause a shift in the ecosystem of VA and affect the risks of ML/FT. However, the FATF defines two problems: the massive use of such VA and their transfer from person to person without a regulated intermediary. The FATF emphasizes that global stablecoin providers will comply with the FATF standards either as VASP or as traditional financial asset providers. The FATF will continue to study the characteristics and risks of stablecoins and provide further clarification on how the FATF standards are applied to global stablecoins and their service providers.

It is significant to understand that stablecoins can be not only private (LIBRA, Gram, JPM Coin projects, etc.), that is, issued by private corporations, but also state-owned, that is, issued by central banks. The state-owned ones are investigated by the Bank for International Settlements (BIS) under the name "Central Bank Digital Currencies (CBDC)". CBDC, as defined by the BIS, is the digital form of central bank money that differs from balances in its reserves or in current accounts [9]. At the same time, BIS sticks to the point that central banks should take into account the problems of ML/FT when issuing CBDC. It is still unclear how AML/CFT requirements can be implemented for anonymous forms of CBDC, which are easily cross-border, but can meet significant challenges in this regard.

BIS taxonomy distinguishes between three forms of CBDC. Two forms are based on a token (token-based), and the other is based on an account (account-based). The two token-based versions differ primarily in those objects that have access to them, which depends on the potential use of CBDC. The first is a widely available payment instrument, which is primarily intended for retail transactions. The other is limited in access and is intended for wholesale (interbank) payments. The account-based version

assumes that central bank opens general-purpose accounts for all agents in its juris-diction. Currently, China, Sweden and some other countries are about to create their own CBDC. The Bank of Russia launched testing stablecoins.

The analysis of CBDC by the BIS and the IMF is carried out and it investigates how the new form of money issue will transform the banking business, and will also affect the monetary policy (its channels, transmission mechanism, tools).

In a press release published on January 21, 2020 [11], BIS announces that the Bank of Canada, the Bank of England, the Bank of Japan, the European Central Bank, the Swedish Central Bank and the Swiss National Bank, together with the BIS created the group to exchange experiences in the area of assessment of potential cases for CBDC in their jurisdictions. The group will assess the cases of CBDC using, cost-effectiveness, functionality and their design for manufacturability, including cross-border compati-bility, and organize the exchange of knowledge about new technologies.

In an IMF blog that is aimed to express the views of IMF staff on current economic and political issues, December 12, 2019, the IMF experts Adrian and Mancini-Griffoli spoke about the future of CBDC [2]. The experts believe that CBDC is a complex and multidisciplinary issue that requires active analysis and discussion. It raises the issues related to monetary policy, functioning of payment systems, financial stability. The IMF can assist in this matter in three ways: informing about political discussions, organizing platforms for discussing policy variations, and helping countries develop policies. Since CBDC is a new topic, the IMF was active in two areas, but is gradually moving into the third area, as member countries are considering options of CBDC implementation and are seeking the advice of the IMF.

Central banks highlight a number of potential benefits of implementing CBDC:

– reducing the cost of cash emissions,
– improving financial inclusion,
– improving the stability of the payment system,
– opposing to new digital currencies,
– support for distributed ledger technology (DLT),
– possible increase in transmission mechanism's efficiency of monetary policy.

At the same time, attention is drawn to the problems and risks of implementing CBDC:

– deprivation of banks' interest income on deposits,
– growth in the balance sheet of the central bank,
– dollarization in the countries with high inflation and an unstable exchange rate,
– high implementation costs for central banks.

One of the trade-offs proposed by experts is the "synthetic CBDC", where private companies issue digital money to the general public (which can be either account-based or represent DLT-based tokens), and the central bank will lend credibility to their system and require the coins to be fully secured by the reserves of the central bank, as well as control the money' issuers.

4   Discussion

The digitalization of corporate compliance instruments and supervision in the financial market (including the banking sector) is a kind of digital response to fintech challenges of economic, information and other types of security, which, along with innovative advantages, presents new technologies.

The main "tangle" of regulatory innovations in the financial market are SupTech/RegTech [7]. In the future the effectiveness of the regulatory influence of central banks will be largely determined how the regulators mastered the ideology and tools of digital supervisory technologies (SupTech), also it will be determined by the introduction of fintech solutions in the systems of internal (compliance) control of credit organizations and other participants in the financial market (RegTech).

We consider these directions in more detail.

Supervisory Technology (SupTech). SupTech is a new concept in the vocabulary of global financial regulators and the banking community. It means the use of digital technological innovation by supervisory authorities in order to increase the effectiveness of supervisory activities. In their core work, "Innovative Technology in Financial Supervision (SupTech) – The Experience of Early Users" Broeders and Prenio define SupTech as supervisory technologies based on innovative technologies used by supervisory authorities to improve their activities [13]. However, in the work "The suptech generations" [16], experts from the Institute for Financial Stability of the BIS makes a point that it remains unclear what innovative technologies fell under the conceptual list "SupTech". Different levels of technological progress in states resulted in differences to interpret the term SupTech. Therefore, experts clarify this concept as follows: the term "innovative technology" refers to the application of Big Data or artificial intelligence (AI) to the tools used by financial authorities, while "financial authorities" are both supervisory and non-supervisory authorities [25]. The second ones are primarily related with financial intelligence units, which in some countries are not authorized with supervisory powers.

Digitalization of supervisory tools helps regulators minimize costs and increase efficiency in the following areas:

1. Data collection (reporting automation, data management, virtual assistants – chat bots).
2. Data analysis (market research, analysis of discipline violations, microprudential supervision and macroprudential supervision) [13].

The role of SupTech in AML/CFT functions is specially emphasized. In the BIS Report [15], on this particular aspect is analyzed based on the experience of nine jurisdictions (including Russia). Taking into account the advantages of new tools (in particular, they can help AML/CFT supervisors and financial intelligence units analyze large amounts of information coming from primary financial monitoring entities, first of all banks), experts at the same time put forward some problems in this field: ensuring high computing power, ensuring confidentiality of information, the difficulty of evaluating the effectiveness of these tools.

The Basel Committee on Banking Supervision (BCBS) made several recommendations for central banks and other banking supervisory authorities (hereinafter referred to as the supervisory authorities) on introducing SupTech into supervisory practice and correlating this tool with financial innovations (FinTech) in the financial market [7].

Not only big data algorithms and artificial intelligence can improve the supervisory activity of regulators, but also the blockchain. Thus, Rafael Auer, the economist of the BIS, in his report "Embedded supervision: How to build regulation into blockchain finance" [10] suggests monitoring tokenized markets using blockchain. Blockchain technology effectively encourages to decentralize trading of tokenized assets, however, it is possible to track such markets using smart contracts, machine learning and artificial intelligence.

The expert underlines that systems based on distributed ledger technology (DLT) can potentially help implement Embedded Supervision as a set of regulatory requirements that allow authorities to automatically track tokenized markets, so the companies don't have to actively collect, verify and provide data.

Regulatory (compliance) technology (Regulatory Technology, RegTech). For the first time, the definition of RegTech was given by Deloitte: it is a technology designed to provide fast, adaptable, easy to integrate, reliable, safe and economic solutions that meet the standards of the regulator.

The FATF emphasizes the development of RegTech tools, according to which this tool will optimize AML/CFT in the primary financial monitoring entities, which, in turn, will contribute to the reduction of ML/FT risks and facilitate communication with financial intelligence units, Central Bank and other supervisory bodies in the field of AML/CFT.

By creating the compliance system (internal control unit), the credit institution implements a compliance function, that is, a function for managing compliance risk. Initially, the concept of compliance risk originates from the documents of the BCBS [12], it is considered only in the context of banking risks and, first of all, in connection with the ML/FT risk. However, gradually the concept of "compliance risk" expanded to conform external and internal rules, norms and standards [27]. RegTech is designed to facilitate, through automation, the procedures for ensuring compliance of an organization (for example, a bank) with the requirements of the regulator and other (in particular, industry and corporate rules and standards).

The BCBS emphasizes that innovative technologies can help financial institutions comply with regulatory requirements (prudential requirements, reporting, consumer protection, AML/CFT). In this context, RegTech can provide banks with more effective ways of risk management.

The Bank of Russia responded in its documents to the pressing issues of digitalization of supervision and compliance in timely way. So, it defines these areas as relevant in its Guidelines for financial market development for the period 2018–2020 [4], and in October 2018 publishes the Report for public consultations "Issues and trends for the development of regulatory and supervisory technologies (RegTech and SupTech) on the financial market in Russia" [6]. The Report analyzes international experience, justifies the necessity to introduce these technologies and suggests a questionnaire for market participants to choose the optimal model for such introduction.

To develop the approach, on October 9, 2019, the Bank of Russia publishes the "Action Plan" (roadmap) for SupTech and RegTech in the Bank of Russia" [5]. The implementation of this action plan should allow: to reduce the regulatory burden on the supervised organizations; improve the quality of Bank of Russia activities in the field of control and supervision; optimize compliance with the requirements of the Bank of Russia by financial market participants.

The issue of international coordination of monetary policy in the post-crisis period of world economic development is one of the most acute and debatable. Experts disagree on the advantages of formal coordination of central banks about the issues of monetary policy implementation, although the unconventional monetary policy implemented by the monetary authorities of the leading countries during crisis resulted in negative effects for the countries with emerging markets, largely due to the lack of such coordination.

The BIS brought into question the benefits of monetary cooperation. However later, it marked that achieving more effective result would require enhanced cooperation, including special joint actions, and perhaps even an agreement on the rules of the game that limit domestic policy. Today, BIS proposes to go beyond the national mandates of central banks and consider the internationalization of financial regulation as an example for monetary policy [8]. Many people reject the global monetary policy outlook. Accordingly, national mandates require large central banks issuing reserve currencies to establish policies for a smaller economic area than that one covered by their currencies. This interpretation of internal mandates contrasts sharply with successful international cooperation in financial regulation and supervision. National mandates there do not impede widespread international cooperation and the development of global rules.

Bruni and his colleagues, relying on the reports of the BIS, believes that the heads of central banks should regularly and officially discuss and agree on some strategic provisions of their monetary policy, and communicate their decisions to the markets. She believes that this discussion is not in conflict with national mandates; in addition, at the international level, coordinated decisions are already the norm in micro- and macroprudential regulations, which are increasingly connected with the principles of monetary policy [14].

As for the European Central Bank, it usually combines orthodox statements about the inevitability of an internal orientation of monetary policy with the liberal recognition that global general shocks and international flows justify the search for some informal and implicit coordination of monetary policy [17].

Much greater consensus is reached among experts when it comes to coordinating monetary policy to contribute to the financial stability and financial security of the global economy. Benua Cure, a member of the Executive Board of the ECB and head of the BIS Innovation Hub, draws attention to this, which focus that a higher level of globalization requires a higher degree of policy coordination, with more clear and mandatory forms of coordination: "In particular, we must strive to strengthen global financial security systems so that we can better cope with global or regional liquidity crises" [19]. Ed Sibley of the Central Bank of Ireland writes about the necessity to strengthen coordination of central banks in the context of ensuring financial stability [28].

The fintech challenges facing the global economy bear the risks of financial stability and financial security (the core of which is the AML/CFT regime), as mentioned above. Their effective minimization is just possible with the interaction not only of regulators in the financial market, but also of monetary authorities.

5   Conclusion

We can conclude that the focus of global monetary regulators to the fintech challenges of our time is reflected in increasingly formalized documents and a deep research of the issue. The risks of financial security and financial stability are pushing the international community to realize the importance of international coordination of various policies, including monetary policy.

The level of reflection of the international banking community regarding the digitalization of banking supervision and compliance reached a new level: global financial regulators publish more and more detailed documents on this issue and summarize more and more good practices. Based on the above stated, in the nearest future innovative regulatory and compliance technologies can be expected to have a significant influence on key parameters of financial market and, in particular, the banking sector: such as stability, security, efficiency, and consumer protection.

References

1. Abramova, M.A.: Concept of development of the Russian monetary system in the context of modernization of the national economy. Ph.D. thesis. Financial University under the Government of the Russian Federation, Moscow (2014)
2. Adrian, T., Mancini-Griffoli, T.: Central bank digital currencies: 4 questions and answers (2019). URL: https://blogs.imf.org/2019/12/12/central-bank-digital-currencies-4-questions-and-answers/. Accessed 25 Oct 2019
3. Adrian, T., Mancini-Griffoli, T.: The rise of digital money. FinTech Notes No. 19/001 (2019). https://www.imf.org/en/Publications/fintech-notes/Issues/2019/07/12/The-Rise-of-Digital-Money-47097. Accessed 25 Oct 2019
4. Bank of Russia: Main directions of financial market development for the period 2018–2020 (2017). http://cbr.ru/StaticHtml/File/36231/ON_FinTex_2017.pdf. Accessed 25 Oct 2019
5. Bank of Russia: The action plan ("road map") in the SupTech and RegTech sphere in the Bank of Russia (2017). https://cbr.ru/fintech/reg_sup/map/. Accessed 25 Oct 2019
6. Bank of Russia: Report of public consultations. Issues and directions of development of regulatory and Supervisory technologies (RegTech and SupTech) in the financial market in Russia (2018). https://cbr.ru/Content/Document/File/50667/Consultation_Paper_181016.pdf. Accessed 25 Oct 2019
7. BCBS: Sound practices: Implications of fintech developments for banks and bank supervisors. Consultative document (2017). http://www.bis.org/bcbs/publ/d415.pdf. Accessed 25 Oct 2019
8. BIS: 85th annual report (2015). https://www.bis.org/publ/arpdf/ar2015_ec.pdf. Accessed 25 Oct 2019
9. BIS: Committee on payments and market infrastructures, markets committee. Central bank digital currencies (2018). https://www.bis.org/cpmi/publ/d174.pdf. Accessed 25 Oct 2019

10. BIS: Working Papers No 811. Embedded supervision: How to build regulation into blockchain finance by Raphael Auer (2019). https://www.bis.org/publ/work811.pdf. Accessed 25 Oct 2019
11. BIS: Central bank group to assess potential cases for central bank digital currencies. Press release (2020). https://www.bis.org/press/p200121.htm. Accessed 25 Oct 2019
12. BIS/BCBS: Implementation of the compliance principles (2008). http://www.bis.org/publ/bcbs142.pdf. Accessed 25 Oct 2019
13. Broeders, D., Prenio, J.: Innovative technology in financial supervision (suptech) – The experience of early users (2018). https://www.bis.org/fsi/publ/insights9.pdf. Accessed 25 Oct 2019
14. Bruni, F., Serrate, J.S., Villafranca, A.: The quest for global monetary policy coordination. Econ.: Open-Access Open-Assess. E-J. **13**(2019-5), 1–16 (2019). http://dx.doi.org/10.5018/economics-ejournal.ja.2019-5. Accessed 25 Oct 2019
15. Coelho, R., De Simoni, M., Prenio, J.: Suptech applications for anti-money laundering (2019). https://www.bis.org/fsi/publ/insights18.pdf. Accessed 25 Oct 2019
16. Di Castri, S., Hohl, S., Kulenkampff, A., Prenio, J.: The suptech generations (2019). https://www.bis.org/fsi/publ/insights19.pdf. Accessed 25 Oct 2019
17. Draghi, M.: The international dimension of monetary policy (2016). https://www.ecb.europa.eu/press/key/date/2016/html/sp160628.en.html. Accessed 25 Oct 2019
18. EBA: Report with advice for European commission on crypto-assets (2019). https://eba.europa.eu/documents/10180/2545547/EBA+Report+on+crypto+assets.pdf. Accessed 25 Oct 2019
19. European Central Bank: The internationalisation of monetary policy (2014). https://www.ecb.europa.eu/press/key/date/2014/html/sp140430.en.html. Accessed 25 Oct 2019
20. FATF: The FATF guidance on the application of the risk-oriented approach "Virtual assets and virtual asset service providers" (2019). https://mumcfm.ru/repository/6c5b5be48c59f9ce7ee3bc73b23fbc95b61e92bf26b6a7259a45ff5df10e2ec9. Accessed 25 Oct 2019
21. FSB: Regulatory issues of stablecoins (2019). https://www.fsb.org/wp-content/uploads/P181019.pdf. Accessed 25 Oct 2019
22. G7 Working Group on Stablecoins: Investigating the impact of global stablecoins (2019). https://www.bis.org/cpmi/publ/d187.pdf. Accessed 25 Oct 2019
23. Golovnin, M.Yu.: Monetary sphere in transition economies: Comparison of the experience of Russia and the countries of Central and Eastern Europe. Ph.D. thesis. Institute of International Economic and Political Research of the Russian Academy of Sciences, Moscow (2003)
24. Guseva, M.V.: Regulation of monetary and credit spheres in Russia at the present stage. Ph.D. thesis. RUDN, Moscow (2004)
25. He, D., Leckow, R.B., Haksar, V., Mancini-Griffoli, T., Jenkinson, N., Kashima, M., Khiaonarong, T., Rochon, C., Tourpe, H.: Fintech and financial services: initial considerations. Staff Discussion Notes No. 17/05 (2017). http://www.imf.org/en/Publications/Staff-Discussion-Notes/Issues/2017/06/16/Fintech-and-Financial-Services-Initial-Considerations-44985. Accessed 25 Oct 2019
26. Official Website of the President of Russia: Osaka Declaration of the leaders of the Group of twenty countries (2019). http://www.kremlin.ru/supplement/5425. Accessed 25 Oct 2019
27. Ponamorenko, V.E., Korovyakovsky, D.G.: Compliance as an actual concept. Custom. Bus. **1**, 28–30 (2017)
28. Sibley, E.: Monetary and financial stability: the implications for prudential supervision (2019). https://www.bis.org/review/r190503b.pdf. Accessed 25 Oct 2019
29. TASS: The G7 Finance Ministers agreed to develop an approach to regulating cryptocurrencies (2019). https://tass.ru/ekonomika/6698293. Accessed 25 Oct 2019

Taxonomy and Typology of Crypto-Assets: Approaches of International Organizations

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Abstract. Subject of research: current doctrinal and legal-technical issues of
taxonomy and typology of crypto-assets by international organizations. In the
paper the author analyzes approaches to taxonomy and typology of crypto-assets
by standard-settings bodies such as IOSCO, FSB, FATF, IMF. Besides the global
crypto-asset regulatory landscape, the author pays attention to the regulation of
crypto-assets at the EU level, especially ESMA policy activities. Special atten-
tion is paid to legal regulation of investment tokens and regulatory approaches to
a new type of intermediaries in the crypto-market such as crypto-asset trading
platforms. The first and foremost issue for regulators to consider is the legal status
of crypto-assets and, as a result, it is determined whether financial services rules
are likely to apply and, if so, which piece of legislation provides the adequate
level of protection to investors. Therefore, the author also concentrates on the
legal qualification of crypto-assets. The results of the study of problematic issues
of crypto-assets' regulation at the global level and in the EU form the ground for
developing the position on the opportunities to adopt the international regulatory
experience to facilitate the development of Russian civil law.

Keywords: Digital assets · Digital law · Standard-setting bodies · Virtual
currencies · Token · Financial instrument

1 Introduction

Over the past two years, the world has come to understand that without global, even
soft-legal regulation of new digital entities in the form of crypto assets, it is very
difficult to track and minimize the risks associated with their circulation. The lack of a
common understanding between global regulators creates a field for regulatory arbi-
tration, as well as the emergence, maintenance and translation of systemic risk.

Today, we are experiencing a period of intense and productive reflection of the
scientific community, global and national regulators, representatives of the crypto
community over the problems of digitalization of the economy and the release and
circulation of crypto assets.

The need for legal regulation of crypto assets at both the supranational and national
levels is caused by such risks of their circulation as violation of financial integrity
(financial integrity), protection of the rights of consumers and investors (investor and
consumer protection), laundering of criminal proceeds and financing of terrorism
(AML/CFT).

This study focuses on summarizing the positions of global regulators serving the securities market, since global and national regulation of digital assets is shifting from cryptocurrencies (payment tokens) to securities tokens (investment tokens, asset tokens, digital securities) and crypto derivatives and smart contracts.

2   Methodology

When analyzing and generalizing the positions of global regulators in the context of the topic under discussion, the formal legal and comparative legal research methods were used. When discussing the problems of taxonomy and typology of digital assets, the following methods were used: historical and legal, the method of interpretation of legal norms, as well as some logical methods: analysis, synthesis, induction, deduction and analogy (traduction). Based on the data obtained, key conclusions are formulated that made it possible to reasonably apply the terms and establish the need for systemic improvement, primarily, of Russian legislation.

3   Results

3.1   Evolution of the Problems of International Regulation of Digital Assets in Documents of International Organizations

One of the first international regulators to issue an official document on virtual currencies back in 2014 was FATF. The same organization received an informal mandate to formulate a global approach to understanding the essence of a virtual asset and requirements for service providers of virtual assets from the Group of Twenty in 2028. And since June 2019, the updated FATF virtual assets guide [14], together with the new updated Recommendation 15 of its standard [13], are both reference points for other global standard-setting bodies and basic elements of the virtualization model for virtual assets at the national level.

The Financial Stability Board (hereinafter referred to as FSB), established in 2009, is focused on monitoring the vulnerabilities of the global financial system for the generation and translation of systemic risk. Acting as an aggregator of global financial standards and a conductor of G20 initiatives, the Financial Stability Board has compiled a compendium of 15 key global financial standards. In recent years, the focus of FSB has been on digitalization of the financial sector. Initially, the attention of FSB was drawn to fintech credit and possible risks to global financial stability from this type of activity [20, 21].

Today, FSB carries out important work on the aggregation of information collected at the level of supranational and national regulation of crypto assets, and its conceptualization, considering the initiatives and priorities of the Group of Twenty. In this regard, two documents issued by the Council should be mentioned: "Crypto-assets: Work underway, regulatory approaches and potential gaps" [23, 25], which summarizes the work of global standard setters in the cryptocurrency market, and "Crypto-assets regulators directory" [24], which summarizes information on national authorities

with competence in the crypto market. According to the FSB work programme for 2020 [26], the Council will pay special attention to the FinTech sector, global stablecoins, cross-border payment systems. However, the Council will continue to work to ensure the security of the derivatives market.

One of the international organizations, which is a key global standard-setter in the field of the securities market, is the International Organization of Securities Commissions (hereinafter – IOSCO). In November 2017, IOSCO made a statement in which it informed its member national regulators about the risks of initial coin offering (ICO) and analyzed various approaches to ICOs' members. After that, in January 2018, IOSCO issued a statement to the general public, which outlined its concerns regarding ICO [28]. The IOCCO's important initiatives are to create the ICO Consultation Network first, through which participants discuss events and share their concerns, and then the ICO Support Framework as an educational resource for participants to help deal with ICO risks in their own jurisdiction. One of the most important documents issued by IOSCO is the Consultation Report of May 2019 [29], in which the regulator examined the problems and risks associated with trading crypto assets on specialized platforms (Crypto-Asset Trading Platforms, CTPs).

Next, we pay attention to the development of cryptocurrency market regulation issues in the European Union, drawing on the experience of Switzerland, the UK and the USA.

The EU crypto market regulation, as in many other jurisdictions, started with warnings from supranational regulators about the risks rooted in crypto assets and actions for their sale, conversion, initial placement. Among the European financial services market regulators, there are the European Securities Market Supervision Authority (ESMA) and the European Banking Supervision Authority (EBA) which are actively involved in communication with market participants regarding the risks arising in the crypto asset trading and ICO. So, in November 2017, ESMA made a Statement [7] and informed investors about the potential threats contained in ICO and reminded the companies involved in ICO that their actions could be subject to current EU legislation. In February 2018, after a request from the European Commission, all three European supervisory authorities in the EU financial market (ESMA, EBA, EIOPA) issued a warning to investors and users about the risks associated with the purchase of crypto assets [9].

Entering a new level of reflection regarding not only risks, but also the innovative potential of the cryptocurrency market, ESMA [10] and EBA [6] published two Reports on January 9, 2019 assessing the regulatory coverage of crypto assets in the EU countries, as well as made recommendations for the European Commission regarding potential regulatory initiatives.

These reports emphasize, among other things, the need for a technologically neutral approach to the regulation of crypto assets, suitable for homogeneous activities and types of assets. It is also noted that most of the crypto assets are not regulated by the current EU legislation on financial services or there are gaps and shortcomings in the legislation, and in different EU countries crypto assets are classified differently as financial instruments, which creates problems for the control and regulation of this sector. ESMA recognizes that the existing regulatory framework for the functioning of the EU securities market is developed without considering the crypto assets market.

Thus, if crypto assets are considered as financial instruments of The Markets in Financial Instruments Directive (MiFID), then there are significant gaps and problems with the application of the regulatory framework to this sector.

One of the priorities in activities not only of ESMA, but also of other European financial regulators is "promoting supervisory convergence", based on the principle of universal, template management of similar risks ("one-size fits all" approach), which should contribute to the creation of a single supervisory field in the EU in relation to both the securities market as a whole and the crypto market, as well as its parts.

Currently, only part of the crypto assets will qualify as financial instruments in the understanding of MiFID. Therefore, many crypto assets will not be subject to the provisions of the EU financial services legislation. According to ESMA, this means that there is virtually no protection for investors and consumers from the risks of fraud, cyber-attacks, money laundering and market manipulation.

As for the European Commission, it gradually came to understand the importance of the innovative potential of new digital technologies, including blockchain technology, which was manifested in several documents of a strategic and conceptual nature. So, first, attention should be paid to the FinTech Action Plan approved by the European Commission in March 2018 [11]. In it, the European Commission indicates that at the EU level, some measures to counter the risks of virtual currency circulation have already been taken (5AMLD, GDPR, statements by ESAs, etc.). However, new financial services do not always fully fall within the existing EU regulatory framework; moreover, the existing national regulation in the EU countries is incompatible with each other. The Commission is in favor of assessing the applicability of the current EU regulatory framework with respect to ICOs and, more broadly, the turnover of crypto assets. The Commission advocates a reasonable balance between measures to minimize the risks associated with crypto assets and the use of their high potential for the development of the EU economy. This is especially true for blockchain technology in general.

The development of these ideas took place in the blockchain report published by the European Commission's Joint Research Center (JRC) in July 2019 [12]. The report is optimistic about the transformational potential of distributed ledger technology. The document notes a significant influx of investment in the industry. However, the position regarding the prospects of cryptocurrencies is more restrained.

3.2   Key Taxonomy

The main taxonomic issues in the field of legal regulation of digital technologies are concentrated around the basic product of distributed registry technology – the "digital asset"/"crypto asset" in its different interpretation. The vocabulary of international and national financial regulators migrated from the concepts of "cryptocurrency" and "virtual currency" to a wider class – "assets" ("digital", "crypto", "virtual"). The Cambridge Center for Alternative Finance draws attention to this trend in its report [2].

The concept of "asset" can be understood in the categories of domestic civil law and, in particular, in the context of "objects of civil rights". An increasing number of researchers and regulators (for example, CFTCs) agree that they are dealing with a "new asset active" [3]. This asset may be tangible or intangible, representing a thing or

property right. It can be recognized that the concepts of "digital asset" and "crypto-active" are used today as identical, since the digital form of the existence of such an asset is based on the technology of a distributed registry, such as blockchain.

A narrower concept in relation to the concepts of digital asset/crypto-asset is the concept of token, which departs from the concept of coin. The term "crypto assets" is used as the base term by the Council on Financial Stability and EU regulators [22]. Having abandoned the term "virtual currencies", the term "virtual assets", as already mentioned, now it is used by FATF. The term "digital assets" is popular in the vocabulary of US regulators and professional communities.

First, you need to pay attention to the ratio of the concepts of "digital asset", "crypto-active" and "token". According to the well-established opinion of the crypto community, they are correlated in volume from a wider to a narrower one. This understanding is most detailed, although somewhat outdated, reflected in one of the early ESMA documents [8]. It uses the term "crypto assets" as a generic term for cryptocurrencies, virtual currencies, virtual assets, and digital tokens. The term "token" is declared more neutral, since it does not carry the claim to the legitimacy inherent in the "currency". It is a broad term that encompasses various virtual assets, and which can be defined by contrasting its assets based on accounts. The abbreviation ICO is used in the ESMA document for the initial offer of any crypto asset. Thus, the concept of "crypto assets" is the broadest for ECMA in this document, the concept of "virtual currency" is narrower, the concept of "cryptocurrency" is even narrower.

In a later Report [10], ESMA uses the term "crypto assets" as a base term for itself, more clearly reducing it to distributed registry technology: "crypto asset" is a type of private asset that is mainly based on cryptography and distributed ledger technology (DLT) or similar technology as part of their perceived or inherent value. The regulator stipulates that unless otherwise specified, ESMA uses this term to mean both the so-called "virtual currencies" and "digital tokens".

At the same time, the "digital token" here is any digital representation of interest, which may be cost, the right to receive benefits or perform certain functions, or may not have a specific purpose for use. Moreover, it seems that in the ESMA taxonomy the adjective "digital" is redundant, tautological. It is not supported by any major national or other supranational regulators.

The British Crypto Asset Task Force, consisting of the Treasury, the Financial Conduct Authority (FCA) and the Bank of England, refers to "crypto assets" as a cryptographically secure digital representation of value or obligations created using distributed ledger technology that can be transferred, stored or traded in electronic format. FATF uses the term "virtual asset" to refer to a digital representation of value that can be traded digitally and can be used for payment or investment purposes, including a medium of exchange, unit of account and/or storage of value.

The most difficult is taxonomy of American regulators. American regulators and the crypto community are very pluralistic about naming new digital entities. For example, the terms "convertible virtual currencies" (FinCEN terminology), "virtual currencies" (IRS and CFTC terminology), "digital assets" (SEC and primarily American expert community terminology), and "cryptocurrency" (IRS terminology) are used in parallel. However, in the 2019 Joint Document, CFTC, FinCEN and SEC use the most universal term "digital assets" in the American expert environment. According to this document,

digital assets include instruments that can be qualified in accordance with the current legislation of the United States as securities, commodities or security-or commodity-based instruments, such as futures or swaps [32].

This definition for the American cryptocurrency market should be recognized as consensus, basic. It should be noted that American regulators use an approach focused on the economic meaning and purpose of a financial instrument, regardless of its name ("label").

3.3   Actual Questions of Typology of Tokens

Typology of tokens allows regulators to customize/fine-tune legal regulation tools to the specifics of crypto assets and the types of activities associated with crypto assets. First, it is about determining the features of the civil law regime of tokens-securities and service tokens [4, 30].

One of the main criteria for classifying tokens is functional. In this regard, the basic classification of tokens from international and national regulators is their division into 3 categories: exchange or payment tokens, they are also cryptocurrencies; utility tokens; security tokens. This classification is adhered to by the British regulators FCA [15], HMRC [27], European Union regulators EBA [6], ESMA [10].

At the same time, quite unexpectedly, in its final guide to crypto assets [16], the UK Financial Conduct Authority (FCA) introduces, along with the aforementioned, "electronic money tokens", allowing itself a mixture of fundamentally different in nature types of money: electronic and digital.

The Swiss regulator FINMA classifies tokens with small nuances: along with payment tokens and utility tokens, it allocates asset tokens.

Some American authors offer a wider, alternative classification of digital assets: "pure cryptocurrencies" – bitcoin, lightcoin (decentralized storage of value); privacy-focused coins – monero, Zcash; general-purpose digital currencies, platform currencies, (platform) – Etherium, NEO, RavenCoin. It is the latter that allow you to create new digital assets called service tokens and security tokens. American experts are conducting a deeper classification of tokens. So, in their report, experts from the U.S. Digital Chamber of Commerce draw attention to combinations of different types of tokens that are carried out in a single transaction. In this regard, they distinguish three specific types of tokens: placeholder tokens, mutable tokens, and dividend-paying tokens [31, 34].

A separate legal issue is hybrid tokens. For example, in the United States, for a security token, which is also a payment token, regulators and courts may provide for various types of legal regulation.

The American Bar Association draws attention to hybrid tokens, citing service tokens as an example, which can act simultaneously as a means of payment (for example, Ether) [1].

There are theoretical questions regarding payment tokens, which experts divide into functioning in account-based payment systems and token-based payment systems. This is especially evident in the implementation of "central bank digital currencies" (CBDC).

A separate legal problem is security tokens: first, the issue is being resolved regarding whether to extend existing legislation to a new class of objects or to accept new ones. EBA and ECMA in their documents refer to these tokens as "investment-type crypto-assets", British and American regulators as "security tokens", FINMA as "asset tokens". The documents of the American SEC and FINRA also mention "digital asset securities" as products of tokenization of existing securities. A separate group of assets is occupied by crypto derivatives, which we consider below.

European regulators EBA, ESMA describe the "investment-type crypto asset" as a type of crypto asset similar to a financial instrument. From FINMA's perspective, "asset tokens" are debt instruments or equity claims on the issuer. However, they can be both digital and digital.

Based on this aspect, today one of the most pressing issues requiring scientific reflection and legal registration is the issue of asset tokenization. First, two types of tokens can receive a different legal regime: primary digital assets, i.e. assets that exist in digital form only within the boundaries of the information system creating them), as well as tokens issued by tokenization of existing assets, including rights.

According to the FINMA definition, asset tokens representing intangible assets are digital assets because they exist exclusively in a computer system. Asset tokens that allow you to trade physical assets on the blockchain are digital representations of physical assets. Therefore, they are digitized assets [18].

The division of tokens into digital assets and digitized assets is supported in large part by the American crypto community. So, experts indicate that a "digital asset" is an electronic record in which an individual has a right or interest. A term does not include an underlying asset or liability, unless the asset or liability is an electronic record. That is, the digital asset is just a code. In this case, the "digitized asset" is the asset (which may be a security or a physical asset), the ownership of which is presented in an electronic record. An example of the digitized asset is an electronic record of ownership of real estate held in the distributed registry [1]. In this regard, the focus of both the market and regulators is gradually shifting from the Initial Coin Offering (ICO) model to the Security Token Offering (STO) model.

According to widespread belief, STO is the next evolutionary step after the boom Initial Coin Offering (ICO), which defines the vector of industry development towards a more regulated and transparent market. A distinctive feature of STO is that this type of token placement is supposed to be in full compliance with the requirements of the securities legislation. This should provide more protection of investor rights and lower regulatory risks for token issuers. In addition, STOs are guided by a different target audience – only professional (accredited) investors can participate in such a placement.

Another current focus of attention of regulators and the crypto community is derivatives of securities based on crypto assets, or crypto derivatives. In this case, the main risk stimulating the development of regulations in this area is the risk of violation of the rights of consumers and investors.

So, in its Consultative Document [15], published on July 3, 2019, the FCA announced that it will begin a consultation process to ban the sale, advertising and distribution to retail consumers of derivatives and exchange-traded bonds (ETNs) that mention certain types of crypto assets. The American regulator CFTC allows listing new virtual currency derivatives contract and details their regulation [3]. In the

document, the regulator indicates that it sees it necessary to promote innovations arising from virtual assets. However, it intends to do so within the framework of the basic principles of trade professed by the Commission.

3.4   The Issue of Adjustable Perimeter

The key issue of typology of tokens according to their functional purpose is the solution of questions: a) whether the tokens fall into the adjustable perimeter; b) whether it is necessary to create new legislation for them or to apply the existing one. For regulators, it is important whether a new tool is included under the adjustable perimeter. These issues are decided by US SEC and CFTC in relation to the Securities Law (SEA) and the Commodity Exchange Act (CEA), EU regulators – in relation to MiFID II, other directives and regulations. The legal regime of crypto assets is the main problematic issue, since "crypto assets" are not defined in the EU legal acts on securities. Clarity in legal regulation is required both at the EU level and at the level of individual states.

Currently, ESMA considers the provisions of MiFID II as the main document for crypto assets. In the event that cryptocurrencies are regarded as financial instruments, ESMA indicates that the following legal provisions apply: Prospectus Regulation (PR3); Transparency Directive; The Market in Financial Instruments Directive framework (MiFID II/MiFIR); Market Abuse Regulation (MAR); Short Selling Regulation; The Central Securities Depositories Regulation (CSDR); Settlement Finality Directive; Alternative Investment Fund Managers Directive (AIFMD); Investor-compensation Schemes Directive; Anti-Money Laundering Directive V (AMLD5). It is expected that the EMIR and GDPR directives will also be adapted to the cryptocurrency market.

The situation is similar in the UK. So, in the already mentioned FCA Guide, it is explained that the regulated perimeter includes: Security tokens, which are regulated for the reason that these tokens provide rights and obligations similar to those specified in the Regulated Activities Order, RAO; E-money tokens, which meet the definition of electronic money according to the UK Electronic Money Regulations; These tokens include some form of stablecoins. Outside the adjustable perimeter are Exchange tokens, Service tokens. FCA notes that, however, some activities that use unregulated tokens can be regulated, for example, when they are used to facilitate regulated payments. In addition, the Anti-Money Laundering Directive V (AMLD5) introduces AML/CFT for exchange tokens.

Although the FCA Guide is more a political statement in form, market participants should use it as a basis for understanding how FCA will treat certain crypto assets. The FCA's position in the Guide, while not binding, may be a convincing factor in litigation.

4   Discussion

As you know, in the first of the "digital" laws adopted in Russia, namely, Law 34-FL [17], by applying the civil law debate concept "right to right" in Article 128 of the Civil Code of the Russian Federation, the concept of "digital rights" was introduced as a new object of civil rights, attributed by the legislator – along with cashless funds and non-documentary securities – to property rights, and disclosed in the new article 141.1 as follows: "Obligations specified in such capacity in the law are recognized as digital rights and other rights, the contents and conditions of which are determined in accordance with the rules of the information system that meets the statutory criteria" [33].

At the same time, "digital financial assets", as the second of the basic "digital" concepts, are not conceived by the legislator, as could be assumed, the object of digital rights, but they are defined in paragraph 2 of Art. 1 of the Draft Federal Law "On Digital Financial Assets" [5]: "Digital rights are recognized as digital financial assets ….", which poses serious challenges for lawyers to logically interpret the laws envisaged for adoption.

In this regard, we need a complex taxonomic structure, taken as a basis for creating a domestic model of legalization of a new class of assets. If there were a more thorough study of international and foreign experience in legalization of new digital entities in Art. 128 of the Civil Code of the Russian Federation, than "digital rights" could sound "digital assets" (or "digital financial assets"). The same as "electronic rights" are not applied to cashless funds and non-documentary securities in Article 128 of the Civil Code of the Russian Federation [33].

In August 2019, the second package of "digital" laws was adopted – the so-called "The Law on Crowdfunding" [16], which introduced the concept of "utilitarian digital rights", which includes: the right to demand the transfer of things; the right to demand the transfer of exclusive rights to the results of intellectual activity and (or) the rights to use the results of intellectual activity; the right to demand the performance of work and (or) the provision of services. It should be noted that this law does not provide for the possibility of investing through cryptocurrencies. In addition, the law does not allow the exercise of utilitarian digital rights outside of Russian specialized sites.

The concept of "utilitarian digital rights" is not supported by the vocabulary of the new "digital" articles of the Civil Code of the Russian Federation, as well as the bill on digital financial assets, which will raise the problem of the correlation of basic concepts and the construction of a "taxonomic tree" of new digital legislation.

In October 2019, the Ministry of Finance proposed dividing "cryptocurrencies" into three types: technical tokens, virtual assets and digital financial assets [19]. The Deputy Minister of Finance of the Russian Federation A. Moiseev explained that tokens are needed exclusively for the functioning of certain systems; "virtual assets" are bitcoin and similar tokens; "digital financial assets" are tokens that appear as a result of ICOs.

Considering the proposal of the Ministry of Finance through the prism of the international and foreign regulatory vocabulary considered above, we can assume that in this classification, the Ministry of Finance means "utility tokens", "virtual assets" – payment tokens", and "digital financial assets" – "security tokens". It should also be said that this classification is problematic with the concepts of "utilitarian digital rights"

given in the Crowdfunding Law, which, of course, does not contribute to the consistency of the legislation regulating the cryptocurrency market. In addition, this position does not correspond to the definition of "virtual assets" by FATF, because the latter - being wide in scope – includes all three types of tokens known to the world (payment, service, token-securities), while in the position of the Ministry of Finance "virtual assets" – and this is nonsense – turn out to be a kind of "cryptocurrency".

5   Conclusion

Thus, we can conclude that conceptualization and legalization of the basic elements of the crypto market regulation - taxonomy and typology of crypto assets - has reached a new level of maturity and formal certainty. Global regulators infiltrate their standards with cryptographic issues, publish specialized guidelines, form a common understanding and a uniform legal field. Soon, one should expect a high level of perception of the approaches of global regulators by national legal systems. At the same time, transformation of civil legislation and modernization of civilistic doctrine will play a significant role in this process. It seems that it is advisable for the domestic legislator to pay serious attention to international approaches and foreign experience in conceptualization and legalization of crypto assets when finalizing/adopting "digital" legislation.

References

1. American Bar Association Derivatives, Derivatives and Futures Law Committee, Innovative Digital Products and Processes Subcommittee, & Jurisdiction Working Group: Digital and digitized assets: Federal and State jurisdictional issues (2019). https://www.americanbar.org/content/dam/aba/administrative/business_law/buslaw/committees/CL620000pub/digital_assets.pdf. Accessed 30 Apr 2020
2. Cambridge Centre for Alternative Finance: The global cryptoasset regulatory landscape study (2019). https://www.jbs.cam.ac.uk/fileadmin/user_upload/research/centres/alternative-finance/downloads/2019-04-ccaf-global-cryptoasset-regulatory-landscape-study.pdf. Accessed 30 Apr 2020
3. CFTC: Staff Advisory No. 18-14. Division of market oversight, division of clearing and risk (2018). https://www.cftc.gov/csl/18-14/download. Accessed 30 Apr 2020
4. Cook, J., Cohen, R., Denisenko, J.: Initial coin offering: a comparative overview of securities regulatory environments in the US, UK and Asia Pacific. In: Dewey, J. (ed.) Blockchain & Cryptocurrency Regulation, pp. 34–47. CPI Group, Croydon (2019)
5. Draft Federal Law N 419059-7 "On Digital Financial Assets and on Amending Certain Legislative Acts of the Russian Federation (on Digital Financial Assets)" (text for second reading). http://cmokhv.ru/news/2019-03-25-news20190325/. Accessed 30 Apr 2020
6. EBA: Report with Advice for European Commission on Crypto-Assets. 9 January (2019). https://eba.europa.eu/documents/10180/2545547/EBA+Report+on+crypto+assets.pdf. Accessed 30 Apr 2020
7. ESMA: ESMA highlights ICO risks for investors and firms (2017). https://www.esma.europa.eu/press-news/esma-news/esma-highlights-ico-risks-investors-and-firms. Accessed 30 Apr 2020

8. ESMA: Advice. Own initiative report on initial coin offerings and crypto-assets (2018). https://www.esma.europa.eu/system/files_force/library/esma22-106-1338_smsg_advice_-_report_on_icos_and_crypto-assets.pdf?download=1. Accessed 30 Apr 2020

9. ESMA: ESMA, EBA and EIOPA warn consumers on the risks of virtual currencies (2018). https://www.esma.europa.eu/file/47283/download?token=FJvg9rX7. Accessed 30 Apr 2020

10. ESMA: Advice. Initial Coin Offering and Crypto-Assets (2019). January, 9. URL: https://www.esma.europa.eu/file/49978/download?token=56LqdNMN. Accessed 30 Apr 2020

11. European Commission: Communication from the commission. FinTech Action plan: For a more competitive and innovative European financial sector (2018). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52018DC0109. Accessed 30 Apr 2020

12. European Commission: Blockchain now and tomorrow. Assessing multidimensional impacts of distributed ledger technologies (2019). https://ec.europa.eu/jrc/en/facts4eufuture/blockchain-now-and-tomorrow. Accessed 30 Apr 2020

13. FATF: International standards for combating money laundering, the financing of terrorism and the financing of the proliferation of weapons of mass destruction. FATF Recommendations. Veche, Moscow (2012)

14. FATF: Guidance on the application of the risk-oriented approach "Virtual assets and virtual asset service providers" (2019). https://mumcfm.ru/repository/6c5b5be48c59f9ce7ee3bc73b-23fbc95b61e92bf26b6a7259a45ff5df10e2ec9. Accessed 25 Oct 2019

15. FCA: Prohibiting the sale to retail clients of investment products that reference cryptoassets (2019). https://www.fca.org.uk/publication/consultation/cp19-22.pdf. Accessed 30 Apr 2020

16. Federal Law N 259-FL dated 02.08.2019 "On Attracting Investments Using Investment Platforms and on Amendments to Certain Legislative Acts of the Russian Federation". https://www.garant.ru/hotlaw/federal/1286343/. Accessed 30 Apr 2020

17. Federal Law N 34-FL dated 18.04.2019 "On Amendments to Parts One, Two and Article 1124 of Part Three of the Civil Code of the Russian Federation". http://www.kremlin.ru/acts/bank/44088. Accessed 30 Apr 2020

18. FINMA: Guidelines for enquiries regarding the regulatory framework for initial coin offerings (ICOs) (2018). https://www.finma.ch/en/~/media/finma/dokumente/dokumenten-center/myfinma/1bewilligung/fintech/wegleitung-ico.pdf?la=en. Accessed 30 Apr 2020

19. Forklog: The Ministry of Finance of the Russian Federation proposed a new approach to the regulation of cryptocurrencies (2019). https://forklog.com/minfin-rf-predlozhil-novyj-podhod-k-regulirovaniyu-kriptovalyut/. Accessed 25 Oct 2019

20. FSB: Financial stability implications from fintech (2017). https://www.fsb.org/wp-content/uploads/R270617.pdf. Accessed 30 Apr 2020

21. FSB: FinTech credit: Market structure, business models and financial stability implications (2017). https://www.fsb.org/wp-content/uploads/CGFS-FSB-Report-on-FinTech-Credit.pdf. Accessed 30 Apr 2020

22. FSB: Crypto-asset markets potential channels for future financial stability implications (2018). http://www.fsb.org/wp-content/uploads/P101018.pdf. Accessed 30 Apr 2020

23. FSB: Crypto-assets report to the G20 on work by the FSB and standard-setting bodies (2018). http://www.fsb.org/wp-content/uploads/P160718-1.pdf. Accessed 30 Apr 2020

24. FSB: Crypto-assets regulators directory (2019a). https://www.fsb.org/wp-content/uploads/P050419.pdf. Accessed 30 Apr 2020

25. FSB: Crypto-assets: Work underway, regulatory approaches and potential gaps (2019b). https://www.fsb.org/wp-content/uploads/P310519.pdf. Accessed 30 Apr 2020

26. FSB: FSB work programme for 2020 (2019c). https://www.fsb.org/wp-content/uploads/P171219.pdf. Accessed 30 Apr 2020

27. HMRC: Policy Paper. Cryptoassets for Individuals. HM Revenue and Customs. 19 December (2018). https://www.gov.uk/government/publications/tax-on-cryptoassets/cryptoassets-for-individuals. Accessed 21 May 2020
28. IOSCO: IOSCO board communication on concerns related to initial coin offerings (ICOs) (2018). https://www.iosco.org/news/pdf/IOSCONEWS485.pdf. Accessed 30 Apr 2020
29. IOSCO: Issues, risks and regulatory considerations relating to crypto-asset trading platforms. Consultation report (2019). https://www.iosco.org/library/pubdocs/pdf/IOSCOPD627.pdf. Accessed 30 Apr 2020
30. Klayman, J.A.: Mutually assured disruption: the rise of the security token. In: Dewey, J. (ed.) Blockchain & Cryptocurrency Regulation, pp. 60–90. CPI Group, Croydon (2019)
31. Rowland, G.S., Kiviat, T.I.: Cryptocurrency and other digital assets for asset menedger. In: Dewey, J. (ed.) Blockchain & Cryptocurrency Regulation, pp. 90–101. CPI Group, Croydon (2019)
32. Tarbet, H., Blanco, K., Clayton, J.: Leaders of CFTC, FinCEN, and SEC Issue joint statement on activities involving digital assets CFTC, FinCEN and SEC joint statement on activities involving digital assets (2019). https://www.sec.gov/news/public-statement/cftc-fincen-secjointstatementdigitalassets. Accessed 19 May 2020
33. The Civil Code of the Russian Federation. http://www.consultant.ru/document/cons_doc_LAW_5142/. Accessed 19 May 2020
34. Token Alliance: Considerations and guidelines for securities and non-securities tokens (2019). https://digitalchamber.org/wp-content/uploads/2019/08/Security-Non-Security-Tokens.pdf. Accessed 30 Apr 2020

Reforming the Russian Oil and Gas Sector (Comparison with Norwegian Practice)

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Abstract. The objective of this paper is to analyze the basic taxation principles in the Russian petroleum industry, identify problems that impede its effective functioning and consider the possibility of reforming the industry's regulation. The current Russian taxation system, based on the hydrocarbons' volumes extracted and not on the financial performance of oil and gas companies, does not fully take into consideration the economics of oil and gas projects. Various measures taken by the state in this area, such as tax relieves and the introduction of lowering ratios, have a positive effect on the efficiency of resource development, but do not affect the very foundations of the system. The current situation in the Russian oil and gas industry makes it extremely relevant to review its taxation policy. In this regard, the paper further considers the Norwegian experience in the taxation of oil and gas industry. The author uses methods of comparative analysis and generalization, as well as statistical and systematic methods of scientific analysis. In conclusion the author analyzes the possibility to apply basic principles of Norwegian oil and gas industry taxation to the Russian petroleum sector.

Keywords: Hard-to-recover reserves · Mineral extraction tax · Oil and gas industry in Norway and Russia · State direct financial interest · Tax on financial result

1 Introduction

At the present time there is an acute problem with the quality of explored and developed reserves in Russia:

- existing fields have already been significantly depleted, the average industry depletion rate is 55% [4],
- most of the explored and unexplored reserves are classified as hard to recover – their share in the total structure of reserves is more than 70% [13],
- due to the insufficient volume of geological exploration, the reproduction of the mineral resource base is not properly ensured. It can become a serious threat to the energy and economic security of the country in the future, especially in terms of rapid growth in oil and gas production [8, 12, 17].

In order to solve all the above-mentioned problems, it is necessary to invest in new expensive technologies, equipment, conduct research and development, work on the reproduction of the mineral resource base. However, the current tax system does not take these factors into account and thus does not contribute to the solution of these problems. At the same time, taxes from oil and gas activities account for almost half of state budget revenues.

2   Methodology

The methodological basis of the research includes various methods of scientific research: statistical and system methods; comparative analysis and generalization, which allowed to study thoroughly various aspects of taxation in the oil and gas industry of Russia, identify the main problems in Russian experience and develop recommendations for improving the tax system in Russia, taking into consideration the Norwegian experience.

3   Results

The basis of the tax burden on Russian oil and gas companies engaged in production of hydrocarbons is the mineral extraction tax (hereinafter – MET). In 2018, its share in the structure of all taxes paid by oil and gas companies accounted for 66.6% [14]. The MET rate is constantly growing. The sharp increase of the MET rate was associated with the introduction of the "tax maneuver". It implies reduction of export duties on oil from 59% in 2014 to 30% in 2017 with a simultaneous increase in the MET rate for oil from 493 rubles per ton in 2015 to 919 rubles in 2017 (Table 1). It also provides for a reduction in the level of export customs duty on light petroleum products (including gasoline) and an increase of export duties on dark petroleum products, with a reference to the export duty on oil [14].

On January 1, 2019, the process of completing the "tax maneuver" began. Under this process it is planned to make the export duty equal to zero by 2024 (in 2019 its rate is 30%) with a simultaneous increase of MET rate.

MET was introduced on January 1, 2002 (Chapter 26 of the "Tax Code of the Russian Federation" [15]) to solve the problem of using transfer pricing by the companies within one structure. The three previously used taxes calculated on the basis of gross indicators could not solve this problem.

Initially, MET had a flat rate, which considerably contributed to the increase in budget revenues, but later it turned out that some companies received very high profits and others incurred losses due to the fact that the current rate did not take into consideration the particularities of the developed fields. In this regard, it was decided from January 1, 2014 to introduce a differentiated MET, which rate would depend on several production factors and production conditions.

Table 1. The evolution of the mechanism for calculating the MET rate for oil by periods of its application

Period	MET rate calculation formula	Grounds
01.01.2002–31.12.2003	340 · price ratio	Federal Law No. 126-FL of 08.08.2001
01.01.2004–31.12.2004	347 · price ratio	Federal Law No. 126-FL of 08.08.2001 (as amended No. 117-FL on 07.07.2003)
01.01.2005–31.12.2006	419 · price ratio	Federal Law No. 126-FL of 08.08.2001 (as amended No. 102-FL on 18.08.2004)
01.01.2007–31.12.2011	419 · price ratio · Ids	Federal Law No. 151-FL of 27.07.2006
01.01.2012–31.12.2012	446 · price ratio · Ids · Ir	Federal Law No. 258-FL of 21.07.2011
01.01.2013–22.08.2013	470 · price ratio · Ids · Ir	
01.09.2013–31.12.2013	470 · price ratio · Ids · Ir · Ic · Idh	Federal Law No. 213-FL of 23.07.2013
01.01.2014–31.12.2014	493 · price ratio · Ids · Ir · Ic · Idh	Federal Law No. 263-FL of 30.09.2013
01.01.2015–31.12.2015	766 · price ratio · Ids · Ir · Ic · Idh	Federal Law No. 366-FL of 24.11.2014
From 01.01.2016	857 · price ratio · Ids · Ir · Ic · Idh	
From 01.01.2017	919· price ratio · Ids · Ir · Ic · Idh	

Source: author.

Currently, MET on oil (R) is calculated according to the following formula [16]:

$$R = 919 * \text{price ratio} * Ids * Ir * Ic * Idh,$$

where: Price ratio is the coefficient characterizing the dynamics of world oil prices. It is determined by the following formula: Price ratio = $(AP - 15) * AER/261$, where AP – the average monthly price of Urals on the Rotterdam and Mediterranean exchanges (dollars/ barrel) and AER is the average monthly exchange rate of the ruble to the US dollar.

Ids – indicator characterizing the degree of depletion of reserves of a subsoil plot. The indicator provides for a reduction in the MET rate for oil for fields with a high degree of depletion.

Ir – indicator characterizing the size of reserves of a subsoil plot. This indicator provides for a reduction in the MET rate for small deposits [15].

Ic – indicator characterizing the degree of difficulty of extracting oil. It varies from 0 to 1 depending on the complexity of oil production from a specific reservoir [16].

Idh – indicator characterizing the degree of depletion of a particular raw hydrocarbon deposit. If the degree of depletion of the reserves of the deposit exceeds "1", Idh is equal to "0.3". In other cases, Idh is equal to "1". For deposits containing hard-to-recover oil reserves, Idh is equal to "1" [15].

The formula for calculating MET is established not only for oil, but also for gas and gas condensate (in accordance with the amendments introduced by Federal Law No. 263-FL of 30.09.2013). The formula for calculating MET for gas is as follows:

$$METgas = 35 * Ufe * Ic + It,$$

where Ufe – basic unit of fuel equivalent; Cc – indicator characterizing the degree of complexity of gas production of combustible natural and (or) gas condensate from a hydrocarbon reservoir; It – indicator characterizing the costs of transporting natural gas. And the formula for calculating MET for gas condensate is as follows:

$$METgas\ condensate = 42 * Ufe * Ic * Icf,$$

where Ufe – basic unit of fuel equivalent;

Ic – coefficient characterizing the degree of difficulty of natural gas production and (or) gas condensate from a hydrocarbon reservoir; Icf – adjusting factor;

The introduction of MET, taking into consideration the peculiarities of field development, in general, had a positive impact on improving the situation in the oil and gas industry. The application of reduction indicators which depend on the conditions of field development to the basic MET rate for oil, gas and condensate has a significant impact on the final performance of projects and relieves the tax burden for oil and gas companies. At the same time, the problem of developing hard-to-recover and significantly depleted reserves is not settled, especially taking into consideration the constantly increasing MET rate and the ratio characterizing the world oil price.

The tax system does not contribute to the development of mature production fields either. Such actions may lead to premature termination of their development. As a result, a significant part of the hard-to-recover hydrocarbon reserves may be lost. Oil and gas companies have to complete production when operating costs do not pay off and do not bring profit. Such actions lead to a loss of reserves and a reduction in recoverable resources.

Since it is unprofitable to continue developing new or significantly depleted deposits companies apply to the state for tax relieves. Tax incentives to the MET were provided for hydrocarbon fields in certain regions of Eastern Siberia, the Nenets Autonomous Okrug, Yamalo-Nenets Autonomous Okrug and offshore fields for a certain number of years or after reaching a certain level of production. Also, the zero MET rate was applied to oil production with a viscosity of more than 200 MPa. On the one hand, the further growth of tax incentives threatens the efficiency of the entire tax system. On the other hand companies will not be interested in further development of hard-to-recover hydrocarbon reserves without incentives.

In order to attract investment in the development of new deposits, and at the same time to get away from the "manual setting" of the taxation system, the state introduced a new revenue added tax (hereinafter – RAT) with a 50% rate [7]. The tax base is the revenue from oil sale reduced by operating and capital expenses, export duties and reduced MET. The performance of this tax will be monitored until 2024 and after that it will be possible to make conclusions about its efficiency and possibilities of further application to other fields [13].

Thus, it is impossible to say that the Government does not take any measures to improve the tax system in the most important for the Russian economy industry. The introduction of a new revenue added tax, the use of lowering ratios in calculating MET, and the provision of incentives for the development of hard-to-recover reserves prove this fact. But at the same time, the measures taken by the Government, except for RAT, do not affect the fundamentals of the entire taxation system. That is why it is necessary to work out new approaches to the taxation policy.

In this regard the Norwegian experience in the taxation of oil and gas sector is a very good example. The current taxation policy in petroleum sector of Norway on the one hand allows the Government to maximize its economic rent from the realization of oil and gas projects on the territory of Norway (78%), but on the other hand makes the development of the shelf commercially viable for investors due to the taxation of net profit, but not the gross revenue.

The basic principle of taxation of oil and gas activities in Norway is the taxation of profits [6], but not the revenues – as it is in Russia (Table 3). This approach contributes to the development of both new fields, where no infrastructure has been created for production, and mature fields, where complex, expensive technologies are required to maintain production at the current level.

Corporate income tax (at the rate of 22%) is levied on profits from the sale of hydrocarbons formed after the deduction from the revenue of exploration, research and development costs, depreciation, CO_2 fees, license fees and operating expenses (these types of taxes are presented in Table 2) [3, 16].

Special petroleum tax (at the rate of 56%) is levied on the same basis as the corporate income tax with an exception of the uplift deducted from the profit. The uplift is an additional depreciation on equipment for the extraction of hydrocarbons on the shelf, pipelines through which oil and gas is delivered onshore [7]. The uplift rate is 20.8% of capital expenditure in offshore infrastructure and it is recognized for four years, starting from the first year of depreciation of operating assets (that is, 5.2% annually) [7].

Through the uplift, the state enables the investor to carry out an accelerated return on investment by providing him with the right to account for more expenses than expenses incurred by the company.

Table 2. The main types of taxes and fees for oil and gas production in Norway and their rates

Tax	Rate
Corporate income tax	22%
Special petroleum tax	56%
Carbon dioxide (CO_2) tax	0.98 krone per 1,000 cubic meters m of burned or released gas, or 1 L of burned oil
N2O emission tax	16.14 kroner per 1 kg of nitric oxide
VAT	25%
License fee (license fee paid at the end of the 10 year license period)	1st year – 34,000 kroner per sq. km 2nd year – 68,000 kroner per sq. km further – 137 000 kroner per sq. km

Source: author based on [1].

Table 3. Calculation of the tax base of oil and gas activities in Norway

Income from the sale of hydrocarbons:
- Operating expenses
- Depreciation (straight-line method of depreciation for investments – 6 years)
- Exploration, research and development costs
- Incurred decommissioning costs
- Fee for CO2 emissions and license fee
- Net financial costs (limited by the rule of thin capitalization: 20% of stakeholder equity)
= Tax base of a legal entity (standard corporate income tax rate is 22%)
- Uplift (additional depreciation on installations located on the shelf, that is, interest on capital expenditure (20.8% for 4 years – 5.2% from the volume of investments annually)
= Special tax base (tax rate - 56%)

Source: author based on [2].

The Norwegian taxation policy in oil and gas sector, based on corporate income tax and a special petroleum tax, is easy to administer and it allows the government to maximize the economic rent from oil and gas activities, while taking into consideration the interests and capabilities of oil and gas companies. It stimulates the application of highly efficient technologies to the development of fields, activates exploration activities and encourages the development of infrastructure around fields developed by subsoil users.

4   Discussion

In Russia, the possibility of introducing the tax on financial result [5] was repeatedly considered, however, each time the solution of this issue encountered certain difficulties. The fact is that when switching to a new tax system based on the tax on financial result in Russia, the state fears that it will face the problem of insufficient receipt of tax revenues to the federal budget, primarily because the amount of tax paid

depends on the profitability of the project, which at the initial stage, is usually low. In this regard, the system is certainly more favorable to oil and gas companies. Secondly, the calculation of the tax base based on cost indicators offers opportunities for oil and gas companies to lower their tax base due to overstatement of costs. Therefore, the Government does not dare to radically restructure the tax system, but introduces changes "surgically". At the same time, the current tax system based on the MET provides the federal budget with guarantees of stable tax revenues regardless of the profitability of the project at all stages of development and, being tied to the volume of extracted raw materials, exclude any possibility of tax evasion by reducing the tax base.

In this regard, before reforming the taxation system in the Russian oil and gas industry, it is necessary to consider the possibility of introducing a monitoring system for field development, which provides for the establishment of a hydrocarbon production control system in terms of quality, production capacity of wells and other parameters that determine the amount of costs and will be further taken into account when calculating the taxable base. Such a monitoring system could be ensured through the state participation in the development of deposits following the example of the Norwegian State Direct Financial Interest (hereinafter – SDFI).

From the economic point of view, SDFI means the possibility of direct participation in the management of field development and in distribution of profit [11]. In order to manage the SDFI portfolio [11] the state-owned company Petoro was established in summer 2001. At that time Petoro had shares in 80 licenses [9]. Petoro is not an oil company. It acts as the trustee of SDFI in licenses on the Norwegian continental shelf. The state is legally liable for all Petoro's obligations under concluded agreements and other obligations [9, 10].

Currently, Petoro owns almost one third of all Norwegian oil and gas reserves. As of the end of December 2018, Petoro is participating in 208 licenses, 34 developed producing fields and 18 joint ventures (JVs) that own pipelines and oil and gas processing facilities in Norway (Tables 4, 5, 6 and 7) [9, 10].

Table 4. Participation of Petoro in field development

Group of fields	Share of SDFI (as of December 31, 2018)	Remaining production period	License duration period
Flyndre Unit	0,354%		–
Fram H-Nord Unit	11, 2%	2030	2024
Gimle Unit	24,19%	2032	2023
Grane Unit	28, 90%	2043	2030
Gullfaks Unit	30%	2034	2036
Haltenbanken Vest Unit (Kristin)	19,57%	2034	2027
Heidrun Unit	57,79%	2044	2024
Johan Sverdrup Unit	17,36%	2058	2036
Martin Linge Unit	30%	2031	2027
Norne Inside	54%	2035	2026

<div align="right">(continued)</div>

Table 4. (*continued*)

Group of fields	Share of SDFI (as of December 31, 2018)	Remaining production period	License duration period
Ormen Lange Unit	36,49%	2042	2040
Oseberg Area Unit	33,60%	2040	2031
Sindre Unit	27,09%	2032	2023
Snorre Unit	30%	2040	2040
Snøhvit Unit	30%	2051	2035
Statfjord Øst Unit	30%	2025	2026
Sygna Unit	30%	2025	2026
Troll Unit	56%	2054	2030
Valemon unit	30%	2026	2031
Vega Unit	28,32%	2030	2024
Visund Inside	30%	2040	2034
Åsgard Unit	35,69%	2032	2027
Field			
Alta	30%	2019	2025
Draugen	47,88%	2035	2024
Dvalin	35%	2032	2041
Ekofisk	5%	2050	2028
Eldfisk	5%	2050	2028
Embla	5%	2050	2028
Gjøa	30%	2027	2028
Heidmal	20%	2021	2021
Johan Castberg	20%	2052	2019
Kvitebjørn	30%	2035	2031
Maria	30%	2033	2036
Rev	30%	2019	2021
Skirne	30%	2020	2025
Skuld	24,55%	2035	2026
Statfjord Nord	30%	2025	2026
Svalin	30%	2043	2030
Tordis	30%	2030	2040
Tune	40%	2021	2020
Urd	24,55%	2035	2026
Veslefrikk	37%	2025	2020
Vigdis	30%	2040	2040

Source: author based on [9, 10].

Table 5. The share of Petoro in the ownership of pipelines

Pipeline	Share of participation (as of December 31, 2018)	License duration period
Oseberg transport system	48,38%	2031
Troll I + II oil pipeline	55,76%	2023
Grane oil pipeline	42,06%	2030
Kvitebjørn oil pipeline	30%	2020
Norpipe pipe line	5%	2028

Source: author based on [9, 10].

Table 6. The share of Petoro in the ownership of onshore infrastructure for oil production

Pipeline terminal	Share of participation (as of December 31, 2018)	License duration period
Mongstad DA	35%	Unlimited

Source: author based on [9, 10].

Table 7. The share of Petoro in the ownership of gas pipelines

Gas pipeline	Share of participation (as of December 31, 2018)	License validity period
Gassled	46,69%	2028
Haltenpipe Gassled	57,81%	2020
Mongstad Gas Pipeline	56%	2030
Nyhamna	26,14%	2041
Polarled (NSGI)	11,94%	2041
Valemon Rikgassror	30%	2031
Dunkerque Terminal DA	30,35%	2028
Zeepipe Terminal J.V.	22,88%	2028
Vestprosess DA	41%	Unlimited
Norsea Gas AS	40,06%	Unlimited
Ormen Lange Eindom	36,49%	Unlimited

Source: author based on [9, 10].

SDFI serves as a support tool for the realization of the state strategy in the development of oil and gas sector in Norway. Due to this mechanism the state remains the largest owner in the industry, Petoro's revenues are accumulated in the Norwegian Oil Fund. Moreover Petoro administers the taxation policy during the development of hydrocarbon fields. Thus, Petoro is an efficient tool for monitoring license performance, which, on the one hand, allows to increase the efficiency of field development, and on the other hand, provides the state with additional income from oil and gas activities.

5   Conclusion

The Russian authorities responsible for the development of the oil and gas industry in Russia could consider creating a mechanism similar to the Norwegian SDFI, which would allow the state to control directly oil and gas production in the fields under license agreements, as well as provide the state budget with stable additional income from oil and gas activities.

After ensuring state control over the development of deposits, following the example of the Norwegian SDFI, it would be possible to create a new tax system for the oil and gas industry in Russia, based on the financial results of companies. A new taxation policy could provide oil and gas companies with a differentiation of the tax burden depending on specific conditions of oil and gas production and would facilitate the development of hard-to-recover reserves.

References

1. BAHR: Oil and gas in Norway (2019). https://bahr.no/wp-content/uploads/2019/01/Oil-and-Gas-in-Norway-January-2019-1.pdf. Accessed 19 Apr 2020
2. Delloitte: Oil and gas taxation in Norway (2014). https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Energy-and-Resources/gx-er-oil-and-gas-taxguide-norway.pdf. Accessed 19 Apr 2020
3. Goncharenko, I.A.: Legal regulation of taxation of oil and gas fields development in the Russian Federation and foreign countries. Statute, Moscow (2009)
4. Mazurina, E.V.: Hydrocarbon production – a source of incomes of the state and subsoil users. Petrol. Geol. Theory Pract. **9**(3), 1–14 (2014)
5. Nedbaylik, I.O.: Mineral extraction tax as a source of state revenue. Int. J. Appl. Basic Res. **9**(2), 276–279 (2016)
6. Noreng, O.: The Oil Industry and Government Strategy in the North Sea. Groom Helm, London (1980)
7. Norwegian Petroleum: The Petroleum tax system (2019). http://www.norskpetroleum.no/en/economy/petroleum-tax/. Accessed 19 Apr 2020
8. Oleynov, A.G.: Fuel and energy complex of the world. MGIMO, Moscow (2008)
9. Petoro: SDFI and Petoro annual report (2012). https://www.petoro.no/petoro-annual-report/2012-/accounts/accounts-sdfi/notes-11-21. Accessed 19 Apr 2020
10. Petoro: SDFI facts (2019). https://www.petoro.no/about-petoro/sdfi-facts. Accessed 19 Apr 2020
11. Roginsky, S.V.: Formation of a model of state regulation of the fuel and energy complex (Using the example of the Norwegian fuel and energy complex). Ph.D. thesis. RSHU, Moscow (2001)
12. Sidorenko, E.L., Bartsits, I.N., Khisamova, Z.I.: The efficiency of digital public administration assessing: Theoretical and applied aspects. Public Adm. Issues **2**, 93–114 (2019)
13. The draft energy strategy of the Russian Federation for the period up to 2035 (version dated 18.12.2019). https://minenergo.gov.ru/node/1920. Accessed 19 Apr 2020
14. The Ministry of Finance of the Russian Federation: Execution of the federal budget and budgets of the budget system of the Russian Federation for 2018 (preliminary results) (2019). https://www.minfin.ru/common/upload/library/2019/04/main/02_Ispolnenie_federalnogo_budzheta_za_2018_god.pdf. Accessed 19 Apr 2020

15. The Tax Code of the Russian Federation (part two) No. 117-FL dated 05.08.2000 (as amended on 07.29.2017) with amendments and additions that entered into force on 01 September 2017. http://www.consultant.ru/document/cons_doc_LAW_28165/992cab53d45 857cbe7b61b9a688ed54275c0dbb4/. Accessed 19 Apr 2020
16. Tormodsgard, Y. (Ed.): Facts 2014. The Norwegian petroleum sector (2014). https://www. regjeringen.no/globalassets/upload/oed/pdf_filer_2/faktaheftet/fakta2014og/facts_2014_ nett_.pdf. Accessed 19 Apr 2020
17. Vygon Consulting: The tax reform of the oil industry (2015). https://vygon.consulting/ upload/iblock/6b7/vygon_consulting_upstreamtaxreform.pdf. Accessed 19 Apr 2020

Approaches to the Formation of an Industrial Enterprise Management System

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Abstract. The authors consider the problem of increasing the efficiency of industrial enterprise management in an unstable and volatile economic environment. The article aims to justify and develop a methodological approach to the formation of an industrial enterprise management system, as well as improving methods and tools for managing an industrial enterprise. The authors conducted critical analysis of the advantages and limitations of modern management systems described in the economic literature and used in the practice of managing industrial enterprises. The study proposes a solution to the problems of managing an industrial enterprise based on the integration of the enterprise economic potential concept and modern management tools: balanced scorecard, the concept of the industry life cycle, foresight, benchmarking and value-based management.

Keywords: Balanced scorecard (BSC) · Benchmarking · Enterprise economic potential · Foresight · Industry life cycle · Value-based management

1 Introduction

At present, the unstable and volatile economic environment creates barriers for business success and increases the risks of enterprise development. New management methods are needed to ensure the flexibility of the enterprise management system that would contribute to successful and long-term development of the enterprise. The increasing complexity of business functioning entities requires permanent improvement of management tools.

Issues of increasing the industrial enterprise management efficiency were resolved in the works of Brierley, Cowton & Drury [1], Chapman [2], Drucker [3], Feigenbaum [4], Horváth [5], Kaplan & Norton [9], Knight [10], Martin [11], Parmenter [12], Pearson & Clair [13], Porter [14], Povey [15] and others.

Modern management are characterized by a wide variety of techniques, methods and tools that allows to improve the management efficiency and make effective management decisions, for example: Balanced Scorecard, Total Quality Management, Controlling, Budgeting, Industry life cycle concept, Foresight, Benchmarking, Key performance indicators, crisis management, Value-Based Management, Management by Objectives and others.

A comprehensive system of assessment, planning, organization and control that takes into account the current situation of the enterprise, its material resources,

competencies and capabilities in the global environment is required to determine the strategic directions of increasing the competitiveness, efficiency and sustainability of enterprises in any industry. We believe that such system can be formed on the basis of the concept of «enterprise economic potential» (EEP).

2 Methodology

Based on a critical analysis of domestic and foreign literature, we propose definition of the economic phenomena «enterprise economic potential» (EEP) [7]. EEP is the ability of an enterprise to ensure its long-term functioning and achievement strategic goals based on the use of a resources system, taking into account the opportunities and its competencies in order to satisfy consumer demand for goods and services in the volume and quality that is determined by his individual needs.

The purpose of our research is to justify and develop methodological approach to formation of enterprise management system based on the concept of enterprise economic potential and to improve methods and tools of industrial enterprise management. The specific objectives of the study are:

– critical analysis of the advantages and limitations of modern management systems described in the economic literature and used in the practice of industrial enterprises management;
– management system development on the basis of enterprise economic potential concept.

In the research, economic phenomena were investigated from the standpoint of the theory of systems. We used the methods of exploratory and descriptive studies such as literature review, case-study, trends analysis, benchmarking, expert interviews and others.

3 Results

In the study the advantages and limitations of existing enterprise management systems were identified. Comparative analysis allowed us to develop a holistic and comprehensive approach to the formation of a strategic management system based on the integration of the concept of the enterprise economic potential and effective management methods and tools.

Table 1 shows the results of a comparative analysis of modern industrial enterprise management systems described in the economic literature and applied in practice.

An industrial enterprise is a multidimensional and complex system with many interconnected subsystems and functions, the effectiveness growth of which can be achieved by applying a system methods, that consider the organization as a holistic hierarchical structure consisting of various interconnected and interdependent elements, and are used to achieve a qualitatively new state of organization. Such systematic methods that would be applicable in most enterprises are controlling, total quality management, crisis management and management by objectives. The other systems

Table 1. Comparative analysis of enterprise management systems

Advantages	Limitations
Controlling [5]	
– aims to coordinate management activities and to achieve the goals of the enterprise; – allows for operational management	– short-term oriented; – strategic controlling is seen as a means of ensuring survival, not of development
Budgeting [1]	
– provides transparency of financial results due to the system of indicators; – reduces production costs	– short-term oriented; – implementation depends on the beliefs and support of managers; – lack of coordination of operational budgets with enterprise strategy
Balanced scorecard (BSC) [9]	
– an integrated approach; – able to translate vision and strategy into specific indicators; – customer and market oriented; – focuses on a limited number of key indicators	– consumer-oriented, ignores other audiences; – there is no final benchmark for measuring effectiveness; – lack of trends consideration; – there is no threshold values
Industry life cycle concept [8, 14]	
– decomposition allows to define a business strategy for each phase that characterizes certain conditions and features of the functioning of the business	– there is no methodology for determining the moments of transition between phases; – it is necessary to obtain a large amount of information for analysis
Foresight [6, 11]	
– focuses on a comprehensive assessment of opportunities; – involves a large number of experts from various fields of activity; – designed for practical activities	– suggests subjective influence of individual participants; – possible lack of experts from related fields; – possible insufficient information base
Benchmarking [15]	
– allows to get an information of company's positioning in the industry market; – allows to assess global industry's trends	– any experience, including foreign, is necessary to adapt to Russian realities; – most effective methods are costly
Total quality management [4]	
– suggests setting long-term goals for the enterprise; – quality is created at all phases of the product life cycle, all departments of the enterprise are involved in process	– there is a lack of a quantifiable indicator of the management system; – focuses on marketing management tools and moves away from the financial and economic processes
Key performance indicators [12]	
– allows to formulate a strategy and convey the goals of the enterprise to employees; – closely related to staff motivation; – suggests constant feedback from employee	– difficulties with the assessment of non-standardized processes; – focuses only on financial indicators of the enterprise

(continued)

Table 1. (*continued*)

Advantages	Limitations
Crisis management [13]	
– allows to anticipate crises, minimize losses, turn their negative consequences into positive changes; – transparency of enterprise management	– high degree of individualization in management process; – high requirements for the qualifications of managers
Value-based management [10]	
– focus on long-term strategic prospects for the development of the enterprise and strategic analysis and choice of market strategy; – takes into account the interests of the investor and the level of risk; – based on market information and reflects actual practice of transactions; – takes into account the influence of industry	– variety of assessment approaches to the value of enterprise creates confusion in the assessment and decision making process; – enterprise valuation often does not take into account certain types of intangible assets; – owners are not always interested in increasing the value of their business
Risk management system [2]	
– focused on long-term sustainable development; – allows to minimize certain types of specific (systematic) risks; – the ability to account, analyze and evaluate various options of scripts, the ability to take into account risk factors	– some risks cannot be avoided or the costs of their management exceed the damage from their occurrence; – the enterprise is deprived of additional sources of profit due to the formation of a large reserve fund and other costs associated with risk management
Management by Objectives [3]	
– provides a holistic vector of enterprise management system; – allows to make decisions based on management objectives, to ensure the effectiveness of management actions according to the criteria of necessity and sufficiency; – promotes centralization processes; – every employee understands his role in business	– the introduction of the entire system in the complex is quite time-consuming and often accompanied by natural resistance of the staff; – the development and implementation of the system requires highly qualified management personnel; – the system is not recommended to be implemented if the organization is in a crisis state

Source: authors.

described in literature are used to achieve a particular goal of enterprise management (assessment of performance on the basis of BSC and value-based management; construction of a motivation and control system based on KPI; organization and control of financial and economic activities based on budgeting; risk management; strategic planning based on benchmarking, Foresight and industry life cycle), which can be used as a local tool in solving specific tasks.

Crisis management shows all these advantages in crisis conditions (enterprise bankruptcy, external shocks and others), but does not reflect effectiveness in a

relatively stable environment. Controlling is more focused on managing short-term performance indicators (revenue and profit) rather than achieving the strategic goals (strategic controlling aims at «survival» of the business). In market conditions short-term oriented controlling does not allow achieving long-term effectiveness of the management system. Total quality management is primarily aimed at improving quality indicators and is far from the financial parameters and processes of the enterprise. Drucker's Management by Objectives concept is the most comprehensive and systematic management system, but does not provide clear implementation tools [3]. Thereby, the system methods and applied management tools discussed above complement each other, and their complex application will contribute to leveling the limitations.

4   Discussion

As has been noted earlier, the enterprise is a complex system with many interrelated parts. It is necessary to use a comprehensive management system that takes into account the current and future situation of the enterprise – strengths and weaknesses, opportunities and threats of external environment. Such system allows to form a comprehensive assessment of the current state of the enterprise, to analyze interdependencies within the enterprise, to develop timely and economically feasible strategic decisions, to make forecasts and plans.

In our opinion, such a comprehensive system for increasing the enterprise efficiency can be formed on the basis of the concept of «enterprise economic potential», and the economic potential itself as well as its individual elements can be subject of management. The concept of the EEP implies an industrial enterprise management system that considers enterprise as a complex hierarchical structure and reflects its ability to ensure long-term functioning, development and achievement of strategic development goals. EPP management is based on a systematic analysis of an industrial enterprise in order to cover the entire financial and economic cycle of the organization and the capital cycle. The strategic directions of the socio-economic and innovative development of an industrial enterprise can be assessed by the structure of economic potential – elements that reflect key points in the formation of enterprise efficiency (production, personnel, finance, innovation, marketing, organization and management) and resources (material and intangible resources of the enterprise participating in the commercial activities of the company and the formation of its income) competencies (reflecting the efficiency of using resources) and opportunities (reflecting internal and external effects – prospects for the enterprise development) [7].

Considering the category «enterprise economic potential» from the position of 6 elements (subsystems) and 3 aspects of management (resources, competencies and opportunities) allows us to consider the economic potential of the enterprise as a concept of industrial enterprise management. An industrial enterprise, like any complex system of elements united by close causal relationships that are in continuous interaction, is a complex of subsystems that perform certain functions. The enterprise economic potential, as a complex category, reflects the basic subsystems and functions

of the enterprise, as well as the relationships and patterns that arise between them, which allows creating a management system based on the concept of EPP.

In the framework of this study, obtaining holistic and systematic management tools is possible through the integration of the concept of the enterprise economic potential and modern methods of enterprise assessment and analysis, organizing, control and planning. Such complex system reduces the influence of the limitations of individual tools and maximizes their positive effect. Figure 1 reflects our methodological approach to building a management system based on the concept of the EEP and proposes management tools that are used to implement management functions in the process of making management decisions – planning, evaluation and measurement, organization and motivation, control.
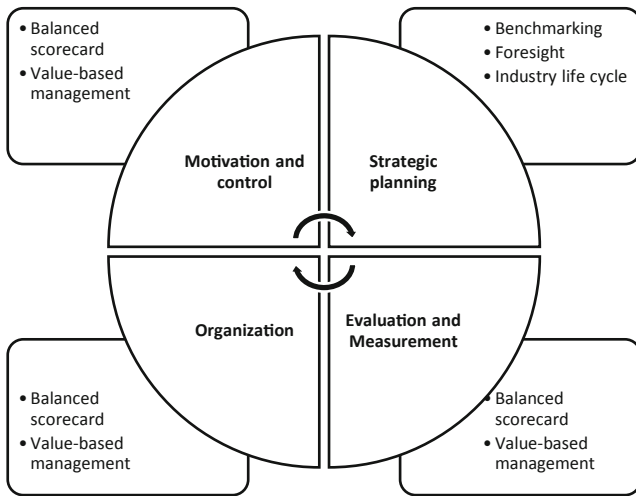
Fig. 1. Approach to the management system of industrial enterprise economic potential (Source: authors)

Planning is the process of determining the goals of the organization, the means to achieve these goals, as well as the required resources, which allows to develop activities aimed at achieving the goals. Effective planning of the enterprise's activity, which means the growth of its economic potential, allows studying the phases of the industry's life cycle, forming priorities in the field of economy, science, technology and society, as well as searching for the best industry experience.

The conclusions of the analysis of industry cycles allow to formulate a common system of key factors for each highlighted stage for the growth of the enterprise economic potential according to its individual elements – production, personnel, finance, innovation, marketing, organization and management. The results of the foresight provide an opportunity to consolidate the opinions of the expert community and identify the current state, problems, opportunities and risks of the industry, formulate strategic development goals and a holistic image of the future, and identify

priority areas for industrial development. Benchmarking in the planning system allows the process of determining and adapting existing examples of effective functioning of companies to improve their own work.

The evaluation function is expressed in measuring the level of individual elements of the EPP and the integral level of economic potential. The literature has very deeply and thoroughly studied the methodology for assessing the resource component (production capital, financial and investment resources, certain types of natural resources involved in economic turnover, as well as human resources), but insufficient attention has been paid to assessing competencies and capabilities.

The paper proposes a methodological approach to the formation of a system for assessing the enterprise economic potential, which consists in the analysis of EEP's six elements and obtaining an integrated assessment of EEP with the allocation of indicators in the following aspects: resources, competencies and opportunities (Fig. 2).
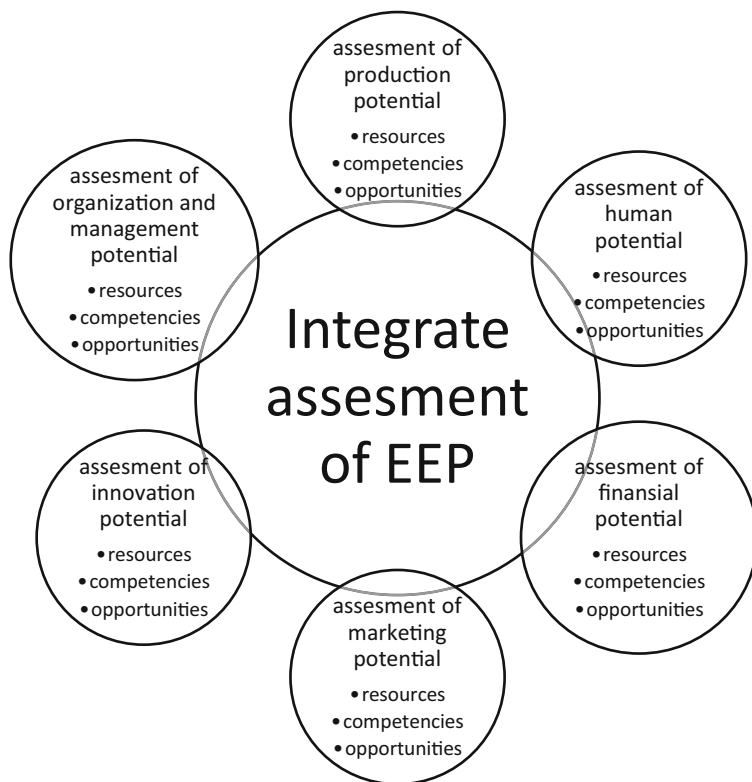
Fig. 2. Approach to the formation of a system for assessing the levels of EEP (Source: authors)

The system for assessing the economic potential of the enterprise, as well as its individual elements, is based on quantitative and qualitative characteristics. The idea of balance, complementarity of financial and non-financial indicators is reflected in the

Kaplan and Norton concept of a balanced scorecard (BSC), which most closely meets modern requirements for assessing the enterprise activities.

Organization is a combination of resources and coordination the actions of individual elements of the system. The functions of motivation and control are to achieve the organization's goals. The balanced scorecards concept and value-based management are the basic tools in the functions of the organization, motivation and control.

Schematically, the industrial enterprise management system based on the concept of the enterprise economic potential and a set of management tools that includes a balanced scorecard, industry life cycle concept, Foresight technologies, benchmarking and value-based management is presented in Fig. 3.
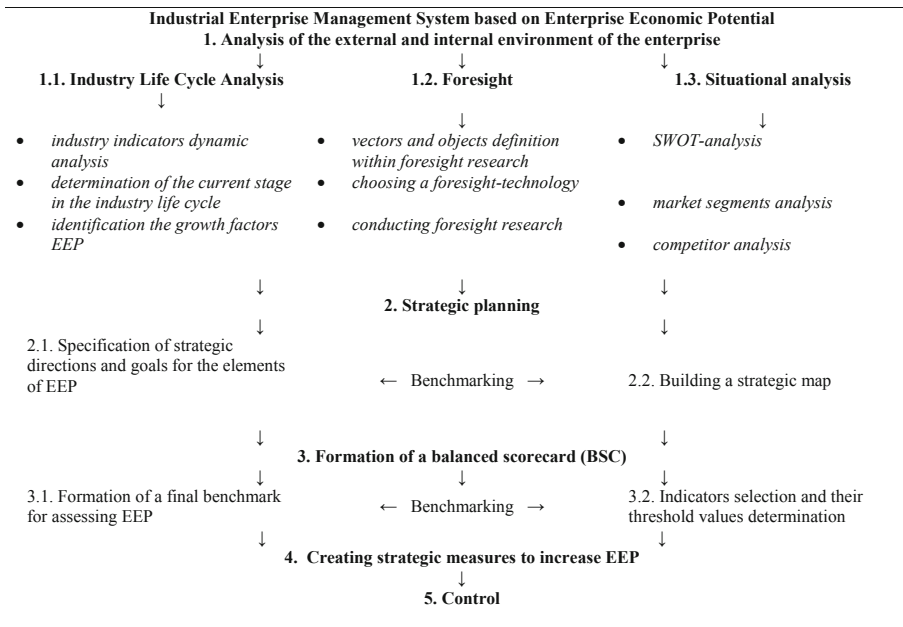
Fig. 3. Industrial enterprise management system based on enterprise economic potential (Source: authors)

Thus, based on a comparative analysis of industrial enterprise management systems reflected in the scientific literature, our study developed and substantiated a management system based on the concept of the enterprise economic potential. The EPP management concept is based on a systematic approach and covers the entire cycle of financial and economic activities and the capital cycle. The approach provides integrated management and makes it possible to identify the impact of various aspects of activity on the enterprise effectiveness.

5   Conclusion

Analysis of systems and tools for industrial enterprises management made it possible to identify their main shortcomings: limited conditions and situations in which the system shows efficiency, orientation toward solving only a few management tasks, insufficient integrity of the approach to enterprise management, focus on short-term performance indicators rather than achieving strategic goals.

The study proposes a solution to the problems in an industrial enterprise management based on the integration of the concept of the enterprise economic potential and modern management tools, such as a balanced scorecard, the concept of the industry's life cycle, Foresight technology, benchmarking, and the value-based management. Such integrated management system makes it possible to minimize the shortcomings of individual tools and maximize their positive effect in the implementation of management functions – planning, evaluation and measurement, organization and motivation, control, which reflect the management decision-making process.

Application of the authors' approach to the formation of the economic potential management system allows:

– to form an understanding of the current state and development trends of the industry as a whole and specific enterprises separately;
– to formulate strategic goals and a holistic image of the future, to identify priority areas for the enterprise development;
– to highlight the strengths and weaknesses of the organization, the problems, threats and opportunities facing the enterprise;
– to create strategic management decisions to ensure the growth of economic potential and capitalization of the enterprise;
– to coordinate strategic goals with operational actions in the implementation of the enterprise strategy;
– to choose a reasonable integral indicator for assessing the economic potential of the enterprise, which allows to compare enterprises with each other.

References

1. Brierley, J.A., Cowton, C., Drury, C.: Investigating activity-based costing in manufacturing industry. Cyprus Int. J. Manag. **13**(1), 21–33 (2008)
2. Chapman, R.J.: Simple Tools and Techniques for Enterprise Risk Management. Wiley, Chichester (2011)
3. Drucker, P.F.: Managing for the Future: The 1990s and Beyond. Routledge, New York (1992)
4. Feigenbaum, A.V.: Total quality management. In: Encyclopedia of Software Engineering. Wiley (2002). https://doi.org/10.1002/0471028959.sof359

5. Horváth, P.: Controlling in der Plattformökonomie. Controlling **31**(6), 1 (2019). https://doi. org/10.15358/0935-0381-2019-6-1

6. Ibragimova, R., Golovkin, D.: Estimation of the textile industry economic potential on the basis of foresight concept. Modern High Technol. Reg. Appl. **4**(56), 128–140 (2016)

7. Ibragimova, R., Golovkin, D.: Methodological substation of the estimation of economic potential of the enterprise. Modern High Technol. Reg. Appl. **3**(47), 64–74 (2018)

8. Ibragimova, R., Golovkin, D.: The industry life cycle concept as a tool for economic potential management at textile enterprises. Perm Univ. Bull. Econ. **12**(1), 124–135 (2017). https://doi.org/10.17072/1994-9960-2017-1-124-135

9. Kaplan, R.S., Norton, D.P.: The strategy map: guide to aligning intangible assets. Strat. Leader. **32**(5), 10–17 (2004). https://doi.org/10.1108/10878570410699825

10. Knight, J.A.: Value Based Management: Developing a Systematic Approach to Creating Shareholder Value. McGraw Hill, New York (1997)

11. Martin, B.R.: The origins of the concept of "foresight" in science and technology: an insider's perspective. Technol. Forecast. Soc. Change **77**(9), 1438–1447 (2010). https://doi. org/10.1016/j.techfore.2010.06.009

12. Parmenter, D.: Key Performance Indicators: Developing, Implementing, and Using Winning KPIs. Wiley, New Jersey (2015). https://doi.org/10.1002/9781119019855

13. Pearson, C.M., Clair, J.A.: Reframing crisis management. Acad. Manag. Rev. **23**(1), 59–76 (1998). https://doi.org/10.2307/259099

14. Porter, M.E.: Competitive Strategy: Techniques for Analyzing Industries and Competitors. The Free Press, New York (1998)

15. Povey, B.: Continuous improvements. TQM Mag. **5**(6). (1993). https://doi.org/10.1108/ eum0000000003111

State Support for the Real Sector of the Economy

Impact of Government Funding of R&D Development in Industrial Sector of Russia

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Abstract. Specific features of the national R&D sector are "regional", cluster location of research and design work, its transfer and low level of integration at the federal level. According to the survey on the implementation of R&D results in innovative projects in Russia's regions more than 90% of intellectual property objects are addressed to regional industry. This is due to the spatial development of production forces and relations in Russia, historical and current trends. The purpose of the article is to determine the impact of government funding on the development of the entire R&D sector in industrial projects. Despite its weak position in the global comparison, it is possible to notice the preservation of "growth points" in the national research and development sector. When analyzing this problem, one can state a general progressive dynamics of technology exports, as well as growth in certain areas, in particular, manufacturing industry. The study assesses the effectiveness of the development of the industrial sector of R&D in the Russian Federation.

Keywords: Industrial sector · Innovation development · Government funding · R&D · R&D budget

1 Introduction

When comparing the competitiveness of world economies [8], the development of the national innovation system is determined primarily by R&D sector indicators, and secondly by institutional indicators. Over the period from 2012 to 2017 there was a slight positive dynamics in the sector (changes below one point on the rating scale), which can be defined as stagnation. Several constraints can be analyzed, the main of which is the low level of industry investment in technological innovation (3.3 out of 7) and the lack of government mechanisms for the procurement of innovative goods and services (3.3) [10].

The intensive path of development of the sector, due to the implementation of a relatively high (but reducing) intellectual potential, is not closed as an opportunity, but requires [4] changes in the organizational model of the innovation process, R&D cycle integrated into it, and the institutional development of the national intellectual property market. Moreover, it requires not only a change in the organizational mechanisms of R&D, but also the activation of the "transfer" of intellectual property rights into industrial production practice. For the last decade there has been an objective trend of a decline in the volume of transfer of intellectual property into the national economy,

expressed by a decrease in the turnover of license rights in absolute terms. In 2017 Russia accounted for 1.41% of the world intellectual property turnover [10] against the background of a breakthrough growth in the number of intellectual property objects in the world, due to the dominance of the "information" and "digital" economy in the structure of social production in economically developed countries. Moreover, technology transfer is not only a key mechanism for the innovative growth of industrial production, but also the basis for integrating the achievements of economically advanced countries into international infrastructure.

In the "Forecast of scientific and technological development of Russia" the Russian Academy of Sciences identified areas where technologies are at the world (or higher) level of development [6]. In particular, global parity - leadership remains in software production; the creation of biocompatible materials, membranes and catalytic systems; bioengineering, bio catalytic, biosynthetic and biosensor solutions; monitoring the state of the atmosphere, hydrosphere, lithosphere and biosphere; energy and energy conservation. These areas are identified by Decree of the president "On the strategy of scientific and technological development of the Russian Federation" as priority areas for R&D investment [1].

2   Methodology

The author analyzes the development trends of the research and development sector of the national industry. The study presents economic characteristics of the national research and development sector, medium-term development trends and comparison with global trends. The process of research, development, experimental and technological work, intellectual property objects created in it are the "core" of added value of technological innovations.

The main research questions are:

– factors of R&D development in the Russian Federation,
– assessment of the development of the industrial sector of the Russian Federation,
– changes in the structure of subjects, interaction processes and the economics of R&D processes,
– allocation of resources for R&D development in most industrial enterprises of the Russian Federation.

The level of R&D costs in the added value of innovative production determines its knowledge intensity, the level of technological efficiency of industries.

3   Results

A key institutional factor in the development of the national research sector is the preservation of a significant amount of basic science funding [4]. The increase in the rate of transfer of fundamental discoveries into applied developments over the period of 10 years (from 2007 to 2017), observed by economists, allows to consider the academic science sector as a resource for innovative activity, a source of breakthrough scientific

and technical development [9]. In particular, the President of the Russian Academy of Sciences in 2016 Fortov highlighted number of breakthrough Russian fundamental developments of world level: proton therapy, femtosecond laser, ultrahigh pressure systems, photon computers based on diamonds with germanium defect centers, etc. Moreover, Fortov designated both the horizon for transferring discoveries to applied development and the markets for innovative products [6]. Thus, in the period from 2000 to 2015, R&D cost in the Russian Federation increased from 100 million rubles to 750 million rubles per year; the cost of basic research to 500 million rubles; and the cost of experimental development from 80 million rubles to 190 million rubles per year.

4   Discussion

Based on the development of the R&D sector as a whole, the author analyzed and highlighted a counter positive trend in the growth of applied research funding (Table 1), which creates the potential for innovative developments, both on the basis of fundamental breakthroughs and on global platforms of "open innovation", acquired franchises on intellectual property. The distribution structure of the R&D budget, funded by state programs of the Russian Federation is given in Table 1.

Table 1. R&D budget, funded by state programs of the Russian Federation in 2014–2016 and vertical analysis (VA) for 2016

State programs	2014, bln. rubles	2015, bln. rubles	2016, bln. rubles	VA, %
Development of science and technology	102.73	111.82	119.61	71
Aviation industry development	28.62	27.87	35.22	20
Development of industry and increasing its competitiveness	7.27	8.55	12.80	7
Development of the nuclear power	0.89	0.20	0.01	0
Energy efficiency and energy development	1.49	1.37	0.92	1
Reproduction and use of natural resources	1.50	1.20	1.19	1
Agricultural development	0.04	0.01	0.00	0
Total	142.54	151.03	169.75	100

Source: author based on [3]

Let's consider sectoral distribution of state R&D funding. After analyzing a number of data, we can conclude about cross-sectoral nature of the funding, 71% of which is concentrated in multidisciplinary research and development. The strategy of state R&D financing is not based on breakthroughs in individual industries, typical for the EU countries, [10] but on the creation of a common innovative scientific and technological platform, that provides the potential for technological breakthroughs in priority sectors

of industry and infrastructure. It is on these principles that the national program "National technological initiative" was created, which replicates general R&D solutions ("Technet") in industry projections ("AeroNet", "MariNet", etc.).

The formed funding program is based on the promising institutional structure of R&D entities. Over the past 20 years, the global innovation system has undergone significant changes: from clusters led by manufacturing corporations to global networks based on an open technology solutions platform. The new and changing functions of traditional R&D institutions appear, and a new organizational model of research and development is being formed. The research on innovation leadership factors of the United States (and other countries) has identified a key factor in creating new operational models for internal R&D organization and cooperation mechanisms [5]. The Russian sector of research and development, the institutional transformation of which is inseparable from global trends, has undergone significant changes (Table 2). The adoption of the "triple helix" concept at the turn of the 2010s led to a change in the role of Universities in innovation processes. Since 2015 the volume of research and development of scientific and educational organizations in Russia has increased by 15% [2].

Table 2. Dynamics and vertical distribution (VD) of the number of organizations performing R&D by sectors of activity and types of organizations in the Russian Federation in 2000 and 2015

Indicators	2000	VD, %	2015	VD, %
Total number of organizations	4099	100%	4175	100%
Distribution by sectors				
State organizations	1247	30%	1560	37%
Entrepreneurial organizations	2278	56%	1400	34%
Universities	526	13%	1124	27%
Nonprofit organizations	48	1%	91	2%
Distribution by types of organizations				
Research organizations	2686	66%	1708	41%
Design organizations	318	8%	322	8%
Design and survey organizations	85	2%	29	1%
Pilot plants	33	1%	61	1%
Universities	390	10%	1040	25%
Industry divisions	284	7%	371	9%
Others	303	7%	644	15%

Source: author based on [7]

The transfer of applied research to universities reduces the role of specialized research institutes (−25%) in innovative industry programs. Educational centers demonstrate clear leadership; due to their activity in innovative R&D processes [5]. The role of the state and its institutions in the implementation of R&D projects (+7%) is increasing, which is in line with world practice. On the one hand, state funding makes up for the deficit of investments in R&D, smooths out the investment gap in R&D

expenses and profits from the introduction of technological innovations, on the other hand, the government financial initiative is holding back R&D investments in the private capital sector (−22%). The increase in the participation of internal scientific divisions of the industry in applied research and development (+2%) is largely due to the state financing programs, rather than an investment initiative of private entrepreneurship. In other words, there is a change in the structure of subjects, interaction processes, and the economics of R&D processes.

5   Conclusion

Thus, the development prospects of the national R&D sector are determined by the following key medium-term trends:

1. Lagging in R&D funding from world parity.
2. Reduction of intellectual resources in scientific and technical sphere.
3. Insufficient implementation of R&D potential.
4. Institutional transformation.

Summing up the analysis, we can confidently conclude that the key direction of intensification of the national sector is the improvement of managerial approaches to the organization of research and development work in innovative industrial projects. One can also speak with confidence about the clear potential for intensifying the R&D sector of industry in terms of the objectivity of "growth points" and institutional prerequisites.

Huge changes in the share of R&D financing in industry can be observed in dynamics over the past 10 years, and this is due to the enormous demand for the development of this particular national sector. Most Russian and Western economists agree with this view. This development allows further progress of the industrial sector in Russia, which will bring additional revenues to the state budget. In this regard, the current trend of active government funding is more than justified.

References

1. Decree of the President "On the strategy of scientific and technological development of the Russian Federation" (2016). http://kremlin.ru/acts/bank/41449. Accessed 02 Apr 2020
2. Etzkovitz, H., Leydcsdorff, L.: The dynamic of innovations: from National System and "Mode 2" to a Triple Helix of university-industry government relations. Res. Policy **29**(2), 109–123 (2000). https://doi.org/10.1016/S0048-7333(99)00055-4
3. Government of the Russian Federation: Annual monitoring of funds allocated from federal funding budget R&D (2016). https://ac.gov.ru/uploads/_Projects/Presentations/4879.pdf. Accessed 02 April 2020
4. Khlebnikov, K.V.: The effects of investment in human capital for the benefit of in-innovative development of high-tech enterprises. Sci. Inf. J. **10**, 84–85 (2016)
5. Popova, I.N.: Analysis of models for the formation of innovative territorial clusters. Econ. Entrepr. **8**(4), 258–262 (2017)

6. RAS: Forecast of scientific and technological development of the Russian Federation for the long term (until 2030). Conceptual approaches, directions, forecast estimates and conditions of implementation. RAS, Moscow (2008)
7. Rosstat: Russia 2015. Statistical reference book (2015). https://www.gks.ru/free_doc/doc_2015/rus15.pdf. Accessed 02 Apr 2020
8. Schwab, K.: The global competitiveness report 2016–2017 (2017). http://www3.weforum.org/docs/GCR2016-2017/05FullReport/TheGlobalCompetitivenessReport2016-2017_FINAL.pdf. Accessed 02 Apr 2020
9. UNIDO: Industrial development report 2016: The role of technology and innovation in inclusive and sustainable industrial development (2016). https://europa.eu/capacity4dev/unido/document/industrial-development-report-2016-role-technology-and-innovation-inclusive-and-sustainable. Accessed 02 Apr 2020
10. World Bank Group: Digital dividends (2016). http://documents.worldbank.org/curated/en/896971468194972881/pdf/102725-PUB-Replacement-PUBLIC.pdf. Accessed 02 Apr 2020

Corruption Counteraction: Theoretical and Practical Aspects

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Abstract. The article reveals the essence of the phenomenon of corruption. The analysis of legal statistics on corruption-related crimes is given. System value for research of problems of counteraction of corruption in the era of digitization has institutional approach, characterized by effective and comprehensive analysis of the mechanism of participation of the state as a whole and its individual institutions in the development and implementation of the security policy and the position of this sphere of legal regulation in the system of powers exercised by the authorities in the field of state internal and foreign policy and its relationship to individual activities. Within the publication, the main purpose of the article is to reveal the essential characteristics of corruption as a socio-steam phenomenon and analyze statistical information that characterizes trends in the sphere of legal counteraction to corruption in the Russian Federation at the present stage. Work is based on the provisions of the theory of national security (namely, the provisions of prevention in its organization) and modern concepts of state policy in the field of combating corruption.

Keywords: Anti-corruption legislation · Bribery · Corruption · Fraud · Theft · State and municipal procurement

1 Introduction

Unfortunately, the formation of a new model of communication through digital technologies does not allow avoiding corruption in the sphere of public and state activities. Moreover, the use of new technologies helps to make this type of relationship even more latent, which makes this problem one of the most acute socio-economic and legal problems facing scientists who are experts in the field of legal science and practitioners – representatives of law enforcement agencies. This kind of economic deviation, especially at the time of formation of the system of digitalization of communication processes not only undermine the authority of state power bodies and business community, but also have an objective impact on slowing down the pace of social development of the state, retard the realization of economic reforms, reduce the profitability of the core activities of enterprises of all forms of ownership and, ultimately, interfere with the normal work of the authorities and structures of civil society. Despite the introduction of a system of bidding on electronic platforms with the

possibility of permanent control by Supervisory and law enforcement agencies, the sphere of procurement of goods services for state and municipal needs remains the most corruption-intensive areas of the domestic economy. To build a reliable and secure procedure for the implementation of state and municipal procurement, it is necessary to develop legal and economic mechanisms of a strategic nature, which will be based not only on domestic scientific and practical research, but also on the experience of anti-corruption activities of developed countries. This will not only help to reduce transaction costs in the form and illegal content of state and municipal contracts, but also lead to real savings in budget funds while improving the quality of goods and services provided.

Within the publication, the main purpose of the article is to reveal the essential characteristics of corruption as a socio-steam phenomenon and analyze statistical information that characterizes trends in the sphere of legal counteraction to corruption in the Russian Federation at the present stage.

2   Methodology

The methodological basis of the research is represented a wide range of scientific approaches: comparative, problematic, systemic, structural, analytical, and a number of others, and a significant number of methods of modern legal science, political science and other related sciences. The complex and multifaceted nature of the problem under study determined the priority use of the principles of unity, comprehensiveness, integrity and movement from the abstract to the concrete.

System value for research of problems of counteraction of corruption in the era of digitization has institutional approach, characterized by effective and comprehensive analysis of the mechanism of participation of the state as a whole and its individual institutions in the development and implementation of the security policy and the position of this sphere of legal regulation in the system of powers exercised by the authorities in the field of state internal and foreign policy and its relationship to individual activities.

The formal legal approach, which is used in the study, determines normative-legal framework of the study and the conditions for the implementation of powers by public authorities. This helps to strengthen the institutional approach and allows you to identify the most priority areas of activity and specify the tasks facing the state-power institutions. The focus on the methodology of economic research is of great importance for the study. This allows a much deeper understanding of the nature and essence of corruption processes and their perniciousness in the modern world.

It should be noted that the tools of psychology, cultural studies, and sociology are important for the study of economic security problems. Besides, the work is based on the provisions of the theory of national security (namely, the provisions of prevention in its organization) and modern concepts of state policy in the field of combating corruption.

3   Results

The current system of views associates corruption crimes exclusively with the political and economic sphere. However, the use of broader and more universal methods, which were mentioned above, allows us to consider corruption not as a universal phenomenon, but as an interdisciplinary, complex object of research: here we see the manifestation of not only economic and legal components – political science, history, philosophy, cultural studies, and even theology cannot be left out. Political science view on this problem is most fully and comprehensively presented in the works "Political corruption: readings in comparative analysis" by Heidenheimer [4] and "The Pathology of Politics – Violence, Betrayal, Corruption, Secrecy, and Propaganda" by Friedrich [3], published in the last quarter of the twentieth century and laid the foundation for the controversy about the essence of corruption, presenting the first terminological arguments. In addition, for the first time, the question was raised about the causes and global consequences of corruption, its impact not only on the economic component, but also on the political life of society. I must say that the issues raised have not lost their relevance today, but we should note a certain shift in the debate towards the formation of concepts for the emergence of corruption manifestations and the development of methods to struggle it. At the same time, there is practically no comprehensive interdisciplinary research on the essence of the phenomenon of corruption [1].

The analyzed phenomenon is a complex formation with several ambiguous views. According to Borzenkov, corruption is an exclusively legal concept, which is a combination of several official crimes (namely theft, bribery, abuse of authority, etc.) that fall under the Criminal code of the Russian Federation [2]. The failure of this kind of view in modern conditions is beyond doubt. Komissarov, criticizing this point of view, raises the question of the need for a broader view of the problem, analyzing cases in which an official acts based on the desire to satisfy an intangible interest. An example of such manifestations can be considered the employment of their own relatives or relatives of "the right people", the desire to satisfy the interests of higher management, etc. [5]. However, this kind of manifestation, characteristic of the late 80's and early 90's of the last century, has undergone significant changes, which also allows us to speak about the imperfection of the described point of view in the modern world. The most successful is the definition of the term "corruption", presented in the works of Kostenko. The author proposes to consider it as a multidimensional socio-economic, political, and moral-ethical phenomenon, which is based on a number of anti-social actions (both illegal and immoral), covering a complex of offenses that are interrelated [6]. An interesting feature of corruption in their works is pointed out by Nesterov and Sukhovarova, who note cases when corruption activities are exclusively immoral in nature, which does not allow to attract the violator under the rules of criminal or administrative law [7]. This allows us to look at corruption not only from the legal point of view, but also from the position of assessing morality. In this case, bribery in state and local government bodies and commercial bribery in the activities of non-state economic entities will be just one of the most striking forms of corruption. The use of such a broad and diverse position suggests that corruption should be considered from

the point of view of criminal law, tort relations and morality. This approach allows us to attribute to corruption manifestations not only the extraction of material benefits by an official, but also various kinds of violations of ethics and morals.

Sources indicate an extremely high level of corruption in the Russian Federation. According to international anti-corruption organizations, we are ranked 136th out of 174, which points the inefficiency of existing methods and mechanisms for fighting corruption and the need to develop completely new approaches to the formation of principles for monitoring activities to meet state and municipal needs and conditions for preventing the considered criminal manifestations. One of the most effective methods is a preliminary assessment of corruption risk in the system of procurement of goods and services for state needs. Experts of the transparency international center, having conducted a number of studies on the problem of combating corruption in the Russian Federation for a long time, point to a number of gaps in the legislation that allow satisfying the illegal interests of interested persons [10]:

- there are no mechanisms for public consideration and discussion of state and municipal needs,
- the law does not establish a mechanism for providing mandatory guarantees of compliance of goods or services with the conditions specified in the tender documentation,
- there are no or veiled conditions for disclosure of information about the characteristics of purchased goods,
- the criteria for evaluating bidders and the conditions for their admission are not objectively justified,
- there are no real guarantees of the independence of persons who must control the course and conditions of procurement,
- lack of guarantees of protection for persons who reported unfair bidding,
- the inability of civil society structures to monitor the progress and results of the bidding process.

4   Discussion

Further, it is necessary to analyze open data reflecting the current state and trends of anti-corruption activities in the Russian Federation. The source base for the analysis was legal statistics (Fig. 1; Table 1). These data mean that the number of crimes under article 290 "Bribe reception" of the Criminal Code of the Russian Federation dated 13.06.1996 No. 63-FZ [8] remained fairly stable during the period under review. A sharp turnaround was observed in 2017, when the indicators of the perfect number of crimes have more than halved (from 6,495 to 3,187 registered crimes). Meanwhile it cannot please the fact of further reducing the number of crimes committed in 2018 and 2019. It appears that this trend is a consequence of introduced in 2016 changes to existing legislation, to strengthen the responsibility for taking bribes, and increase the effectiveness of oversight bodies.
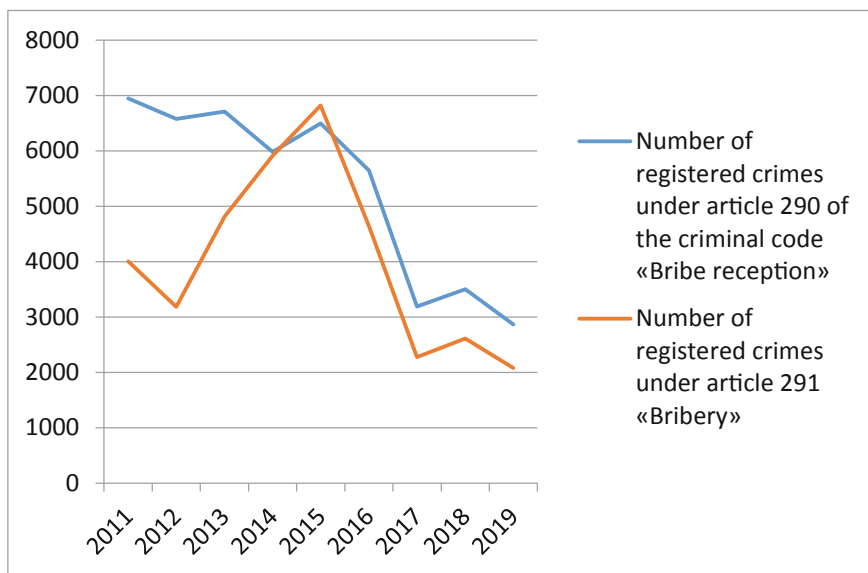
Fig. 1. Indicators of registered corruption crimes for the period from 2011 to 2019 in the Russian Federation (Source: authors based on [9]).

Table 1. Number of registered corruption crimes for the period from 2011 to 2019 in the Russian Federation

Statistics	2011	2012	2013	2014	2015	2016	2017	2018	2019
Crimes under article 290 of the criminal code of the Russian Federation	6947	6576	6710	5980	6495	5644	3187	3499	2866
Crimes under article 291 of the criminal code of the Russian Federation	4005	3182	4811	5913	6816	4640	2272	2612	2077

Source: authors based on [10].

A different scene is shown by data on the number of crimes committed under article 291 of the criminal code of the Russian Federation "Bribery". The year 2011 is marked by a marked decrease in the number of registered crimes, but since 2012 there has been an annual 30% increase, which led to more than double the total increase in the number

of crimes in 2015 – from 3182 to 6186 cases. It is encouraging that the tightening of sanctions for this crime in 2016 contributed to a sharp decrease in their number, but in 2018 there is a slight increase. Let's assume that this is based on both improving the mechanisms for monitoring the conduct of auctions, and changes in the worldview of the officials responsible for their conduct.

5   Conclusion

All the above ideas about the phenomenon of corruption, which have received theoretical development in the scientific and legal field, allow us to conclude that the domestic legal science still lags behind the needs formed by practice. The improvement of technologies, the development of communication tools, and the modernization of society and the economy are taking place much faster than new scientific concepts and ideas defining the concept of corruption. Statistical data indicate that the mechanism for improving anti-corruption legislation is slow and, unfortunately, the mechanism for committing certain crimes is improving. In this regard, it seems that the most promising activity is not only the scientific substantiation of changes in legal acts that establish responsibility for corruption, but also the analysis of the corruption risk of various types of decisions and actions of public authorities and local self-government.

References

1. Bekyashev, K.A.: International Public Law. Prospect, Moscow (2014)
2. Borzenkov, G.N.: Corruption in the system of criminal offences. Bull. Moscow Univ. **1**, 21–26 (1993)
3. Friedrich, C.J.: The Pathology of Politics – Violence, Betrayal, Corruption, Secrecy, and Propaganda. Harper and Row, New York (1972)
4. Heidenheimer, A.J.: Political Corruption: Readings in Comparative Analysis. Holt Rinehart and Winston, New York (1970)
5. Komissarov, V.S.: Criminal-legal aspects of the fight against corruption. Bull. Moscow Univ. **1**, 26–30 (1993)
6. Kostenko, N.I.: International Criminal Law at the Present Stage: Trends and Problems of Development. Yurlitinform, Moscow (2014)
7. Nesterov, A.V., Sukhovarova, E.L.: Transformation of corruption in the conditions of transition to the market. In: Materials of the Scientific-Practical Conference Corruption in Russia: State and Problems, 26–27 March 1996, pp. 59–63. Institute of MIA of Russia, Moscow (1996)
8. The Criminal Code of the Russian Federation dated 13.06.1996 No. 63-FZ (1969). http://base.garant.ru/10108000/. Accessed 25 Sept 2019
9. The Portal of Legal Statistics: Number of registered crimes under articles 290 and 291 of the criminal code "receiving a bribe" (2019). http://crimestat.ru/regions_chart_total. Accessed 25 Sept 2019
10. Transparency International Russia: Russia in the corruption perception index 2019: 28 points and 137th place (2019). https://transparency.org.ru/research/indeks-vospriyatiya-korruptsii/rossiya-v-indekse-vospriyatiya-korruptsii-2019-28-ballov-i-137-mesto.html. Accessed 25 Sept 2019

Legal Regulation of International Payment Systems in the Russian Federation

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Abstract. The dynamic development of payment systems, the formation of new mechanisms for payment infrastructure functioning, the emergence of new types of payment instruments and forms, which are taking place recently, have a significant impact on all spheres of our life, including the sphere of economic security of the state and, as a result, require a special approach and careful legal regulation. Due to the historical development of the monetary system, when paper, credit and electronic money was included into the monetary circulation, there is a need to develop special rules for their circulation and transfer procedures, which should be followed by all participants in payments. As a result, a payment system for transmitting payment information is formed. The purpose of the article is to determine the place and role of international payment systems in the legal regulation of this sphere in the Russian Federation. The main research method is the complex analysis, since legal regulation of payment systems cannot be considered in isolation from the economic content of these relations. Effective regulation and control of payment systems enables national banks to develop a payment system infrastructure.

Keywords: Foreign payment systems · Money transfers

1 Introduction

In the last decade, there has been a rapid development of the payment infrastructure: the emergence of new entities that provide payment services and apply modern payment schemes for goods, works and services, and a radical change in the approach to making payments. Such changes are caused by global factors: scientific and technological progress, the emergence of a worldwide system of unified computer networks for storing and transmitting information (the Internet) and its penetration into almost all spheres of the human activity, structural changes in the economy – globalization and integration. Economic relations between countries are becoming more complex [15]. With the increasing globalization of economic and political processes, the role and importance of payment systems is significantly growing. Rapid and, most importantly, secure implementation of cross-border payments is a basic element for effective functioning and development of the world economy. Among the fundamental institutions that should ensure the continuity and security of cross-border payments are international payment systems, which have developed rapidly in recent decades. In the scientific literature on this topic, it is noted that even if today customers are able to pay

for purchases by cash on delivery, which seems safe and reliable, there is still a need for electronic payments that can only be provided through banks [4]. Currently, banks have special systems such as Internet banking, electronic transfers, plastic money (credit and debit cards) and mobile banking [5, 9, 10, 13].

As follows from the norms of domestic legislation, a foreign payment system is a set of organizations that have joined the rules of the payment system organized in accordance with the foreign legislation, and interact under the rules of a payment system (participants of the international payment system), according to which a foreign bank (a foreign credit organization) can act as a payer and recipient of funds for transferring funds of participants in the foreign payment system [2]. This concept was included into the specified regulatory act in 2014 in order to ensure the smooth functioning of payment systems, as well as the legal regulation of the national payment card system.

Initially, as a result of changes made to Federal law No. 161 regarding the definition of a foreign payment system, it was used only for the purpose of legal protection of operations of a foreign central payment clearing counterparty that has a bank account in the Bank of Russia [2]. Since, in accordance with paragraph 11 of Art. 29 of Federal law No. 161-FZ, a transfer of funds made by a foreign central payment clearing counterparty that has a bank account opened in the Bank of Russia, or with its participation, within a foreign payment system, cannot be invalidated on the grounds provided by the legislation of the Russian Federation [2]. However, the economic and political events that happened in the following years predetermined and necessitated clearer legal regulation for functioning of foreign payment systems on the territory of the Russian Federation. The result was changes made to Federal law No. 161 by the Federal law No. 264-FZ of 02.08.2019 [3].

2   Methodology

In the course of research on this topic, the following methods were used. Firstly, it is a method of comparative law which is based on the study and use of the legal regulation of similar relations. In cases where this method is used, not only the content of a particular legal institution is subject to research, but first of all, reasons for its origin in a particular national legal system, as well as development forms of this institution are studied, which makes it possible to establish both general, universal features and legally specific features in the considered institute. This, in turn, allows us to establish a certain basis for purposes of a new research in this area and the formation of proposals for further improvement of the domestic legislation, taking into account national specifics. Secondly, the method of complex analysis was used. Studying a specific legal phenomenon, other tools that are used in other scientific branches are also used together with legal instruments.

In particular, as for this study, it is impossible to consider the issue of legal regulation of payment systems functioning in isolation from the economic science, and from processes that it studies. After all, the evolution of the legal formalization of economic relations will not take place if lawyers avoid analyzing the economic nature of these relations. As for the general formal-logical methods, analysis, synthesis and

generalization were applied (in particular, when determining specific features of legal regulation of payment systems and identifying the subject composition of these relations).

3   Results

A foreign organization, which is an operator of a foreign payment system, where cross-border transfers of funds from individuals are made, has to send to the Bank of Russia a statement in the prescribed form through a separate division of a foreign operator payment system on the territory of the Russian Federation which enables to include information about it into the register of foreign operators of the payment systems. The application of the operator of a foreign payment system, among other documents provided by law, should be accompanied by rules of the foreign payment system in Russian.

The rules of a foreign payment system regarding cross-border money transfer with the participation of money transfer operators determine the procedure for payment clearing and payment itself in a foreign payment system. It is also mandatory to specify in the rules the risk management system in the foreign payment system, including the procedure for ensuring the fulfillment of obligations related to the settlement. The scientific literature also repeatedly emphasizes the need to analyze a credit risk, which is an important criterion for the stability of the banking sector [14].

In addition, it is necessary to provide requirements for ensuring the protection of information in a foreign payment system. This is because the development of digital cashless payments also raises various issues that national banks should take into account. In particular, these payments can create problems regarding payment stability and cybersecurity. Security and privacy are becoming increasingly important as operators accumulate huge amounts of customer data through digital payment platforms [17].

It is also important to indicate the order of interaction between the foreign operator of the payment system and the operators for transferring money in disputed and emergency situations, as well as requirements for combating legalization (laundering) of proceeds from crime, financing of terrorism and financing of proliferation of mass destruction weapons.

In addition, the current version of the Federal law No. 161-FZ grants the Bank of Russia the right to establish additional requirements regarding the content of the rules related to the procedure for conducting cross-border money transfers with the participation of money transfer operators, as well as requirements for ensuring information protection when conducting cross-border money transfers with the participation of money transfer operators [2].

In the course of its activities, a foreign payment system operator must: ensure public availability of the rules of the foreign payment system on the territory of the Russian Federation, as well as their observance in the sphere of cross-border money transfer with the participation of money transfer operators; attract service operators from the payment infrastructure that provide payment infrastructure services within payment systems whose operators are registered by the Bank of Russia.

The operator of a foreign payment system and operators of payment infrastructure services attracted by it may not suspend or terminate unilaterally the provision of services within the framework of a foreign payment system to other operators of money transfer and their clients.

As for money transfer operators, they are entitled to participate in a foreign payment system only if the Bank of Russia includes information about the operator of a foreign payment system in the register of foreign payment system operators. At the same time, money transfer operators are required to send a notification to the Bank of Russia about participation or termination of participation in a foreign payment system.

It should be noted that all these requirements do not apply to foreign organizations that have subsidiaries on the territory of the Russian Federation that are registered by the Bank of Russia as payment system operators, as well as to international financial organizations and foreign central (national) banks.

The Bank of Russia is responsible for monitoring and supervising activities of foreign payment system operators. For this purpose, the Bank of Russia carries out some specific functions: check whether the of a foreign payment system operator follows the rules of the foreign payment systems to cross-border transfer of funds with the participation of operators for transferring funds, as well as ensure the public accessibility of the rules of foreign payment systems on the territory of the Russian Federation; verification of compliance by the operator of a foreign payment system with additional requirements established by the Bank of Russia regarding the operation of a foreign payment system; assessment of measures taken by the operator of a foreign payment system to eliminate identified violations of legal requirements; verification of the operator's observance of the obligation to attract payment infrastructure service operators from among the operators providing payment infrastructure services within payment systems whose operators are registered by the Bank of Russia [11].

4   Discussions

At the moment, the world is striving to create a single financial market, and modern technologies allow us to move capital in real time not only from city to city, but also from country to country. In modern conditions, the financial sphere has acquired an independent character, has become "a thing in itself and for itself", having broken away from the material production and exchanges of goods and services. The latter account for only 30% of global cash flows, and 70% serves the financial sector itself [1]. In the context of modern globalization, payment systems are a key element of the global financial system, providing payments both at the national and interstate level, which contributes to the effective implementation of monetary policy and ensuring financial stability of the economy. Due to the increased integration and economic development processes, there is a constant increase in the turnover of existing payment systems [8].

The Federal law "On the national payment system" has laid the basis for a legal framework that is adequate to modern economic realities. The legislator takes serious steps aimed at creating and establishing effective functioning of the payment system as an important institution of the financial system [2].

In the scientific literature, the payment system is understood, for example, as "a set of economic relations that ensure the movement of interrelated cash flows between subjects of the total payment turnover in the process of functioning and integration of the company's finances" [12, p. 42]. At the same time, other authors consider the payment system in a narrower sense, meaning only the system of plastic cards. At the same time, this approach does not take into account money transfers to bank accounts that are carried out by legal entities and individuals, money transfers without opening a bank account, and other operations that are performed without using a bank plastic card. In the legal science, there is a slightly different approach to the definition of a payment system. For example, Tarasenko interprets the payment system as a set of legal norms, institutions, software and other means that ensure interbank settlements [16]. A somewhat broader view of the payment system is proposed by Karchevsky. He identifies a number of qualifying features of the payment system, based on which the author understands the payment system as a set of interrelated elements of an institutional and infrastructural nature that ensure the implementation of settlements and settlement of debt obligations between participants in the economic turnover [7].

5   Conclusion

The development of payment systems helps countries to make financial operations in the international transactions, and citizens to make purchases and pay for trips abroad. The main tool for performing these operations is a payment card that is served by one of the payment systems. In addition, payment systems help countries to control risks that may arise in the course of financial transactions, which indicates their dominant role in the payment system of countries as a whole. Effective regulation and control of payment systems enables national banks to develop a payment system infrastructure. The world experience in the organization of non-cash payments indicates that cash is inevitably eliminated from the payment turnover. At the same time, frequent changes in rules and norms that regulate the sphere of non-cash payments and functioning of payment systems can lead to legal conflicts in practice. Analysis of modern research on functioning of foreign payment systems, in particular, shows that the financial systems of national economies are very sensitive to any changes in the payment space and its legal regulation. Due to the importance of payment systems and their impact on the banking sector, as well as the fact that a perfect payment system has not yet been found, this topic remains complex and relevant for further research on payment systems [6].

References

1. Alekseeva, D.G.: Banking security: legal issues: Ph.D. thesis, Peoples' Friendship University of Russia, Moscow (2011)
2. Federal law of 27.06.2011 N 161-FZ (ed. from 02.08.2019). On the national payment system (2019). http://www.consultant.ru/cons/cgi/online.cgi?req=doc&ts=8035955670921901654 2332128&cacheid=B716A701C4860B534AFF6B34A455964F&mode=splus&base= LAW&n=331203&rnd=0.12130959861038093#2b49a9lufby. Accessed 28 Feb 2020

3. Federal law of 02.08.2019 N 264-FZ. On amendments to the Federal law "on the national payment system" and the Federal law "On the Central Bank of the Russian Federation (Bank of Russia)" (2019). http://www.consultant.ru/document/cons_doc_LAW_330671/. Accessed 28 Feb 2020

4. Gubenko, E.S.: Financial and Legal Regulation of Payment and Settlement Systems. Prometheus, Moscow (2017)

5. Hemmati, M., Yaghoub, S.: The effect of the execution of the real time gross settlement system (SATNA) on electronic banking (central bank of Islamic Republic of Iran). Adv. Environ. Biol. **7**(13), 3946–3950 (2014)

6. Issa, F., Ahmad, M., Alyaseen, J., Mourad, M.: Towards decreasing the associated risks with payment settlement systems. Int. Rev. Comput. Softw. **9**(10), 1767–1775 (2014)

7. Karchevsky, S.P.: Payment system: Concept, structure, typology, and construction principles. Payments Oper. Work Commer. Bank **4** (2007). https://www.lawmix.ru/bux/62843. Accessed 28 Feb 2020

8. Karmin, I.A.: Formation and development of payment systems in the context of globalization of world finance. Ph.D. dissertation, Saint Petersburg University of Engineering and Economics, Saint Petersburg (2006)

9. Khomenko, E.G.: Financial and legal regulation of the creation and functioning of the national payment system of Russia. Ph.D. thesis, Moscow State Law University, Moscow (2017)

10. Milkau, U.: International payments: current alternatives and their drivers. J. Payments Strat. Syst. **13**(3), 201–216 (2019)

11. Regulations of the Bank of Russia On the procedure for supervision by the Bank of Russia of compliance by non-credit organizations with payment system operators, payment infrastructure service operators, and foreign payment system operators with the requirements of Federal law No. 161-FZ of June 27, 2011 "on the national payment system" and Bank of Russia regulations adopted in accordance with it (2011). http://www.consultant.ru/cons/cgi/online.cgi?req=doc&ts=80359556709219016542332128&cacheid=29ADC56C9464F198D9A993B13C8D264A&mode=splus&base=LAW&n=344213&rnd=0.12130959861038093#5d0itasgjv. Accessed 28 Feb 2020

12. Savinova, N.G.: Functioning of the national payment system of the Russian Federation in modern conditions. Ph.D. dissertation, Samara State University of Economics, Samara (2012)

13. Sha, N., Shariq, M.: Virtual banking and online business. Banks Bank Syst. **12**(1), 75–81 (2017)

14. Singh, E.R., Sivasankar, E.: Risk analysis in electronic payments and settlement system using dimensionality reduction techniques. In: Bansal, A. (ed.) Proceedings of the 8th International Conference Confluence 2018 on Cloud Computing, Data Science and Engineering, pp. 14–19. IEEE, New Jersey (2018)

15. Surodeev, Yu.V.: Financial and legal regulation of the national payment system of the Russian Federation: Ph.D. dissertation, Moscow State Law University, Moscow (2016)

16. Tarasenko, O.A.: Payment system of the Russian Federation. Actual Prob. Russ. Law **1**, 65–70 (2008)

17. Yamaoka, H.: The future of central banking. Accounting, Economics, and Law: A Convivium (2019). https://www.degruyter.com/view/journals/ael/ahead-of-print/article-10.1515-ael-2019-0003/article-10.1515-ael-2019-0003.xml. Accessed 28 Feb 2020

State Support for Investment Policy in the Real Economy Sector

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Abstract. In modern economic conditions, it is urgent and necessary to apply new technologies, innovative technical and technological solutions. The most important market for innovations is construction and related industries ensuring commissioning of facilities and production capacities in the real economy sector. One of the segments of this market is housing construction, which also solves important social problems. In terms of capital investments, housing construction is a leader. The demand for housing facilities together with other social infrastructure facilities is constantly growing. Taking into account the high level of deterioration of the existing housing stock and living conditions that do not meet modern requirements, the need for new construction of residential facilities is obvious. The article investigates the main directions of housing construction development. The authors evaluate advantages of mortgage lending, the application of the housing renovation program, and changes in the structure of construction projects in favor of low buildings in small and medium-sized cities. Considerable attention is paid to the growth prospects of individual housing construction. The relations of developers with the financial and credit system and the state are analyzed. Specific proposals aimed at improving the efficiency of housing construction are given.

Keywords: Housing policy · Loans · Mortgage · Net cost · Renovation

1 Introduction

Construction, as a sphere of engineering and economic activities, plays a significant role in the formation of the gross domestic product and the development of related industries – the construction materials industry, metallurgy, chemistry, and others. The industry is developing constantly and stable, facing quite ambitious goals – to bring the volume of housing construction to 120 million square meters per year, against 80 million square meters at present. Solving this problem will require a significant increase in the production capacity of contractors, structural changes, and many other tasks [3]. The government of the Russian Federation has set goals not only to ensure economic growth rates of 3% by 2020, but also to increase investment in fixed assets to 25% of the total volume of all financing sources. The focus of the investment policy on the real sector of the economy will ensure an increase in production capacity in various industries and, first of all, in capital-intensive areas of economic activity, including capital construction. Temporarily available funds of both legal entities and, most

importantly, individuals should be directed to investment, not speculative purposes. It is obvious that the state should create appropriate conditions: legal, tax, tariff and other [3].

2 Methodology

The concept of state support for investment policy should primarily concern the creation and further support of national projects and investment programs at all governmental levels: from the federal to the municipal ones. These are usually projects aimed at implementing state infrastructure initiatives of social orientation. The essence of the concept is to create a single organizational and economic mechanism for managing the investment process at all stages of the life cycle of a program or project. First of all, it is the improvement of the current legislation, which should take into account interests of all participants in the investment process, including private investors; new tools for the development of construction and reconstruction of infrastructure facilities; regulations for managing the development of federal and regional innovation systems, which should include a system of indicators and methods for the development, implementation and evaluation of innovative development programs, as the most investment-intensive, on the one hand, and long-term related to the return on investment, on the other.

The regulations should cover a procedure for approval of federal interests and interests of specific territories, while respecting principles of the supremacy of national interests over private and regional ones; a factor of interactions with other public policies, programs and measures undertaken by the Government of the Russian Federation. They should also take into account peculiarities of specific territories in the sphere of influence of separate mechanisms for the regional policy implementation; the possibility of creating intra-regional or inter-regional clusters in various industries or activity areas, allowing to activate the innovation and investment potential, which in turn will make it possible to optimize the internal innovation and investment resources of the whole system. The adoption of such regulations will enable an internal assessment of the state of the regional innovation system, the availability and balance of resources, the readiness of the regional infrastructure to accept innovations and implement simple and expanded reproduction, on the basis of which federal and regional strategic programs for innovative development can be formed with a sufficient degree of justification.

It is obvious that for successful functioning of innovation systems under such regulations, a clear balance of actions of all participants in the process is necessary, and this is possible only when constant monitoring is carried out, not only of investment revenues, but also of regulatory measures that ensure effective interaction of the system elements.

Currently, the most active investors in the Russian Federation are federal and regional budgets, centralized investment funds (at the disposal of the government), large companies, joint ventures that are being built and operating in the territory of the Russian Federation, and non-resident external investors. The state's participation in the development of the economy should not be limited to providing targeted, gratuitous

and irrevocable assistance to commercial structures, even with a share of participation similar to the budget financing of investments. It is necessary to create a large state bank that will finance innovative and investment national projects and programs on the return basis. Interest rates should be set depending on the profitability level of projects being implemented. The bank branches should be created at the regional level, and their funds can be supplemented from regional budgets.

3   Results

A number of prerequisites for the growth of investment activity are already visible. First of all, this is a stable growth in federal budget revenues, which allows implementing large investment projects in the real sector of the economy. At the regional level, structural innovation projects are being actively implemented within the framework of the construction of medium-sized enterprises in the processing industries, the construction materials industry, the food industry and many other sectors of the economy [10–12]. At the municipal level and especially regional levels, investments should primarily address social issues through the construction of housing, social services, engineering infrastructure, road construction, and communications upgrades.

The investment climate formed at the level of the state policy should encourage enterprises to make long-term investments. Such a source as an investment tax credit is almost forgotten. Bank loans, especially long-term loans, continue to be expensive.

Mortgage lending is slowly developing, which in turn hinders the construction and implementation of residential facilities development. Project financing at the infrastructure level is practically not used.

Project financing assumes that investments directed within specific projects are necessarily profitable, and the level of profitability should ensure continued financing (at least 25%). The funds raised for these purposes should ensure not only production and current investment costs, but also the debt obligations of investors. The real viability (stability, profitability, creditworthiness) of projects must be ensured. Any long-term investment involves the return of these funds in a mandatory period. Cash flow, as a result of investments, assumes the receipt of income sufficient for the implementation of strategic development goals of organizations and enterprises [9]. In real practice, the cash flows generated at the operating enterprise do not coincide with the volume and structure of capital investments for production facilities under construction.

It should be noted that debts of individuals to banks on consumer loans, which practically do not bring a real income, reach almost 15 trillion rubles, and investment lending stands still. To solve the problem, project financing should become an integral part of business plans of investment projects. Huge funds, about 8 trillion rubles, without taking into account mortgage lending, are diverted from the financial turnover. Banks cannot invest, investments in household lending are growing, and the banking system is moving further and further away from the real sector of the economy. If the state does not take measures aimed at reorienting the banking system to the investment environment, the most severe consequences are possible – bankruptcy of individuals, mutual non-payments of legal entities, a return to barter schemes, and other adverse consequences. Such measures may include: the creation of a state mortgage bank,

further administrative regulation of interest rates, guarantees in obtaining loans (household loans) in the form of property pledge, guarantees from employers or other third parties. Currently, there is a decrease in investment in fixed assets.

Another problem is the development of network (engineering) infrastructure, without which the increase in construction volumes is hopeless. According to various estimates, the development of this network requires about 300 billion rubles a year, compared to 100 billion rubles at present. The question remains "who and how?" should invest these significant funds. There are several options: public-private partnership, concession, project financing and, in particular, refinancing, bank lending.

4   Discussion

Public-private partnership is limited to the participation of private investors in connecting constructed facilities to various networks and minimal reconstruction of communications, which is associated with the allocation of land for construction by public authorities. Private investors not only do not want to be responsible for the replacement of 75% or more worn out engineering networks, but also cannot. If they are required to do so, the cost of new housing and other facilities will more than double.

As practice shows, the use of concession agreements in the sphere of housing and communal services is also unlikely. Land plots and various natural objects in the extractive industries are among the attractive objects for transferring them to a concession. But it is extremely unattractive to take almost completely worn-out networks into the concession, which are not yet subject to depreciation.

You can consider project financing, but not as a tool to attract investment in the implementation of new projects, but as a tool for re-crediting (refinancing) [5, 6]. However, this option does not provide for repayment of investment debts. In this case, the main project agreement is concluded, which provides for the conclusion of contracts for the purchase of various types of products: electricity, water, pipes, etc., this requires long-term price agreements. The activities of the project company participating in the transaction must be licensed. The advantages of this scheme are the lack of own funds, resource costs, wide access to external sources of financing, the use of savings on the project, the presence of the state among the owners of the project, and more.

Issues of lending in the investment and construction sector have long been discussed in the economic literature, but a final, effective solution has not been found yet [4]. If you follow the accepted classification, loans are divided into long-term and short-term. If current short-term loans are easy, long-term loans are not. The fact is that construction products have a long production cycle, and contractors have their own working capital sufficient for 1–2 months of construction and installation work. Then the customers pay for the previously completed works in stages. If we take into account that these works are paid for at the estimated cost, then the estimated profit gradually enters the economic turnover, which causes hidden inflation, since the finished object is put into operation in 1.5–2 years. Lending contractors in the construction process is possible, but this will inevitably leads to an increase in the cost of building products, and in housing construction it increases prices of 1 sq. m. of the property value, which now can hardly be acceptable for a buyer.

The transition to mortgage lending does not solve this problem either. Mortgages are expensive (about 8–10% per), and in 2018–2019 there was a trend towards an increase in bank interest (up to 9–11% per annum). Taking into account that citizens take mortgages for a period of 10 years or more, then square meters purchased on credit cost are twice or more times more expensive for buyers. Government regulation is needed, not just state assistance in mortgage lending. Such a regulator can be a state mortgage bank with a dominant share of state capital, a single state policy, common principles and terms of investment risk insurance, a single mechanism for maintaining accounts of creditors (citizens) and borrowers (general contracting construction organizations). Funds from regional budgets can also be accumulated, which will be transferred to developers after the objects are put into operation. If commercial banks reduce their interest in mortgage lending, and this will necessarily be for at least two reasons: first, it is a long-term and stable income (the guarantee is an apartment under construction), and second, the decline in household income (and this trend is confirmed by surveys of the population) will affect the flow of citizens' funds to the banking system in the downward direction. But such participation must pass through the state mortgage bank and opening of special accounts, which will significantly strengthen the state control over the movement and expenditure of investment resources. It will also be appropriate to note that the debts of individuals to banks exceeded 15 trillion rubles.

The development of the construction industry is hindered by the presence of large volumes of unfinished construction. According to Rosstat, the volume of construction in progress is estimated at 2.5 trillion rubles [8]. These funds are withdrawn from the economic circulation and practically do not bring any real benefit. More than 85 thousand objects are either preserved or temporarily suspended from construction. The consequences of this situation are obvious, it not only negatively affects the efficiency of investments, but also the speed of turnover of funds, return on assets, aging of fixed assets, increasing costs in the process of the construction completion [2].

In Moscow, where the minimum number of dilapidated housing is located, a solution has been found in the form of renovation of the housing stock. But Moscow is an exception in terms of the regional budget, land value, and financial capabilities of the population. Demolition of mentally and physically worn-out five-story houses solves several problems at once: improving the housing conditions of the population, improving the comfort of housing and social infrastructure, and improving the architectural appearance of cities. In the Soviet era, in the early 60s, the strategy of large-panel construction was chosen in the field of housing construction and more than 600 plants for the production of panels and other large-size structures were operating in the country. In all cities and towns of urban type and even in rural areas, a huge number of five-story buildings were built with a standard operating life of 25 years. These deadlines have long expired, but this does not mean that the example of Moscow is being applied in other cities and regions. In Moscow, industrial zones are used for construction, the most significant example is the development of the territory of the former ZIL automobile plant.

In 2019, 79.2 million square meters of residential premises were built in Russia, which is slightly less than in 2014–2018 [1]. The estimated cost of construction continues to grow. It should be noted that these figures include individual, cooperative construction and even self-construction projects, i.e. houses built without permits, land

acquisition and other violations. The main developers are organizations based on private ownership, which have very little working capital of their own. Investment and construction companies have been leaving the market in recent years, and new ones are coming much slower, namely, they can ensure the completion of the full construction cycle and put ready-made houses into operation.

In modern conditions, renovation is the most effective mechanism for solving the housing problem, but how to extend the experience of Moscow to the territory of Russia. Obviously, it is impossible without the support of the federal budget. In addition, the renovation program is long-term (15 years) and very capital-intensive. It would be rash to rely only on the state, and we are once again returning to private investors and bank lending. Private investors are interested in investing in housing construction because the difference between the estimated cost of construction, for example, 1 m^2, and the selling price (market value) is two or more times. Part of this revenue is used to cover additional infrastructure costs, but the profit of investors is several times higher than the estimated profit of contractors. If you move residents from five-story buildings to high-rise buildings, some of the space can be transferred to investors for subsequent sale on the housing market. In addition, the investor saves on engineering networks and social facilities, since renovation programs are implemented within walking distance of demolished residential buildings that have long been integrated into the existing urban infrastructure around them.

When we evaluate certain investment programs in terms of their value, in millions or in billions of rubles, these figures often lose the idea about the quality level and other consumer characteristics, which is interpreted by us as the final result of the investment activity. Construction differs from other sectors of the economy in that the final result will be visible in 2–3 or more years after the first investment. The renovation program has a natural-real expression. Currently, 15 construction grounds have been identified, where it is planned to build 500 thousand square meters of residential space. The demolition of five-story buildings, which may soon fall into the category of dilapidated or emergency housing, solve the problem of settlement. Construction of high-rise houses on the site of demolished five-story buildings significantly increases the load on infrastructure and engineering facilities. The consumption of water, electricity, and the length of pipelines, sewer networks, and other infrastructure facilities is increasing. There is an increasing need for inter-house driveways, car parking spaces, recreation areas, playgrounds, and much more. Therefore, the renovation program is accompanied by a significant restructuring of the environment, which requires significant additional investment costs.

The amount of housing construction is significantly affected by the debt of individuals to banks, which exceeds 15 trillion rubles. These funds could be used by banks as credit resources. The practice of issuing second and subsequent loans should be limited (individuals take these loans to pay off debts on previously issued loans).

As it was stated at the investment forum in Sochi, in 2019, to solve the housing problem, it is necessary to build 1.5 million apartments annually, in parallel, it is necessary to change the structure of housing construction, encourage the construction of individual homes, develop mortgages and other areas of financing [7].

5 Conclusion

In order to attract investment in housing construction, enterprises and organizations should intensify their activities for the construction of departmental housing stock. For this purpose, potential developers can be exempt from income tax, in terms of deductions to regional budgets, for the period of construction of departmental housing. For small and medium-sized towns, the transition to the construction of low-rise buildings is relevant. Reducing the cost of building such houses is possible by saving on load-bearing structures, foundations, and elevators. In total, this can save up to 30–32% of the estimated cost of 1 m^2 of living space. If such houses are combined into a structure like cottage settlements, then you can simultaneously solve infrastructure and social problems. Experience of such construction already exists on the territory of "new Moscow", where even the market price of 1 m^2 does not exceed 60–70 thousand rubles. It is obvious that such a solution to the housing problem for megacities is hardly possible because of the acute shortage of land plots. Saving land in relation to the renovation program is another advantage.

The development of individual housing construction is hindered by the lack or high cost of land around urban areas. Regional and local authorities should not only take care of land acquisition issues, but also finance costs of connecting engineering networks and other infrastructure facilities to such areas. As incomes grow in the country's economy, the possibilities of budgets at all levels expand. From the point of view of this approach, subsidized regions remain problematic. Taking into account that these regions receive federal assistance, it is possible to allocate a separate line of targeted funding for the development of housing construction as part of the total amount of subsidies. The problem remains in relation to self-built houses that have already been built and are already inhabited. It is obvious that demolishing these buildings means aggravating the housing problem. The authorities can limit to penalties against developers who violate the law.

Thus, the coordinated work of all financial institutions is necessary to activate housing construction. Funds of the population – citizens, buyers – should be accumulated on the accounts of the state mortgage bank, which will lend to developers before completing residential buildings and social cultural facilities at a minimum fixed percentage. A guarantee can be the volume of construction and installation work performed, linked to specific physical meters: section, floor, apartment. We need to make greater use of mortgage holidays and preferential lending during the transition period, gradually change the current system of payments for work performed, and activate the insurance system in the investment and construction sector. These measures will work if the volume of construction in progress, the population's debt on all types of loans and cross-lending are reduced. Such steps will negatively affect the cost of finished construction products. To reduce or completely eliminate the impact of these factors, it is necessary to develop an effective mechanism for reducing the cost of construction and installation work, including through innovative engineering and technological solutions, at all stages of production and sale of construction products.

References

1. Decree of the Government of Moscow N 497-PP dated August 1, 2017 to the "Program for the renovation of the housing stock in the city of Moscow" (2017). https://www.mos.ru/programmarenovacii.pdf. Accessed 20 Mar 2019
2. Decree of the Government of Moscow of September 27, 2011 N 454-PP on the approval of the State Program of the city of Moscow "Housing" (2011). https://www.mos.ru/dgi/documents/normativnye-dokumenty/view/209518220/. Accessed 15 Mar 2019
3. Decree of the Government of the Russian Federation of April 15, 2014 N 316 on the approval of the state program of the Russian Federation "Economic development and innovative economy" (2014). http://www.consultant.ru/document/cons_doc_LAW_162191/. Accessed 15 Mar 2019
4. Fleischer, G., Bensoussan, B.: Business and Competitive Analysis: Effective Application of New and Classic Methods. FT Press, Moscow (2007)
5. Germaschewski, Y.: Stabilization policy, infrastructure investment, and welfare in a small open economy. Econ. Model. **84**, 322–339 (2020)
6. Keeley, A.R., Matsumoto, K.: Investors' perspective on determinants of foreign direct investment in wind and solar energy in developing economies – review and expert opinions. J. Clean. Prod. **179**, 132–142 (2018)
7. Roscongress: Sochi Russian investment forum 2019. Forum results (2019). https://roscongress.org/news/rossijskij-investitsionnyj-forum-sochi-2019-itogi-raboty-foruma/. Accessed 15 Mar 2020
8. Rosstat: Construction (2020). https://www.gks.ru/folder/14458. Accessed 15 Mar 2020
9. Sharafutdinova, N.N., Persteneva, N.P.: Basic human resource management models. Bull. Young Sci. Samara State Univ. Econ. **2**(30), 228–233 (2014)
10. Waldron, R.: Capitalizing on the state: the political economy of real estate investment trusts and the 'resolution' of the crisis. Geoforum **90**, 206–218 (2018)
11. Wesseh Jr., P.K., Kin, B.: Environmental policy and 'double dividend' in a transitional economy. Energy Policy **134**, 110947 (2019)
12. Zhang, C., Zheng, N.: Monetary policy and financial investments of nonfinancial firms: new evidence from China. China Econ. Rev. **60**, 101420 (2020)

Features of State Regulation of Small Business Financing in the Russian Federation

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Abstract. Under current economic conditions, the existing problem of the impact of foreign sanctions on reducing the operational efficiency of domestic business representatives is especially relevant from the point of view of maintaining the country's economic security. In such conditions, the state development assistance of small business as a future alternative in the form of replacing external counterparty suppliers for national enterprises is particularly relevant. In the institutional environment of the Russian economy that has formed now, the state is the most important participant performing regulatory functions of the funding process that are encouraging investments in real business. The purpose of this study is to structure the existing mechanisms of state control over the funding process for small businesses. Descriptive, systemic and statistical methods will be used to solve this purpose. The result of the study will be the formed spectrum of existing state methods for regulating financing of enterprises in the real sector of the economy and an assessment of its effectiveness, which can be further used by both the scientific and business environment in forming scientific approaches to the study of the problem identified above, as well as in the development of firms' own investment strategies.

Keywords: Business environment · Financing · Industry · Subsidizing

1 Introduction

Under current economic realities, small businesses are steadily increasing their share in the production of gross domestic product of the Russian Federation. Further development of small business in the domestic economy is difficult without improving the regulatory framework that regulates the provision of small business loans available from the federal budget, as well as investment resources of other market participants. Currently, the development of small businesses, including certain aspects of its financing by state authorities, is regulated by the Federal Law "On the Development of Small and Medium Enterprises in the Russian Federation" (hereinafter - the Law) [5].

Among new directions in the legislative sphere that regulates the activities of small businesses in 2018, there has been a reform of the Civil Code of the Russian Federation (hereinafter - the Civil Code [4]). From 01.06.2018, amendments to the Civil Code began to apply in terms of financial transactions, bank deposits, accounts and settlements. The most significant change for the business was the opportunity to conclude a loan agreement according to the consensual model: the agreement will now be valid for the parties from the moment of signing, and not from the moment the money is transferred.

Lack of attention to the specifics of small business activities in the development and implementation of regulatory decisions reduces the level of confidence of entrepreneurs in the state, creates additional incentives for businesses to leave in the shadow sector of the economy. Taking into account socio-economic and foreign economic conditions, the Government of the Russian Federation has developed a long-term positive program of activities in the field of small business development (hereinafter – the Strategy) [10].

The Strategy involves the implementation of the following principles: when designing and implementing government decisions in regulating entrepreneurial activity, the interests of representatives of small and medium enterprises are primarily taken into account. The second principle is legalization of business. It will be profitable for an entrepreneur to work legally if his interaction with regulatory authorities is minimized and a trusting relationship is established between business and the state. The third principle of the Strategy is to promote accelerated development. The fourth principle is to form a system of incentives for the involvement of state authorities and local governments in the development of small and medium-sized enterprises. The fifth principle is to ensure guaranteed and stable "rules of the game". In addition to the initiatives indicated in this Strategy, a multichannel system of financial support for small businesses at various stages of development has been formed at the federal level, involving the use of both repayable and non-repayable financing instruments. At the same time, financial support for small business will be provided on the basis of differentiation of small business entities according to selected target sectors - mass and high-tech. Commercial banks are encouraged to expand lending to enterprises in the real sector of the economy, microfinance and long-term financing are developed by improving syndicated lending to small and medium-sized enterprises, and the development of credit securitization, leasing, factoring, and direct financing instruments.

2   Methodology

The following methods were used in the study: a system method is to systematize the key factors mediating the process of attracting real capital in the small business segment. This study also places great emphasis on the comparison method. The results of studies obtained by other authors are analyzed and conclusions are consolidated. Based on them, a short-term forecast on the provision of investments is compiled. Often, the studies of investing problems represent theoretical justification for investing as a mediation between investors (who have money to invest) and corporations (which need capital to grow and run their business). The method of analysis and synthesis was used. Expert assessments of domestic and foreign researchers were analyzed.

3   Results

We believe that the prepared legislative environment regulating the activities of small businesses is not complete for the broad development of financing operations for small businesses. A significant variety of legislative norms under consideration, including

internal standards of financial organizations to control financing operations of small businesses, leads to heterogeneity of the legislative framework in the country's economy [1].

Studying historical dynamics of legislation in developing and financing small business in Russia, the following stages can be distinguished, and they are shown in Table 1 [13].

Table 1. Stages of development of legislation in supporting small business

Stage	Regulatory Acts
Policy formation	1. Law of the USSR "On the State Enterprise"; 2. "Regulation on Small Enterprises" (Minutes No. 6 of the Meeting of the Commission on Improving the Economic Mechanism at The Council of Ministers of the USSR); 3. Law of the USSS "On Cooperation in the USSR"; 4. Law of the USSR "On the Enterprise in the USSR"; 5. Law of the RSFSR No. 445-1 "On Enterprises and Entrepreneurial Activity"; 6. Decree of the Council of Ministers of the RSFSR No. 406 "On Measures to Maintain and Develop Small Enterprises"; 7. Law of the RSFSR "On Corporate Income Tax"; 8. Decree of the Council of Ministers of the Government of the Russian Federation No. 446 "On Priority Measures for the Development and State Support of Small Business in the Russian Federation"; 9. Decree of the President of the Russian Federation No. 2270 "On Some Changes in Taxation and Relationship of Budgets of Various Levels"; 10. Decree of the Government of the Russian Federation No. 409 "On Measures for State Support of Small Business in the Russian Federation for 1994–1995"
Legal foundations	1. Civil Code of the Russian Federation; 2. Tax code of the Russian Federation; 3. Federal Law No. 88-FL "On State Support of Small Business of the Russian Federation"; 4. Decree of the Government of the Russian Federation No. 1256 "On Federal State Program Support of Small Business in the Russian Federation in 1996–1997"; 5. Decree of the Government of the Russian Federation No. 697 "On Federal State Program Support of Small Business in the Russian Federation in 1998–1999"; 6. Federal Law No. 14-FL "On Limited Liability Companies"

Table 1. (*continued*)

Legal acts in the context of economic crises	1. Resolution of the Government of the Russian Federation No. 121 "On Federal State Program Support of Small Business in the Russian Federation in 2000–2001"; 2. Federal Law No. 128-FL "On Licensing of Certain Types of Activities"; 3. Federal Law No. 129-Fl "On State Registration of Legal Entities and Individual Entrepreneurs"; 4. Federal Law No. 94-FL "On Placing Orders for Supply of Goods, Works, Provision of Services for State and Municipal Needs"; 5. Federal Law No. 209-FL "On Development of Small and Medium-Sized Enterprises in the Russian Federation"; 6. Federal Law No. 223-FL "On Procurement of Goods, Works, Services by Certain Types of Legal Entities"; 7. Federal Law dated 05.07.2013 No. 44-FL "On Contract System in Procurement of Goods, Works, Services to Ensure State and Municipal Needs"; 8. Decree of the Government of the Russian Federation No. 98-r "On Approval of the Priority Action Plan to Ensure Sustainable Economic Development and Social Stability in 2015"; 9. Government Decree No. 265 "On Establishment of Income Limits for SMEs"; 10. Federal Law N 356-FL "On Amending Articles 251 and 252 of the Federal Law "On the Development of Small and Medium-Sized Enterprises in the Russian Federation"

Source: authors based on [13].

Legislation in this direction should be carried out as part of liberalization and amount of income tax payment, especially enterprises working in the innovation sphere, since there is the growth in production of value added in this sphere [3].

4   Discussion

To correctly determine the category of small businesses and analyze the regulation of their financing, it is necessary to have a correct understanding of the specific activity of the segment "Small business". There are a number of industry characteristics for enterprises in this market segment. In Table 2, we indicated the main industries in which small businesses operate.

Table 2. Classification of industries in the segment "Small business"

Industry	Description
Wholesale	- Inventories account for more than 15% of assets; - Significant (more than 15% of assets) volumes of receivables and payables; - Insignificant (less than 15% of assets) share of fixed assets
Retail	- Small proportion of fixed assets (mainly retail and office equipment); - Minimum amount of equity is possible; - Sufficiently high level of liquidity ratios; - Short financial cycle
Services	- Significant proportion of fixed assets through which enterprises operate; - High proportion of receivables and a small amount of accounts payable; - Minimum amount of equity is possible for enterprises in this industry

Source: authors.

Below we analyze the main trends in small business. Figure 1 shows the territorial structure of the number of small businesses in the Russian Federation [9].
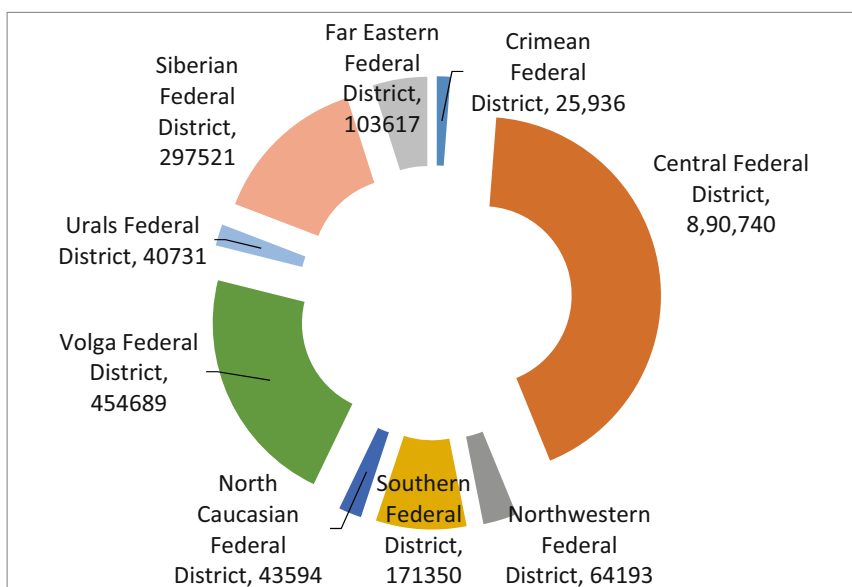
Fig. 1. The territorial structure of small businesses in the Russian Federation, units. (Source: authors)

The highest growth for the noted period is in the Urals Federal District (an increase of 9.7% or 13.9 small enterprises for every 100 thousand inhabitants), the Southern Federal District (an increase of 7.7% or 8.9 small enterprises for every 100 thousand inhabitants), the Central Federal District (an increase of 2.8% or 4.8 small enterprises for every 100 thousand inhabitants) [9].

We analyzed the relationship between the dynamics of institutional indicators prepared by the World Bank specialists and the dynamics of overdue debts of small businesses in the Russian economy that is a sign of the undeveloped system of financing enterprises in the segment we are considering. One of the indicators of the business environment development in the country's economy is the Doing Business Index. Its components are indicators "Time required to start a business" and "Percentage of contract execution" [7] (Fig. 2). We took the data for indicators from the World Bank DATA [11].
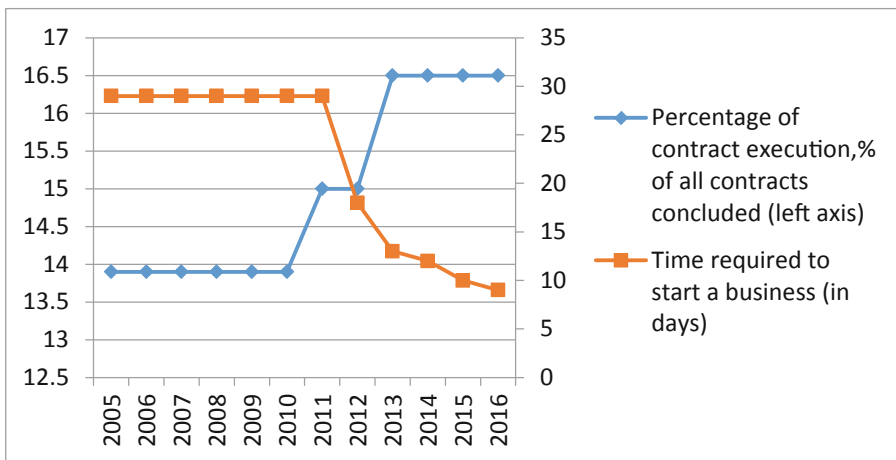
Fig. 2. Institutional indicators in the Russian Federation. (Source: authors)

According to the dynamics of these indicators, it has become easier to organize a business in the Russian economy since 2010. Business organization attracts external financing. However, the dynamics of overdue debt in the Russian economy shows us a negative trend (Fig. 3). «A significant moderator in the development of small businesses is the presence of corrupt patterns of interaction with government bodies. There is a so-called corruption risk» [8, p. 117].
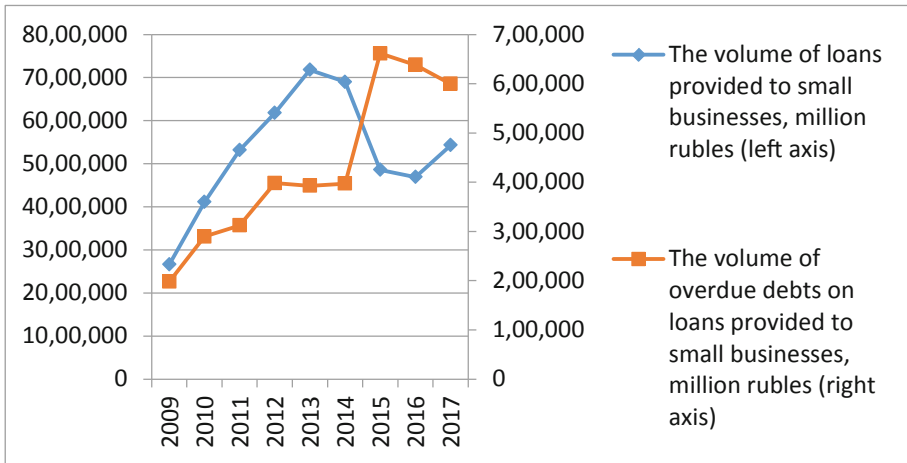
Fig. 3. Indicators of lending and overdue debt of small businesses. (Source: authors)

According to the results of eight months of 2016, the volume of loans provided to small and medium-sized businesses decreased by 11%, to 5.3 trillion rubles. More than half of enterprises (54.4%) had reduced financial stability, of which almost 10% - significantly. Thus, a graphical analysis of overdue loans for small businesses shows us that problems in the legislative environment aimed at regularly improving business conditions in the country affect the quality of loan debt of small businesses [6]. Support in the development and promotion of financing of small businesses is one of key factors in the formation and expansion of activities of small businesses. Among the types of assistance can be identified the creation of funds to support entrepreneurship, simplification of the tax base, the development of business training programs, financial support in the form of subsidies, loans [12].

5 Conclusion

To solve structural problems in the economy, especially the formation of a system for financing enterprises in the real sector, it is necessary to consider the structural features of our national economy, as well as internal and external challenges and restrictions in conducting monetary policy. At the same time, the role of mechanisms aimed at combining the efforts of the state and business in solving problems such as the use of public-private partnership tools in priority projects and programs for economic development [2] should increase. It is also important to maintain the stability of the economy and prevent the accumulation of imbalances in financial and real sectors, to exclude excessive growth in bank lending. Thus, state support of business, in all its forms, whether it is educational, consulting services or direct financial assistance, is the most important factor in the formation of entrepreneurship in the country.

References

1. Berezina, E.: TOP-6 laws that will change the life of business in 2018. Russian Newspaper (2018). https://rg.ru/2018/01/03/top-6-zakonov-kotorye-izmeniat-zhizn-biznesa-v-2018-godu.html. Accessed 01 Feb 2020

2. Cole, A.R., Sokolyk, T.: Debt financing, survival, and growth of start-up firms. J. Corp. Financ. **50**, 609–625 (2018). https://doi.org/10.1016/j.jcorpfin.2017.10.013

3. Ding, S., Jia, C., Wu, Z., Yuan, W.: Limited attention by lenders and small business debt financing: Advertising as attention grabber. Int. Rev. Financ. Anal. **49**, 69–82 (2017). https://doi.org/10.1016/j.irfa.2016.12.003

4. Federal Law dated 26.01.1996 No. 14 "Civil Code of the Russian Federation (part two)" (1996). http://www.consultant.ru/document/cons_doc_LAW_9027/d73c103b664fa1b30b63f8fa944a2e0f33cd67f0/. Accessed 01 Feb 2020

5. Federal Law of July 24, 2007 No. 209-FL "On the Development of Small and Medium Enterprises in the Russian Federation" (2007). http://www.consultant.ru/document/cons_doc_LAW_52144/. Accessed 01 Feb 2020

6. Haaker, T., Bouwmann, H., Janssen, W., Reuver, M.: Business model stress testing: a practical approach to test the robustness of a business model. Futures **89**, 14–25 (2017). https://doi.org/10.1016/j.futures.2017.04.003

7. Jindal, V., Seth, R.: A new order of financing investments: evidence from acquisitions by India's listed firms. J. Corp. Financ. **58**, 307–328 (2019). https://doi.org/10.1016/j.jcorpfin.2019.04.007

8. Makhmudov, T., Konovalova, M., Kuzmina, O., Persteneva, N.: The impact of the institutional environment on the shadow economy. Acta Oeconomica **68**(1), 115–133 (2018). https://doi.org/10.1556/032.2018.68.1.6

9. Mikhailov, A.M., Petrov, N.A., Nedorezova, E.S., Belyakova, O.V.: Influence of factors of production interaction on processes of world economy globalisation. In: Mantulenko, V., (ed.) International Scientific Conference Global Challenges and Prospects of the Modern Economic Development. European Proceedings of Social and Behavioural Sciences, vol. 57, pp. 747–756. London: Future Academy (2019). https://doi.org/10.15405/epsbs.2019.03.74

10. The Order of the Government of the Russian Federation of June 2, 2016 No. 1083-r on the "Strategy for the development of small and medium-sized enterprises in the Russian Federation for the period until 2030, and the action plan ("road map") for its implementation" (2016). http://base.garant.ru/71418202/. Accessed 01 Feb 2020

11. The World Bank: Ease of doing business index (1 = most business-friendly regulations) – Russian Federation (2019). https://data.worldbank.org/indicator/IC.BUS.EASE.XQ?locations=RU. Accessed 01 Feb 2020

12. Troshani, I., Janssen, M., Lymer, A., Parker, D.L.: Digital transformation of business-to-government reporting: an institutional work perspective. Int. J. Account. Inf. Syst. **31**, 17–36 (2018). https://doi.org/10.1016/j.accinf.2018.09.002

13. Vershinina, A.P.: Development and improvement of regional policies to support small business. Internet J. Sci. of Sci. **7**(1), 2–15 (2015)

Innovations in Financial Sustainability Management of Public Health Care Organizations

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Abstract. Healthcare organizations operating under the program of state guarantees of free medical care in Russia are not financially stable because of underfunding. In this regard, the development of methods for analyzing the financial stability and break-even management is an urgent task of the theory and practice of financial management for medical organizations. The aim of the research is to develop new methodological approaches to financial management of public health organizations to ensure a balance between funding and costs. The work is based on the methodology of financial management, namely the concept of cash flow and the concept of alternative costs. The study showed that on average, the plan for the number of visits to clinics is not fulfilled by 4%, and for the amount of funding spent – by 7%. Financial performance and efficiency indicators are excluded from the planning, management, and analysis process. Based on the operational analysis, the authors obtained parameters for adjusting the structure of medical care, the volume of variable and fixed costs that can be implemented in the framework of strategic planning.

Keywords: Break-even · Cost management · Finance of medical organizations

1 Introduction

Permanent health care reform in the Russian Federation since the early 90's of the 20th century aims to provide the population with affordable medical care at the appropriate quality level that meets modern requirements through the effective use of targeted financial resources of the budget system. The most acute problems of the first years of market transformations were solved by creating a system of compulsory medical insurance (CMI). At the same time, difficulties remain in providing free medical care financially.

State medical organizations (MOs) are not able to provide the full amount of medical services ordered by the state every year, because their funding is not enough to fulfill the planned tasks. Modern problems of health care finances and medical organizations, in particular, are caused by the transition from financing in accordance with the approved cost estimates to paying for services at the expense of the CMI and subsidizing socially significant medical services ordered by the state. The declared advantages of such a system of financing were the provision of targeted and economical use of state financial resources. However, with a low share of value added in the gross domestic income of the Russian Federation, on which premiums for CMI and budget security depend, it has not been possible yet to realize these advantages. Thus, an urgent task of today is to organize an effective financial management mechanism in medical organizations (MOs), which would be integrated into the financial system of the industry as a whole and would increase their financial stability.

The purpose of this research is to develop new methodological approaches to financial management of public medical organizations to ensure a balance of funding and costs. In particular, it was assumed:

– to identify shortcomings of financial management practices in MOs,
– to formulate innovative methods for substantiating management decisions to ensure the financial stability of MOs,
– to quantify parameters of scenario conditions for achieving break-even of a multi-profile MO.

2 Methodology

In addition to general scientific methods of cognition, the authors based their research on the methodology of financial management, namely the concept of cash flow and the concept of alternative costs. These concepts imply to take into account in the financial management of the organization, on the one hand, estimates of positive and negative cash flows and its determinants, on the other hand, the analysis of alternative scenarios for a possible way of investing financial resources, determination of the cost structure and creation of a system of management accounting and control. In some scientific works, researchers justified the use of appropriate indicators of operational analysis in the construction of effective models of financial management in medicine, as well as the validity of the analysis of the MO's efficiency based on the definition of a financial risk zone and a financial security zone, focusing on the break-even point and solvency indicators [12].

In this research, the authors applied direct costing, break-even analysis (margin analysis) and operating analysis of indicators of economic-financial activities of MOs, which allowed us to determine compliance of available resources with volumes of medical care commissioned by the founder and to suggest ways to optimize the cash flows. The purpose of using these methods was to assess the optimal volume of medical services, their structure, volume of funding, variable and fixed costs to achieve break-even. Among the existing set of methods for calculating the break-even point, we selected the graphical method.

To calculate the level of conditional fixed costs, the following formula was used:

$$FCi = Qi * (Pi - SVCi) \tag{1}$$

where:

FCi – conditional fixed costs;
Qi – number of medical services (units);
Pi – price per unit of service;
SVCi – specific variable costs.

To calculate the correction coefficient for conditional fixed costs, the following formula was used:

$$K = 1 - D/FC \tag{2}$$

where K – reduction coefficient of conditional fixed costs; D – lack of funding.

The standard of variable costs per unit of medical services was calculated in the context of services types (ambulance services, polyclinic services, hospital services, day hospital services) in accordance with the cost structure provided in the tariff agreement for compulsory medical insurance, using the formula:

$$nSVCi = \sum_{i=1,n}^{j=1,m} Fi * dj/Qi \tag{3}$$

where:

Fi – the volume of funding for the i-th service,
dj – the stipulated share of j-th expenses

3   Results

The lack of a positive effect of optimizing healthcare is largely because of its under-funding over the past three decades. Estimates of government spending on medical care as a percentage of the gross domestic income (GDI) published in open sources range from 3% to 6% and, in our opinion, are not correct enough. According to our estimates, at the beginning of market reforms, this indicator was at the level of 2% of the GDI, by the end of the 90 s – it increased to 3% and remained at this level until the early 2000s [9]. Then the growth rate in budget spending on health care slowed down. According to the Accounting Chamber of the Russian Federation, in 2018, the indicator was 2.6% of the GDI (about 2.6 trillion rubles). The implementation of budget expenditures on medicine in 2019 was approximately at the same level – 2.7% of the GDI. The budgets for 2020 were adopted taking into account the growth of medical expenses up to 3% of the GDI. The state program for the development of healthcare in Russia, adopted in 2014, intended to bring state funding for healthcare (including CMI, the share of which accounts for about 40%) to 11% of the GDI by 2020, was not fulfilled. Based on information published by the World Health Organization (WHO) in the global health

expenditure database, we have obtained the following comparative estimates: as a percentage of the national income, Russia spends 7 times less on medicine than in the United States, 4 times less than in France and Norway, and 3 times less than in Israel and Estonia. In terms of health care expenditures in US dollars per capita in 2016, Russian indicators were 19, 9, 16, 6, and 2 times less, respectively [11].

External financial conditions make MOs to pay special attention to the development of a mechanism for operational and strategic management of financial resources aimed at maintaining the necessary level of financial stability and break-even. Modern rules for financing the activities of MOs in accordance with the state task do not imply its correlation with the provided quantitative indicators of their activity. The planned task reflects the number of medical services, as well as the maximum amount of funding, which is determined based on low (compared to the objective need) standards of costs per unit of service. The corresponding share of planned financial resources is transferred to MOs on a quarterly basis. Payment for services as they are rendered is not provided. Ensuring that actual costs correspond to the amount of funding within the year is not provided for in the planning task. This approach can be considered as a reduced version of estimated funding.

In the course of performing a planned task, the medical organization may exceed or under-perform planned indicators of the provision of medical services. This will not affect the amount of government funding. The study showed that on average, the plan for the number of visits to clinics is not fulfilled by 4%, and the amount of funding disbursed by 7%. Financial performance and efficiency indicators are excluded from the planning, management, and analysis process. The financial result of a medical organization is not taken into account when planning the volume of services, does not appear as an indicator when forming the cost of services, and is not displayed in the organization's annual reports.

When developing the financial management system of a medical organization, a number of factors determined by the legislation and external economic conditions should be taken into account, namely:

– single-channel principle of financing within the CMI,
– subsidizing medical services provided by the order of state authorities,
– embedding MO's finances in the budget process,
– specific features of financial relations with subjects (participants) of the CMI,
– the state regulation of business activity of MOs,
– ensuring the financial sustainability of the medical organization in conditions of insufficient funding,
– the need to ensure social effectiveness, financial efficiency of the MO and compliance with the legislation.

The analysis of the financial management system of a multi-disciplinary MO serving a large administrative-territorial entity of the Samara region revealed shortcomings inherent in the current management practice:

1. The MO does not independently plan indicators of the volume and structure of medical care. It is satisfied with the indicators provided by the regional commission for the development of the program of state guarantees, in terms of CMI services,

and the indicators provided by the regional Ministry of Health in terms of socially significant and high-tech services. Thus, the planned performance indicators are not linked to the financial condition of the MO, including break-even.

2. Financial analysis, practiced by the MO, does not involve comparing the timing and volume of inflows (payment for medical services by patients, payment by insurance medical organizations for CMI services, budget financing, payment for services by insurance companies for the voluntary medical insurance VMI) and outflows (payment of wages, taxes, payment for contractors' services) of funds. There is no necessary management accounting for this purpose.

3. The organization of operational management of financial and economic activity of the MO is characterized by insufficient control over compliance of the actual volume of medical care to planned indicators, which could lead to the failure of the approved planned task. This, in turn, may lead to non-receipt of planned revenues from the CMI.

4. The current financial management procedure does not imply the development of leverages that would ensure break-even or profitability of the MO's activities in the current and strategic period. In particular, the profitability of a type of medical care or service, as well as the structural division or the MO as a whole, is not evaluated.

5. Reporting is limited to three areas: the number of medical services provided at the expense of the CMI and budget subsidies, accounting reports, and compliance of the quality of services provided with established indicators.

Developments carried out in the course of this research are an attempt to overcome the above-mentioned shortcomings by integrating into the existing management system tools that can be considered as innovative for the Russian medical organizations. The development of methodological recommendations for using the capabilities of operational analysis and economic justification of management decisions was carried out on the basis of data from a multidisciplinary MO for three years. Financial flows in connection with the provision of medical services under the CMI were analyzed.

The CMI rules are so that the MO cannot set prices for medical services in the framework of the program of state guarantees or change them. However, there is a legitimate opportunity to manipulate the cost of providing services in the context of types of medical care if the planned volume of services is met.

To enable the use of operational analysis tools, it is necessary to develop an internal cost accounting system that allows you to assess the cost volume in the context of assistance types or structural divisions of the MO. In addition, for each direction, the division of costs into variables and constants is mandatory.

For the research purpose, the variables included the cost of medicines and other medical expendable materials, the cost of feeding patients in hospitals, and the cost of fuel and lubricants for emergency medical stations. Analysis of the structure of actual costs for providing medical services of the CMI allowed us to draw the following conclusions:

– the share of variable expenses in the structure of actual expenses is generally 12% of the CMI,
– the share of variable costs in the context of types of medical care is significantly differentiated (from 4% in polyclinics to 25% in day hospitals).

Depending on the specific weight of variable costs in the cost of the corresponding assistance type, the break-even point will be more or less sensitive to them. Accordingly, it is possible to ensure the break-even of a multidisciplinary MO by manipulating not only the cost structure, but also the structure of types of medical care provided.

An analysis of existing cost accounting practices shows that material costs are attributed to a division that is randomly selected for this purpose. Expenses are charged directly to the services of a polyclinic, hospital, day hospital, or ambulance only if this is explicitly defined in the regulatory documents. Accrual and accounting of expenses for wages and social insurance contributions in accordance with the directive automated system occurs on the whole for the entire MO. Such databases are useless for cost and break-even management purposes.

We offer two solutions to the problem:

- to reflect the corresponding principle in the accounting policy and keep records of all costs in the context of constant and variable types of medical care,
- variable costs are accounted by types of medical care, and fixed costs are attributed to conditional divisions, so that they are distributed in proportion to variable costs or the number of staff when analyzing the implementation of the plan for expenses, break-even, etc.

In the process of break-even analysis, which usually involves determining the sales volume that covers the variable and fixed costs, a definition of such a cost structure (and corresponding amount) is required which would, on the one hand, allow to provide the volume of services ordered by the state, on the other, ensure the equality of costs and public funding at the expense of CMI means. Calculations of the necessary initial data and the break-even point of the MO are carried out in accordance with the authors' methodological approach.

The break-even point was estimated using the following three scenario conditions:

1. Provision of a planned volume of medical services at the expense of planned financing while maintaining the amount of costs and their structure at the level of the base year.
2. Provision of a planned volume of medical services at the expense of planned financing, while maintaining the basic fixed costs and bringing variable costs to the standard level.
3. Provision of a planned volume of medical services at the expense of planned financing when bringing variable costs to standard ones and reducing fixed costs to the optimal level (expert assessment).

The first scenario option showed that the break-even point will be reached at the volume of 101353 bed days (with the planned value of 90553 bed days). The amount of financing should be 196,746 thousand rubles, with the planned volume of 175781 thousand rubles within the framework of the program of state guarantees, i.e. increased by 12%.

Scenario parameters of the second option ensure that the break-even point is reached with the volume of services of 106,153 bed days. The amount of financing, respectively, should be equal to 2,064 thousand rubles, i.e. it should be increased by 17% in comparison with the planned task for the program of state guarantees.

Below there is a graph illustrating the third scenario option for achieving a break-even for the MO, when providing medical care in hospital conditions (Fig. 1).
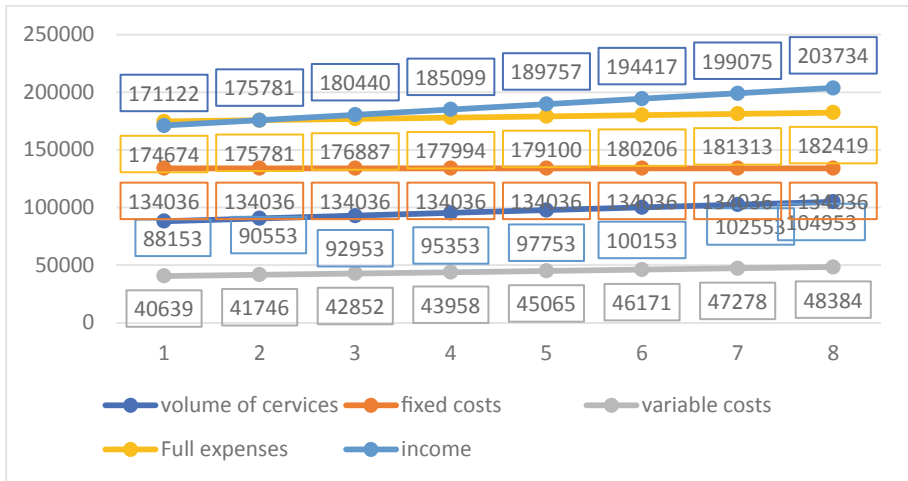
Fig. 1. Analysis of break-even of inpatient care when bringing variable costs up to standard ones and reducing fixed costs to the optimal level. (Source: authors)

According to the third option, the break-even point should be reached if both the variable cost standards and the planned volume of services and financing are met, as a result of a reduction in fixed costs from 155269 thousand rubles to 134036 thousand rubles, i.e. by 14%. Thus, the balance of financial resources and costs in the provision of inpatient medical care in modern conditions of financial security is possible when optimizing fixed costs, consisting mainly of labor and social insurance costs, as well as utility costs. The preferred option, in our opinion, is to increase the state order for medical services (according to our estimates by 17%) while maintaining the number of staff and other factors that affect fixed costs. However, in conditions of insufficient funding, management may choose the latter option.

4   Discussion

The problems considered in this study are widely presented in scientific publications. The variety of interpretations and methods used does not negate the common position of economists, which is to recognize the importance of managing finances of public health organizations in order to ensure, at least, a balance of income and expenses, including on the basis of models and methods originally intended for business. The objective background of this consensus, in our opinion, is the widespread rise in the cost of medical services, which is increasingly difficult for national health insurance systems and budget systems to cope with. Let's focus on the points of view that are closest to us on the issues under study.

The Russian authors draw attention to the need to modernize mechanisms for the formation and use of financial resources of medical organizations that provide socially important medical services and services for CMI. Options for the economic justification of quantitative parameters that determine the financial mechanism in the primary health care outpatient level are proposed. The relevant indicators (funding standards and prices for medical services set by the state, payment rates for contractors, insurance premiums) are the most mobile part of the management system and should be modified depending on external economic conditions, social priorities, etc. The authors draw attention to the need to regulate the process of redistribution of financial resources between the structural divisions of clinics in order to provide financial support for expenses and organize the financial control [7].

A significantly higher level of healthcare financing in the economically developed countries of Europe does not reduce the relevance of the discussion on improving the source structure of financial resources in the industry and the efficiency of their use. In the Netherlands, for the past ten years, the cost of capital construction and technical re-equipment has been funded by insurance premiums but from the mandatory medical insurance system. The analysis of this relatively new economic practice in terms of its efficiency and future prospects is the focus of attention of our Dutch colleagues [6].

Russian scientists pay much attention to issues of financial control in medical organizations, which is particularly relevant in the context of a shortage of financial resources. Attention is drawn to the lack of a unified approach (methods of federal or regional agencies) to the organization of control over the use of both state financial resources and entrepreneurial income. The generally accepted system of budget accounting and commercial accounting does not allow tracking the direction of using funds of MOs. The existing system of financial accounting and reporting does not allow us to quickly assess the implementation degree of the planned activity parameters. Options for improving the financial management tools of medical organizations, including their internal control, are proposed based on the creation of a management accounting system [8].

In a number of works, it is proposed to analyze the economic efficiency of the MO, determining the risk zone, the financial security zone and its actual financial position on the basis of quantitative parameters, and make management decisions based on these conclusions. Parameter estimation is implemented using operational analysis techniques. It is recommended that zones are characterized by break-even indicators, as well as by indicators of solvency and economic potential. It is assumed that financial management organized in this way will contribute to the achievement of strategic goals, namely, economic efficiency and social performance of operating activities [1].

Risk assessment in healthcare organizations is a popular issue. In particular, it is proposed to use a balance mathematical model for managing economic risks in municipal health organizations that provide emergency care. The model has a modification for organizations that carry out business activities. Its use allows you to forecast basic financial indicators. The ease of implementation of the methodology is emphasized. The basis of predictive estimates is the average values of accounting data for a number of reporting periods [5].

Italian colleagues are investigating the revenue management process in public health trusts. The directive condition for functioning of the latter is balancing of incomes and expenses. The studied state medical organizations in some cases showed insignificant losses in reporting, without any distortion of accounting data on income. It was also noted that trusts allow manipulations of certain types of expenses in order to prevent a positive financial result. It is emphasized that state incentives to achieve a budget balance in healthcare can lead to a decrease in the quality of medical services [3].

Some researchers note that in the newly liberated states of Eastern Europe, in most of the observed cases, cost accounting and analysis is carried out for the entire medical organization. The distribution of costs by type of medical care or by completed cases in public health institutions is not common. It is noted that the application of managerial cost accounting would increase the added value in this sector of social services. This conclusion is similar to the one we obtained in the course of a study of medical organizations in the Russian Federation [4].

Published research works show that one of the weak elements of the management system is planning costs and prices for paid medical services. A variant of the operational accounting development and cost analysis is proposed, which will improve pricing and competitiveness of a MO, on the one hand, and increase its financial stability, on the other [10]. Brazilian scientists are also concerned about the problems of risk management in healthcare organizations. They note that healthcare is a complex subject from the point of view of financial management. In this regard, it is insufficiently studied, and the risk assessment methods used are not without disadvantages. One of the reasons for this state of affairs is the lack of sufficient transparency of financial activities of medical organizations. The possibility of using the ERM model, which assumes an assessment of the riskiness of cash flows and variability of costs, is justified. All MOs that tested this risk assessment model recognized the effectiveness of using the information obtained from it to justify management decisions [2].

5   Conclusion

In a standard situation, an organization should increase sales or reduce expenses in order to ensure its break-even. Subsidizing the state order of medical services and funding from the CMI are in short supply. In most cases, MOs follow the first path and increase the volume of services paid by patients within the framework of permitted entrepreneurial activities. But here they face restrictions related to both the population's ability to pay for them and the own "production capacity."

In a situation where it is impossible to influence the incoming financial resources, as it is the case in healthcare organizations, the structure of services and optimization of expenditures become the leverages of the financial stability regulation. The most difficult task is to determine specific optimization parameters that would not lead to a decrease in the quality of medical care. Operational analysis, including the determination of the profitability threshold, can become a methodological tool for justifying the relevant management decisions.

The parameters for adjusting the structure of medical care, the volume of variable and fixed costs obtained on the basis of operational analysis can be implemented within the framework of strategic planning for at least three years. In this regard, financial management can only be used as an element of the MO's general strategic management system. The financial strategy should take into account what changes are expected in the profile of the MO and its organizational structure, personnel composition, volume of services by assistance types, etc. Financial strategy should be based on the following indicators for the whole MO in the context of the structural divisions specializing in the provision of a particular type of medical care: scope of services, fixed costs, the ratio of specific variable costs, prices for services, the amount of state subsidy, funding of the CMI, the financial result.

References

1. Efremova, Yu.S.: Application of strategic management tools in healthcare. Humanit. Res. **1** (65). http://human.snauka.ru/2017/01/18947. Accessed 29 Mar 2020 (2017)
2. Etges, A.P.B.S., de Souza, J.S., Neto, F.J.K., Felix, E.A.: A proposed enterprise risk management model for health organizations. J. Risk Res. **22**(4), 513–531 (2016)
3. Ibrahim, S., Noikokyris, E., Fabiano, G., Favato, G.: Manipulation of profits in Italian publicly-funded healthcare trusts. Public Money Manage. **39**(6), 428–435 (2019)
4. Jovanović, T., Dražić-Lutilsky, I., Vašiček, D.: Implementation of cost accounting as the economic pillar of management accounting systems in public hospitals – the case of Slovenia and Croatia. Ekonomska Istraživanja **32**(1), 3754–3772 (2019)
5. Kraftová, I., Kašparová, L.: Assessment of the financial health of regional emergency medical services in the Czech Republic using the BAMF model. J. Bus. Econ. Manage **18** (2), 340–353 (2015)
6. Kroneman, M., Boerma, W., van den Berg, M., Groenewegen, P., de Jong, J., van Ginneken, E.: Netherlands: health system review. Health Syst. Trans. **18**(2), 1–24 (2016)
7. Razumovskaya, E.A., Lugovtsov, R.Yu., Kozlov, A.V., Fomenko, V.V.: Economic justification for the need to reallocate financial obligations in healthcare. Bull. VSGUTU **2**, 70–76 (2016)
8. Vakhrushina, M.A.: Management accounting of medical (municipal) institutions: perspective or reality? Account. Budgetary Non-Profit Organ. **6**, 17–29 (2016)
9. Valieva, E.N.: The structure and features of the financial mechanism of Russian non-profit organizations that provide public services. Bull. Samara State Univ. Econ. **10**(120), 59–64 (2014)
10. Voronina, L.P.: Financial management of healthcare institutions. Municipality Econ. Manage. **3**(58), 57–67 (2019)
11. World Health Organization: Global health expenditure database. http://apps.who.int/nha/database. Accessed 29 Mar 2020 (2017)
12. Yashina, N.I., Yashin, K.S., Artamonycheva, E.V.: Problems and approaches to assessing the financial condition of medical institutions to determine the types of organizations. Econ. Anal. Theory Pract. **37**, 44–57 (2014)

State Support as Incentive for Developing Enterprises and Increasing Competitiveness

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Abstract. The study represents the features of state support for enterprises in the state control system of the agricultural sector. The importance of support is associated with the need of enterprises for supportive and stimulating development mechanisms that meet the effective functioning of the economy. The authors analyze the mechanism of state support, focus on the goals of support, internal and external factors of support, and methods of influence on factors. Analyzing the practice of subsidizing, the authors reveal the features of using this form in technological, investment, and marketing processes of products. In conclusion, approaches to assess the relevance and effectiveness of various forms of state support for enterprises are summarized. The authors conclude that at the current level of the agro-industrial complex, support types aimed at increasing the purchasing power of farmers by investing in production of high value-added products using competitive technologies and long-term strengthening of their positions in dynamically changing global markets are becoming relevant.

Keywords: Compensation · Export · Insurance · Investment · Public procurement · Stimulation

1 Introduction

State support is of great importance for agricultural enterprises growing plants and animals in difficult climatic conditions. Natural disasters can provoke the complete death of crops and animals, and the authors examined the state's willingness to support farmers in such situations. In 2019, 303 billion rubles were allocated to support agriculture and it was up by 62 billion rubles in funding in 2018. The agro-industrial complex is evolving, so the state supports for the competitiveness of products and enterprises, develops an efficiently functioning market, creates a favorable investment climate and investment growth, maintaining parity of price indices for agricultural and industrial products, which are also reflected in government support policies through a wide range of ongoing programs.

Klimenko and Minchenko analyze approaches to optimize state control, considering market shortcomings and possibilities for improving it, and conclude that the opposition of state control to market control is unjustified [6]. Lenchuk notes that public policy should ensure the formation of harmonious proportions in the economy through the development and implementation of a set of state control measures at the macro, meso and micro levels [7]. A few authors consider state support measures as a tool for the development of small and medium-sized businesses [4]. The purpose of this study is to analyze the mechanisms of assistance to the agro-industrial complex and identify the causes that affect the demand for individual support measures. Many of the applied measures to support agricultural enterprises remained behind the analysis, which represents an independent research topic.

2 Methodology

A way to organize this study is to consider state support as a system which is to create favorable conditions for the development of the agricultural sector. The authors revealed the elemental structure of the state support system, its internal organization, determine qualitative properties that ensure its integrity and peculiarity, determine external relations of state support with other systems. Historical consideration made it possible to find out the conditions for the emergence of state support, the stages passed, the current state, as well as possible development prospects.

3 Results

3.1 Support for the Cultivation of Crop and Livestock Products Under Unsustainable Agriculture

The production process in agriculture has its own characteristics associated with the fact that biological processes, the prevailing weather and climate conditions, especially during the growing season, often influence the value of the produced products, affect the quality, and make it impossible to produce the planned volume products and, as a result, get the necessary profit.

Compensatory support is provided for a range of agrotechnological work in crop production, support for dairy farming, livestock breeding, elite seed farming, meat livestock farming, the development of traditional crop and livestock farming subsectors, and insurance premiums.

Analyzing regional requirements, we can conclude that subsidies allocated are not determined from the actual costs incurred by the farmer, but they are set at the rates – per 1 hectare of sown area, per 1 hectare of low-productivity arable land, per 1 kilogram of milk, per 1 head of farm animal, per 1 ton of farm animal weight. The approach of the lower border is applied - the required livestock is established, the productivity of animals is achieved by the farmer at which subsidies will be allocated to him. Restrictions on the lower limit of purchase (at least 100 heads) of pedigree cattle are allowed. The amount of the annual rate is limited, they can split the annual rate by quarters. Information on regional subsidies is available on the Internet.

The mechanism of any control system should contain a motivational part. The increasing coefficient is introduced when the yield exceeds the average for the area. In regions, the task is to put into circulation unused land, including irrigated land, here farmers can compensate up to 80% of the costs incurred. Regarding elite seed production, the acquisition of seeds of the first reproduction, elite, superelite (depending on what has been achieved in the regions) is motivated, regional authorities apply demotivation, which reduces the coefficient if elite seeds are acquired outside the region.

The amount of support is formed based on the share of each region in the total value of indicators for the country, while if support is distributed among several indicators, a significance coefficient is established for each indicator. The stimulating approach involves supporting accelerated development, some sectors need to be given an impetus for development, while for other sectors, support is directed to strengthen their activities.

In accordance with the Budget Code of the Russian Federation [10], the State Program for the Development of Agriculture and Control of Agricultural Products, Raw Materials and Food Markets [9], priority sub-sectors of the agro-industrial complex are defined: production of grain and leguminous plants, oilseeds, open-ground vegetables, viticulture, fruit and berry plantations, stimulation of production of flax, milk, development of specialized meat cattle breeding, development of sheep husbandry – the financing of priority sectors is provided with state support.

In the regions of Russia, state control is being developed and it explains the procedure for providing incentive subsidies to farmers to help achieve the goals of regional programs for the development of agriculture and control of agricultural products, raw materials and food markets. In breakthrough areas, indicators and enterprises that will ensure this growth to regions until 2024 have been identified. A stimulating subsidy is provided based on the share of each region in the total value of indicators for the country. In the calculation of the incentive subsidy, significance factors are applied both for each priority sub-sector of the agro-industrial complex and for each of indicators involved in the calculation.

Farmers can receive short-term loans at a preferential rate for Russia of no more than 5% on working capital: the purchase of fuels and lubricants, chemical and biological plant protection products, fertilizers, seeds, payment for the repair of agricultural machinery and equipment. Soft working loans cover 70% of the need for financing the sowing campaign. Soft loans are provided for the purchase of young farm animals, fish stock, and for the payment of insurance premiums. At the same time, subsidization of soft short-term loans is increasing from year to year and the list of industries that can receive soft loans is expanding, now the state is ready to assist processing enterprises that have not been practiced before, now they are supporting those processing industries that are nearby and will cause agricultural growth.

3.2   Stimulating Modernization and Innovation

A measure of support for investment projects is the reimbursement of 10–25% of the direct costs incurred, such as monetary costs of agricultural producers to create and modernize facilities equal to the actual value of the facility. It is considered one of the

well-proven measures that really affect the development of agriculture, contributes to the influx of new investors in the industry since it significantly reduces the payback period of projects and improves the attractiveness of certain areas [8]. It is especially evident in the example of the greenhouse industry, where, many projects were supported and implemented, and the saturation of the market was achieved.

Assistance is currently being given to investment projects aimed at construction and modernization of storage facilities, dairy complexes, sheep breeding complexes, breeding centers, flax processing, production of dry dairy products for baby food, which indicates the coordination of the state support program, the agricultural development program, and the scientific and technical agricultural development program.

The state gives signals which projects can count on winning the competitive selection: modern technologies, high-performance jobs that provide yield growth in crop production and productivity and livestock. At the design stage of the facility, the total amount of financing, the estimated amount of state support, the financial results of the project, the budget effect, and the payback period are determined.

For projects of dairy farms, investment support will be provided if modernization of both equipment for animal husbandry systems and equipment for feed production and manure removal is provided. Seed centers are supported if elite and superelite seeds are grown. To receive support, projects of dry infant formula of baby food need to be provided with their own raw materials by 70%–90%.

Support will be given to storages with a one-time storage capacity of at least 30,000 tons of agricultural products, and the state indicates what storage it needs: meat and meat products, milk and dairy products, fruits and berries, vegetables and food melons, potatoes, fish and fish products. These should be premises with controlled temperature conditions, the availability of equipment for sorting, calibration, washing, packaging, part-time work, freezing, re-freezing, ripening, the presence of a veterinary and phytosanitary control point, and an automated information management system.

Another very important and successful measure of support is soft investment lending. Like any borrower, farmers have important goals for which they can take a soft loan, the terms of the loan, the opportunity to prolong it. Regions distribute soft loans based on priority areas and can set a limit for one borrower on the territory of the subject. The priorities of regions are also small business forms. There are new opportunities for soft loans for construction of complexes for growing berry and mushroom products. As for individual equipment, the range of support is expanding, for example, to expensive milking installations, highly specialized agricultural machinery. The provision of credit funds for reconstruction and modernization of oil and fat industry enterprises is expanding, they began to expand access to soft loans for flour mills and bakeries, and facilities and equipment for the development of fish farming were added to the list of targeted areas for soft loans, which will enable aquaculture to develop.

Soft investment loans are granted for a period of 2–5 years – to purchase agricultural machinery and equipment for animal husbandry, for a period of 2–8 years to construct vegetable stores, to create facilities for deep processing of products, to construct livestock and reconstruct poultry farms, for up to 15 years – to purchase cattle breeding products, to construct breeding and genetic centers. Farmers faced the need to increase the terms of soft loans to construct slaughter shops from 8 to 12 years, as profitability in the meat industry began to decline.

The issue of subsidizing engineering plants remains debatable. Subsidies reimbursed the manufacturer from 15 to 30% of the price of agricultural machinery sold to agricultural enterprises or leasing companies, the manufacturer of agricultural machinery must be a tax resident of Russia, carry out the established mandatory list of technological operations in Russia, have service organizations to maintain and repair agricultural machinery. Such support gave stability to machine builders and the opportunity to buy agricultural equipment cheaper for farmers.

The support mechanism accepts a new vector and is replaced by a leasing scheme. The state believes that, firstly, under the new conditions, small farms will be able to renew the equipment fleet, earlier they could not do it even with a discount. Secondly, the new mechanism allows farmers not to withdraw funds from circulation, but to direct them to further business development, which makes it possible to update more equipment at equal costs. Thirdly, the state is more likely to stimulate solvent demand of farmers, rather than directly subsidize the engineering industry.

3.3   State Insurance Support

In world practice, Multi-Risk Crop Insurance or Index-Based Crop Insurance is used. Index-based insurance based on easily observable external phenomena is advertised as an inexpensive insurance product [5]. In Russia, traditional insurance products are common. The insurance theory has always considered the mandatory form of insurance as a tool to achieve certain state goals in economic policy. The purpose of state insurance support is to protect property interests of agricultural producers from possible damage associated with natural climatic factors. Under state insurance, all crops in crop production, all livestock of animals (from a certain age) are insured.

The insurance period is one year. Insurance risks are natural disasters and contagious diseases. High insurance rates force the government to provide state support by reimbursing 50% of the insurance premium under the concluded agricultural insurance contracts with state support. The state subsidy for insurance premiums is needed to stimulate the participation of farmers and to prevent insurance failures from entering the market [11].

Considering the state support measure at this stage remains not very popular among farmers. Historically, the legislative base of the state insurance support system has been improved in stages, but after next innovations, insurance did not become in demand, and even despite growth expectations, reduction indicators were recorded.

Low demand indicates the imperfection of insurance mechanisms:

– high cost of insurance policy,
– flexible line of insurance products,
– insurance subsidies were the unprotected budget item, as a result of which they were redistributed to other purposes,
– in case of emergency, support is also provided to uninsured enterprises, which reduces the interest in insurance,
– funds are not allocated within the period specified by the contract.

To solve this problem, the state shows a flexible policy as well as coercion. Motivation is through optimization of insurance objects and optimization of insurance risks. Historically, only crop production was insured, then livestock and aquaculture were introduced into insurance objects.

The Ministry of Agriculture is optimizing the list of insured natural phenomena, according to statistics, the main risk for crops is phenomena associated with a lack of moisture, drought, and dry wind [1]. Due to the geographical extent of Russia, these risks are not the main ones for some territories. Here the crop dies from prolonged rains during harvesting, freezing of the upper soil layer and early snow cover.

Compensation for animal insurance accounts for the damage caused by contagious diseases. If damage was previously compensated for distemper, now the insurance system has been amended and farmers will be able to receive insurance compensation for forced slaughter of livestock during an outbreak of the disease. The violation of electricity, heat, water supply because of natural hazards and natural disasters were included in risks, which is important for a business specializing in growing products in sheltered soil, on reclaimed land, for pig and poultry complexes.

Following the principle of openness of insurance, the Ministry of Agriculture of the country annually develops, approves and places a property insurance plan by regions, groups and types of crops, by types, sex and age composition of farm animals, species and age composition in the Internet [1]. The basic marginal insurance rates are differentiated for each region, for each risk group considering the participation of the insurant (franchise). The flexibility of insurance with state support gave legal opportunity to sign the agreement to one or more risks, more specific to the region and thereby reduce the overall cost of insurance protection.

Before, farmers could receive insurance compensation only if they lost more than 20% of the planned crop, now this threshold has been canceled. However, a mandatory unconditional deductible has been introduced, the minimum amount of which cannot be less than 10% of the sum insured. This will allow for insurance compensation payments of minimum loss of crops. In 2018, only 16% of livestock and 1.5% of the sown area were insured with state support in Russia.

3.4   State Support for Price Stabilization

The maximum level of minimum grain prices for purchasing interventions is a regulator of falling market prices and protects the interests of producers. The maximum level of maximum grain prices for commodity interventions is a regulator of the growth of market prices and protects the interests of processing enterprises. The marginal tariff for storage and insurance is a cost regulator and protects the interests of the budget.

Public procurement interventions are carried out with a strong reduction in the market for product prices. Thanks to this program, farmers do not need a loan and interest payments. The access of small enterprises to public procurement will solve other problems, such as employment, the growth of tax revenues from small businesses in the budget system and will also increase competition [4]. Commodity interventions are conducted when prices rise above the maximum estimated prices through the sale of purchased agricultural products.

The public procurement mechanism has a buyback instrument, farmers who previously sold grain to the state can return it, i.e. purchase it from the state fund at the purchase price, having paid the costs of insurance, storage and paying taxes. Then farmers can sell the grain on the free market, and the state can get rid of the costs of storing and earning grain.

The mechanism of interventions has been determined, which provides farmers with participation in this procedure, as well as control and compliance with the rules. An important indicator is the target volume of the intervention fund, which provides an opportunity to quickly carry out commodity interventions in the future. The following methods and rules are developed:

– methods for calculating the limit levels of minimum and maximum prices;
– methods for calculating the maximum size of fees for services for the storage of purchased products;
– rules for competitive selection of insurers participating in public procurement;
– rules for competitive selection of custodians of reserves of the intervention fund – other documents.

Agent – an enterprise that organizes storage and insurance of reserves of the intervention fund, servicing loans taken by the agent to form reserves of the intervention fund. Public spending on interventions:

– purchase of products from agricultural producers and processing organizations is carried out through loans from authorized banks;
– agent remuneration expenses;
– elevator storage costs;
– stock insurance costs;
– in case of sale at a price lower than the purchase price, the losses are repaid from the funds provided for in the federal budget for financial support of measures in conducting public procurement interventions.

Revenue received by the state from the sale of inventories at high prices is allocated to the federal budget. Many national governments are faced with the need to regulate the industry market, firstly, due to overproduction or insufficient production of agricultural products, and secondly, under the influence of external factors - externalities. Externalities include geographic and demographic factors in Russia due to transport isolation, as well as limited domestic sales due to population outflows and low birth rates in the Asian part of the country.

The value of this type of state support is highly valued as it is the only type of support that directly affects the amount of revenue for grown products. Researchers are considering, along with traditional forms of public procurement, public-private partnerships [2]. Public procurement creates a guaranteed managed market for suppliers where market volumes are known in advance, sources of payment from the budget and a guaranteed level of purchase prices are provided. Optimistic estimates are now changing to realistic: if production and trade are guided by distorted prices and will not be effective, there are price risks for the state that make the realization of reserves acquired in previous years unprofitable; intervention purchases relieve regional authorities and farmers of responsibility for planning and maintaining the balance of production and consumption of agricultural products.

3.5   Support for Export of Products

A new paradigm in the state support system is support for export of products, giving export orientation to cultivation, storage, processing, logistics, creation of economic growth points in the agricultural sector. State approaches to this state support – today it is necessary to help remove trade barriers so that enterprises continue to increase the share of their presence in markets of respective countries.

The federal project "Export of Agricultural Products" was developed in two scenarios: inertial scenario (target export volume of 25 billion dollars), breakthrough scenario (increasing foreign deliveries of agricultural products to $ 45 billion in 2024) will require additional allocations from the federal budget [3].

Support for export:

– create a new commodity mass of agricultural products;
– create an export-oriented commodity distribution infrastructure;
– remove barriers;
– promote and position agricultural products.

The implementation of the federal project provides for a change in the structure of agricultural exports by increasing the supply of higher value-added products. The countries where Russian products will be in demand are identified – China, India, countries of Southeast Asia, Africa, and the Persian Gulf.

Export sums up all the finances that will be required for investments, including government subsidies. The amount of project financing is 696,092 million rubles, more than 53% is soft lending (including construction and modernization of seaports), the remaining 47% is in other areas of support, such as additional capitalization of Rosselkhozbank JSC, reimbursement of part of costs of agricultural machinery, reimbursement of part of direct costs for construction and modernization of export-oriented objects, land reclamation, reimbursement of costs of renting warehouses in target countries, part of costs of transporting products.

The state of the transport infrastructure is a significant obstacle to the development of exports – insufficient throughput of transport routes, insufficient port and transshipment capacities, and uncompetitive logistics. Investments are needed to create transport corridors: railway, sea, automobile. Support is provided for investments in additional port transshipment facilities. The organization of regular route shipments is also in the field of state control.

Another filter of business access to the market is the approval of permits and certificates of veterinary state supervision, sanitary-and-hygienic (epidemiological) control. Permission has been obtained to subsidize certification of agricultural products, comprehensive measures in the field of veterinary and phytosanitary control, monitoring activities and ensuring epizootic safety. There is a wide range of subsidized activities for the creation and promotion of brands and regional sub-brands, the creation of a network of agricultural representatives abroad, the functioning of the Agroexport Center.

The enterprises of the southern agricultural regions do not experience problems with the transportation of goods to sea ports for transshipment of goods. Enterprises of the Siberian, Ural and Central regions record high transport costs. The adoption of the breakthrough scenario caused an adjustment in the amount of compensation for part of costs of transporting products through the expansion of subsidies for export transportation. 50% of costs of exporters for transportation of products by rail (railway tariff + rolling stock rental + loading/unloading) are compensated.

Farmers showed a lack of competencies to promote the export of products, especially regional enterprises and small and medium-sized businesses. To acquire competencies, the government authorized costs of the export assistance program, these subsidies were collected for consultations on foreign economic activity in the target country, on local control and participation in tenders, costs of establishing contacts with foreign companies, and the organization of business meetings, negotiations, examination of foreign trade contracts. As part of the product promotion program, up to 90% of costs of assessing the conformity of products to the requirements of the external market are compensated; up to 50% of costs of R&D performed for these purposes are compensated; up to 80% of costs of congress and exhibition events are compensated to small and medium-sized enterprises; 100% of costs of business missions are compensated to all organizations. As part of solving the problem of lack of competencies, an educational online platform has been launched for small and medium-sized enterprises interested in export activities.

4   Discussion

1. State control currently has a twofold effect on the agro-industrial complex. This is manifested in the fact that, on the one hand, there is an annual increase in the amount of state support, on the other hand, these investments contribute to the development of a market mechanism and suggest a fading interest in separate measures of state support in the future.
2. The process of production in agriculture is taking place under conditions of uncertainty about biological processes, the prevailing weather and climate conditions, especially during the growing season of plant growth. The need for support is also generated by eternals, such as demographic processes, population outflow from agricultural production territories, and geographical factors of remoteness from seaports.
3. In connection with the achieved profitability and saturation of the market with products, some investment projects are withdrawn from state support. At the same time, support is given to wholesale distribution centers and projects that appeared in response to changing preferences in the nutrition of the population. The stimulation of agricultural engineering turned into stimulation of leasing, stimulation of greenhouses through subsidies went into stimulation through soft loans. The range of equipment subject to lending is expanding, credit extension is allowed, some of them are revised due to the deteriorating situation of the sub-sector.

4. The challenge was to determine the relevant insurance risks for farmers, ensure the variability of risks for regions, and determine the level of franchising. Optimization of the insurance system with state support required the formation of the insurance plan, flexibility in the selection of insurance risks, allowed farmers to reduce their own costs and provided access to insurance tools. The state makes it clear that it intends to shift many risks to farmers, as it is customary in world practice and the state is taking coercive measures to do it.
5. The most popular measure of state support is state procurement interventions and state trade interventions, a transparent market with known volumes, demanded types of products, guaranteed prices. Budget expenses are associated with costs of storage and insurance of grain, possible losses from the sale at prices below the purchase price.
6. Export-oriented state support with tasks of financial and non-financial assistance in creating transport corridors, modernizing the reclamation system, epizootic monitoring, umbrella brands, will require large amounts of state and municipal subsidies.

5   Conclusion

Russia's example shows that state support can be given a vector of compensation for losses and a vector of export promotion in developing sectors of the economy. Export facilitation will bring surplus crops to the foreign market, and not just to domestic intervention funds. The increase in the investment component in the long term will affect the pace of development and qualitative transformations of the agro-industrial complex.

The state believes that, under the new conditions, small farms will be able to renew the equipment fleet, earlier they could not do it even with a discount. The new mechanism allows farmers not to withdraw funds from circulation, but to direct them to further business development, which makes it possible to update more equipment at equal costs. The state is more likely to stimulate solvent demand of farmers, rather than directly subsidize the engineering industry.

References

1. Agricultural insurance plan for 2020. Approved by order of the Ministry of Agriculture of Russia N 667 dated December 2, 2019 (2019). https://www.garant.ru/products/ipo/prime/doc/73264647/. Accessed 20 Apr 2020
2. Buso, M., Marty, F., Tra Tran, P.: Public-private partnerships from budget constraints: looking for debt hiding? Int. J. Ind. Organ. 51(C), 56–84 (2016). https://doi.org/10.1016/j.ijindorg.2016.12.002
3. Federal project "Export of agricultural products" dated February 7, 2020 (2020). http://mcx.ru/upload/iblock/013/013f266cee8d39bce5ca867381ff0da1.pdf. Accessed 20 Apr 2020
4. Gafurova, G.T., Notfullina, G.N., Fukina, S.P.: Government procurement as a tool for the development of small and medium business in Russia. Econ. Region 12(4), 1233–1243 (2016). https://doi.org/10.15826/recon.2016.2.4.046

5. Jensen, N., Barret, C.: Agricultural index insurance for development. Appl. Econ. Perspectives Policy **39**(2), 199–219 (2017)
6. Klimenko, A., Minchenko, O.: State control of the economy: theory and best practices. Public Adm. Issues **3**, 7–30 (2016)
7. Lenchuk, E.B.: Formation of industrial policy of Russia in the context of the new industrialization. J. New Econ. Assoc. **3**(39), 138–145 (2018)
8. Razvadovskaya, Yu., Shevchenko, I., Grezina, M.: The role of the sectoral concentration, foreign investment and government support in the innovation strategy of the Russian enterprises of the ICT industry. Terra Econ. **13**(4), 65–82 (2015). https://doi.org/10.18522/2073-6606-2015-4-65-82
9. State Program for the Development of Agriculture and Control of Agricultural Products, Raw Materials and Food Markets N 717 dated July 14, 2012 (2012). https://base.garant.ru/70210644/. Accessed 20 Apr 2020
10. The Budget Code of the Russian Federation N 145-FL dated July 31, 1998 (1998). http://www.consultant.ru/document/cons_doc_LAW_19702/. Accessed 20 Apr 2020
11. Yanuarti, R., Aji, J.M.M., Rondhi, M.: Risk aversion level influence on farmer's decision to participate in crop insurance: a review. Agric. Econ. **65**, 481–489 (2019)

Program-Target Management of Russian Aircraft Industry Development

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Abstract. The purpose of this study is to manage national special-purpose programs distinguished by limited time frames for implementation and available resources. The authors consider the problem of program-target state financing of development programs for aircraft construction enterprises; the essence of program-target management at aircraft construction enterprises is to develop promising changes to be implemented in the form of a project with certain goals and a team, with certain resource and time costs. The current state of the Russian economy distinguished by no competitive management system at aircraft construction enterprises leads to dependence on imports, which significantly affects the country's security, therefore, it is necessary to evaluate the effectiveness of state financing of special purpose aircraft construction programs based on the calculation of investment project indicators. The efficiency of import substitution policy implementation and provision of national aircraft industry technological security is based on the appropriate physical infrastructure and organization of scientific sector activities in the aircraft industry.

Keywords: Aircraft construction · Innovative activities · Innovation project · Program-target state financing · Science · Technology

1 Introduction

The main method of managing programs with limited time frames and available resources is program-target management. Its object is a program, its intended purpose. The target program is a single set of scientific, economic, technical, organizational and production activities united by a general goal achieved under single management.

The essence of program-target management at aircraft construction enterprises is the functioning of promising changes in the form of a project with certain goals and a team, the implementation of which is associated with resource and time costs. A peculiar feature of program-target management is the unity and integrity of taken measures combined into an innovation cycle produced by a special team of performers and managers. It is important to introduce a set of estimated figures that are calculated with a high degree of accuracy and should be used to analyze enterprises' effectiveness [4]. The study of program-target management was carried out by many scientists [3, 7, 8, 12, 13].

Innovative aircraft construction projects are characterized by a significant degree of uncertainty and complex implementation associated with the management of a significant number of components in a dynamically changing external environment. When assessing the level of project complexity, it is required to highlight its main parameters: the time frame for implementation; final result; analysis of information; the degree of team interaction; business needs [6].

Elements of the target program are as follows: goals and objectives; the functional and management structure (scientific and research activities, work on the implementation and introduction of innovations); organizational structure (implementation mechanism, rights and responsibilities of the customer and contractors, the procedure of financing, etc.); resource justification and feasibility study of the program to be implemented.

The category "innovation project" in program-target management is defined as the process of innovation, which represents the implementation of scientific, production, technological, organizational, commercial and financial activities in a given sequence, as a result of which we obtain innovations; as a form of targeted management of innovative activity of a business entity, which is a system of measures interrelated and interdependent in terms of time, use of resources and performers to achieve goals in the areas of priority development of science and technology; as a set of organizational and planning, technical and financial documentation necessary to achieve the objectives of the draft documentation.

The prevailing feature of managing the aircraft industry is requirements for using a program-target approach having no alternative, which determines the use of certain tools, mechanisms and methods determined by the vector of increasing innovative activity of the entire complex of industry enterprises.

The development of innovative activity of aircraft construction enterprises within the framework of the existing strategy and special-purpose programs for the development of the aircraft industry has the following features:

1. It is necessary to rank and identify priority areas of R&D to increase aircraft industry efficiency.
2. The industry needs a unified strategy for R&D created and implemented in the form of special-purpose programs.
3. Special attention should be paid to projects, which implementation target is the development of competitive innovative technologies.
4. Organizational innovations in aircraft industrial production shall be carried out on the basis of modernization through the introduction of innovative technologies that increase efficiency and reduce costs for the introduction of innovative products, increase labor productivity using modern management technologies, information systems for quality and business processes management.
5. Expansion of inter-branch networking, relations with scientific organizations, universities and innovative organizations.
6. Creation of a new talent pool in the aviation industry.

In the circumstances concerned, today it is required to make the scientific and industrial complex of the industry ready for the creation and implementation of innovative projects through the introduction of innovative technologies for program-target

management in order to increase the competitiveness of domestic aircraft construction enterprises. Considering problems that cause the use of the program-target control method in the aircraft industry we can distinguish the following ones: economic; technical and technological; financial; process (or organizational and managerial); informational; environmental; social, etc., the main of which are technical, technological and process problems [2]. Technical and technological problems related to an increase in the innovative activity of the aircraft industry lie in the design and production potential of the industry that requires a strong research, experimental and production base and highly qualified personnel.

2   Methodology

Organizational, managerial and process innovations that develop the innovative activity of aviation industry enterprises consist in the use of new technologies for managing business processes, both at individual enterprises and in the complex as a whole. Here, it is worth noting that the special relevance of process innovations lies in organizing program-target management based on planning and implementing individual projects related to designing innovative products, reengineering of technological processes within the complex, improving product quality, designing and implementing integrated informatization systems at enterprises. A drawback of innovative activity development is the distribution of resources used in linear-functional structures by units, but not by targeted programs. These problems can be eliminated through the transition to new forms of management organization – the implementation of special-purpose programs.

In terms of the structure a special-purpose program includes the following elements: tasks and objectives; functional structure (research and development, personnel training, introduction, mastering and implementation of innovations, technology transfer, import and export of licenses) with the provision of accurate information about performers; resource support and a feasibility study (costs, timing, results); organizational structure (customers, performers, procedure for delivery, acceptance of works, financing, sanctions and fines, bonuses, etc.).

The organization of the system of target-oriented management at aircraft construction enterprises is aimed at solving the following problems:

1. Creation and implementation of effective interaction of all structural units involved in the introduction of innovations in production processes.
2. Increasing the level of operational efficiency of current management by the development of innovative activity through the approximation of management bodies to performers and the organization of a direct relationship between them.
3. Provision and implementation of functions of effective control over the implementation of works creating the basis for administrative regulation, as well as motivation to achieve the highest results of works in terms of the time frame and quality.
4. Increasing the degree of responsibility of governing bodies and performers involved in the development and introduction of innovations for the deadlines and results of works [1].

The main objective of program-target management in the aircraft industry is to eliminate the divergence of interests of functional services of enterprises in the process of implementing a particular program, which provides the most optimal way to implement it. Innovative programs at aviation enterprises are associated with the development and implementation of new types of products and technologies and, therefore, with the implementation of new tasks and objectives, so the arrangement of program-target management in terms of the organization is the most effective area allowing to achieve the objective quickly. The state priorities of the Strategy for the Development of the Aviation Industry for 2013–2025 of the Russian Federation consist in the creation and implementation of large-scale program-target projects for the civil and military aircraft industry [9]. The program-target approach to managing the aircraft industry requires all managerial and industrial subsystems to be ready for the organization of activities based on innovation.

3   Results

Program-target development of the aircraft industry of the Russian Federation is carried out on the basis of Federal Law of the Russian Federation dated June 28, 2014 No. 172-FZ "On Strategic Planning in the Russian Federation" through the development of documents related to special-purpose programs by the state [5].

In 2018, the planned amount of state subsidies for the industry under State Program of the Russian Federation "Development of the Aviation Industry for 2013–2025" was 59,105 million rubles (in 2016 – 53 billion rubles; in 2017 – 45.4 billion rubles) [11]. In 2019, 135 aircraft and 234 military and civilian helicopters were supplied to customers according to federal programs. According to the Ministry of Industry and Trade of the Russian Federation, an increase in the volumes of industrial production in the industry in 2019 will be 0.6%.

According to Decree of the Government of the Russian Federation dated June 26, 2018 No. 733, the priority areas of R&D covered by subsidies include works carried out under import substitution programs regarding the onboard equipment of the Sukhoi Superjet 100 aircraft [2]. 1,705 billion rubles in 2018 and 1,491 billion rubles in 2019 were provided for these purposes in the state budget for 2018 and for the period of 2019–2020. State subsidization of research and development in the aircraft industry will stimulate the production of competitive domestic aviation products.

The Ministry of Industry and Trade of Russia proposes changes in the financial support of State Program "Development of the Aviation Industry for 2013–2025" based on the federal budget for the period from 2019 to 2021. It is provided for to increase the amount of budget funds sent to for program implementation: [11].

– 2019 – by 19,588 billion rubles,
– 2020 – by 46,235 billion rubles,
– 2021 – by 43,309 billion rubles.

The total amount of funds sent to for this program will be:

– 2019 – 59,93 billion rubles,
– 2020 – 86,809 billion rubles,
– 2021 – 83,85 billion rubles.

This adjustment of budget allocations is justified by the need for temporary restriction on the use of credit resources in 2008–2018 and putting the MS-21 aircraft into serial operation. In addition, the program provides for budget financing of manufacturers of aircraft and their individual components for financial provision of costs associated with the production, sale and maintenance of the MS-21 series aircraft in the following amounts:

– 2019 – 1,579 billion rubles,
– 2020 – 4,109 billion rubles,
– 2021 – 4,811 billion rubles.

As for the scientific research and carrying out of design and experimental measures for the development of the MS-21 aircraft, there are no changes in budget financing for 2019 and 2020 – 7,378 billion rubles and 5,443 billion rubles, respectively. As for 2021, according to the clarification of the needs for financial resources for research and development, budgetary funds were reduced by 5,248 billion rubles, which is 2,53 billion rubles. Additional budget investments are planned for the Russian-Chinese project for the creation of a long-range wide-body CR929 aircraft:

– 2019 – 4 billion rubles,
– 2020 – 6 billion rubles,
– 2021 – 7 billion rubles.

Additional financing from the federal budget is provided for the upgrading of the Il-114 aircraft up to its new version – the Il-114-300:

– 2019 – 967 million 840 thousand rubles,
– 2020 – 2,35 billion rubles,
– 2021 – 616 million rubles.

In 2019, additional budgetary funds in the amount of 2,221 billion rubles were provided for the industrialization of the Il-114-300 aircraft. Budget financing is not provided for 2020–2021 due to the need in more precise indicators and deadlines for the implementation of this program. In 2019, financing of the fatigue tests of the Il-76MD-90A aircraft remained unchanged (135 million rubles). Budget financing of these activities in 2020–2021 is not provided for. R&D of the Sukhoi Superjet program (modification – 75 seats) provides for additional budget funds:

– 2019 – 9,92 billion rubles,
– 2020 – 17,33 billion rubles,
– 2021 – 14,1 billion rubles.

No budget funding is provided for in 2019–2021 for the modernization of the Il-96 aircraft and production infrastructure facilities for the Il-96-400M aircraft. Additional financing of state program "Development of the Aviation Industry for 2013–2025" will

be provided for at the expense of secondary and subsequent issuance of shares of UAC PJSC [12]. Based on the above information, it is planned to increase the budget financing of the industry in 2019–2021 by 109,1 billion rubles (by 38%), of which about 41,35 billion rubles is provided for R&D on the creation of a regional SSJ75 aircraft [11]. Financing of MS-21 aircraft research and development remained unchanged due to the completion of the program. So, budget financing in the following amounts is planned under the project for the development of the fleet of domestic aircraft for 2019–2021:

– the SSJ75 – 41,35 billion rubles (75 seats),
– the CR929 – 17 billion rubles,
– the MS-21 – 10,5 billion rubles,
– the Il-114-300 – about 3,934 billion rubles.

E = 0.18 – discount coefficient.

4   Discussion

Now let us determine the effectiveness of state financing of aircraft construction programs by calculating investment project indicators. Al-Invest software was used to carry out calculations. First, let us determine the net profit (NP) that is planned to be obtained from investing. The planned values from the implementation of the investment project are presented in Table 1.

$$NP = R - C \tag{1}$$

Table 1. Generated income from project implementation

Projects/PV	Step of the calculation period	SSJ75	CR929	MS-21	Il-114-300	Discount coefficient
2019	0 Investments	−13,35	−6,0	−3,5	−1,3	1
2020	Investments	13,0	−6,0	−2,5	−1,3	0,85
2020	1	2,9	2,9	1,1	0,4	0,85
2021	Investments	−15,0	−5,0	−3,5	−1,33	0,72
2021	2	9,8	4,3	2,8	0,8	0,72
2022	3	1,2	1,5	2,7	0,3	0,61
2023	4	4,6	3,6	1,2	0,9	0,52
2024	5	8,6	9,2	1,5	0,8	0,44
2025	6	13,5	13,4	1,1	0,8	0,37
2026	7	18,3	16,8	1,8	0,9	0,31
2027	8	23,7	20,2	2,3	1,0	0,27
2028	9	28,5	24,5	2,5	1,0	0,23
2029	10	36,8	27,1	2,8	1,2	0,19
–	In total	41,35	17,0	10,5	3,93	–

Source: authors.

R is the result, profit.

C is project costs.

$$a = 1/(1+\mathrm{E})^n \qquad (2)$$

n is the step of the calculation period.

E = 0.18 – discount coefficient.

A year, six months or a month can be chosen as the step depending on the preliminary feasibility study of the project. For the convenience of calculations we chose a step of one year, since if we choose one month as the step, it will significantly complicate our calculations due to a large amount of processed information. Now let us determine net present values (NPV) of the projects.

$$\mathrm{NPV} = \sum_{n=0}^{T} NP \times a - K \times a \qquad (3)$$

m is the calculation step number.

T is the number of periods.

N = 0 – the moment of starting investments ("zero" year).

K is (capital) investments.

Future cash flows are adjusted to the current point in time in Table 2.

We can observe from Table 2 that the MS-21 and Il-114-300 projects have a negative discounted income, therefore, there will be no profit on the project and the investments will not pay off.

Now let us determine the project profitability index (PI). If it is greater than 1, then the project is effective (Table 3).

$$PI = NPV/K \qquad (4)$$

We can observe from profitability index values that the indices of MS-21 and Il-114-300 projects are less than zero, therefore, the projects are not effective. Now let us determine the discounted payback period (PP). It shows the number of years from the start of the project to the period when the *NPV* with accumulation changes its value from negative to positive taking into account the coefficient *X* (Table 4).

$$X = S - m/(S - m + S + m) \qquad (5)$$

S − m is a negative value of the *NPV* on a cumulative total at the step of changing the sign from negative to positive.

S + m is a positive value of the *NPV* on a cumulative total at the next step.

We can observe from Table 4 that *X* is part of the discounted payback period. It means that the payback period in the first project is not 9 years, but 9.08 years. The value of 0.08 is the value of *X*. It follows from Table 4 that it is inexpedient to use the MS-21 and Il-114-300 projects.

Table 2. Discounted income from project implementation for the entire calculation period

Projects/PV	Step of the calculation period	SSJ75	CR929	MS-21	Il-114-300
2019	0 Investments	−13,35	−6	−3,5	−1,3
2020	Investments	−11,017	−5,085	−2,966	−1,102
2020	1	2,458	2,458	0,932	0,339
2021	Investments	−10,773	−3,591	−2,514	−0,955
2021	2	7,038	3,088	2,011	0,596
2022	3	1,576	1,523	0,628	0,513
2023	4	2,373	1,857	0,619	0,464
2024	5	3,759	4,021	0,656	0,35
2025	6	5,001	4,964	0,407	0,296
2026	7	5,745	5,274	0,565	0,283
2027	8	6,305	5,401	0,612	0,225
2028	9	6,425	5,524	0,564	0,225
2029	10	7,031	5,178	0,533	0,229
NPV	In total	11.726	24,001	−0,436	−0,099

Source: authors.

Table 3. Profitability index of planned projects

Projects	PI
SSJ75	1,33
CR929	2,64
MS-21	0,95
Il-114-300	0,97

Source: authors.

Table 4. Discounted payback periods for the projects

Projects	X	Название	PP
SSJ75	0,08	Plus 9	9,08
CR929	0,4	Plus 6	6,4
MS-21	0,98	Not payback	Not payback
Il-114-300	1,0	Not payback	Not payback

Source: authors.

Now let us determine the internal rate of return *(IRR)* generated by a particular project, provided that the costs of the project are fully covered by income (Table 5).

$$IRR = E' + NPV' \times (E'' - E')/(NPV' - NPV'') \tag{6}$$

E' is the rate of discount at which the value of NPV is positive (or negative) and closest to zero.

E'' is a discount rate increased (or decreased) by one point as compared to the value of E'', at which the value of NPV is negative (or positive) and closest to zero.

NPV' – corresponds to the value of E'.

NPV'' – corresponds to the value of E''.

Table 5. Internal rate of return on investment generated by the project

Projects	NPV	IRR, %
SSJ75	Between $E' = 0{,}24$ and $E'' = 0{,}25$. At $E' = 0{,}24$ NPV' $= 1{,}039$, at $E'' = 0{,}25$ NPV'' $= -0{,}312$	24,77
CR929	Between $E' = 0{,}43$ and $E'' = 0{,}44$. At $E' = 0{,}43$ NPV' $= 0{,}242$, at $E'' = 0{,}44$ NPV'' $= -0{,}128$	43,65
MS-21	Between $E' = 0{,}16$ and $E'' = 0{,}17$. At $E' = 0{,}16$ NPV' $= 0{,}1$, at $E'' = 0{,}17$ NPV'' $= -0{,}178$	16,360
Il-114-300	Between $E' = 0{,}17$ and $E'' = 0{,}18$. At $E' = 0{,}17$ NPV' $= 0{,}016$, at $E'' = 0{,}18$ NPV'' $= -0{,}099$	17,139

Source: authors.

IRR shows the level of the rate of discount *E*, above which it is not profitable to implement the project, since *NPV* will become negative.

Now let us determine the average rate of return (*ARR*) for the projects (Table 6).

$$ARR = (NIavg/I) \times 100\% \tag{7}$$

NIavg – the average project income.

I – total investments.

ARR takes into account undiscounted data, i.e. it is the usual profitability of project implementation.

Table 6. Calculation of the average rate of return (*ARR*) for the projects under consideration

Projects	ARR, %
SSJ75	35,768
CR929	72,706
MS-21	18,857
Il-114-300	20,941

Source: authors.

We can observe from Table 6 that the MS-21 and Il-114-300 projects show low profitability.

General conclusion: state investment in the SSJ75 and CR929 projects is effective, since the *NPV* of the projects is positive, *PI* is greater than 1, and they will pay off. Therefore, it is expedient to invest in these projects, and it is not expedient to invest in the MS-21 and Il-114-300 projects.

Then the authors carried out an analysis of the efficiency of using the funds allocated according to federal special-purpose programs for the enterprises under consideration (Table 7).

Table 7. Analysis of the efficiency of using the funds allocated according to the federal special-purpose programs for aircraft construction enterprises

Indicators	2012	2013	2014	2015	2016	2017	2018
JSC Aviaagregat							
Revenue, thousand rubles	2 382 880,0	2 561 186,3	2 632 922,1	1 988 942,4	2 746 274,0	4 454 530,0	3 447 320,0
Revenue from the Federal target program, thousand rubles	77 341,0	73 090,0	101 829,0	1 659 934,5	521 106,0	334 564,0	399 722,0
Share of products under the Federal target program in total sales,%	10,6	3,9	3,9	6,8	7,5	20,6	12,6
JSC Sukhoi							
Revenue, million rubles	6 481 283,0	8 864 487,2	9 153 821,3	10 482 143,1	11 315 451,2	12 551 311,2	14 123 419,5
Funds for innovation, thousand rubles	14,0	18,0	35,0	23,0	15,0	28,0	14,0
Revenue from the Federal target program, thousand rubles	12,0	20,0	35,0	21,0	16,0	27,0	14,0
Share of products under the Federal target program in total sales %	5,2	7,3	8,6	9,4	11,3	12,1	12,8
JSC «GidroMash»							
Revenue, million rubles	3 812,0	4 132,0	4 751,0	5 409,0	7 415,0	8 135,0	7 226,0
Funds for innovation, thousand rubles	–	459 246	459 943	866 130	641 821	480 321	556 739
Revenue from the Federal target program, thousand rubles	–	18	35	23	15	28	14
Share of products under the Federal target program in total sales %	–	11,1	9,7	16,0	8,7	5,9	7,7

Source: authors.

Based on the values presented in Table 7 we see that federal funds allocated for the development of innovative activities of aircraft construction enterprises have a small share in the total volume of activities of these enterprises.

5 Conclusion

Today the following program-target projects are used in the aircraft industry:

1. Completion of static tests of the MS-21-300 aircraft at the Central Institute of Aerohydrodynamics, assembly and installation of aircraft resource model units, the start of flight tests of the second prototype of the aircraft.
2. Continuation of the development of design and technical documentation for the components and parts of the Il-96-400M aircraft, reconstruction and technical re-equipment of the production of this airliner.
3. Continuation of development of design and technical documentation for components and parts of the Il-114-300 turboprop aircraft, start of their production.
4. Organization and carrying out of works on technical re-equipment and reconstruction of production at Rostvel MiG aircraft plant for the purposes of serial production of aircraft.
5. Certification of the Mi-38-2 helicopter for IFR flights at high altitudes and high temperatures.
6. Completion of the assembly of a standard transmission of the Ka-62 helicopter and its fatigue life expenditure of at least 50 h.
7. Approval of the certification test program for the Ka-62 helicopter.
8. Certification of the extended temperature range (up to +40 °C) for the Ansat light helicopter and an increase in its life up to 10 thousand hours.
9. In the engine industry, the development of technical specifications and outline designs of gas generator assemblies for the demonstrator of PD-35 engine technologies.
10. Development of "critical" technologies" of PD-35 engine.
11. Carrying out tests using an in-flight simulator and ensuring certification of PD-14 engine.
12. Production of TV7-117ST-01 automatically controlled engine intended for the installation on the Il-112V and Il-114-300 aircraft to carry out preliminary bench tests.

In this study the authors analyzed target financing for the implementation of aircraft construction projects and concluded: state investment in the SSJ75 and CR929 projects is effective, the NPV of the projects is positive, the PI is greater than 1, the projects will pay off, and it is proposed not to invest in the MS-21 and Il-114-300 projects [10]. The efficiency of the use of budgetary funds at aircraft construction enterprises was determined. It showed that federal funds for the development of innovative activities of aircraft construction enterprises have a small share in the total volume of activities of the enterprises.

References

1. Aleshin, B.S., Manturov, D.V.: Strategic planning for the development of the aviation complex at the national level. In: Kleiner, G.B. (ed.) Scientific Reports of the Thirteenth All-Russian Scientific Symposium "Strategic Planning and Enterprise Development", vol. 4, pp. 8–11. Department of Social Sciences of the Russian Academy of Sciences, CEMI RAS, Moscow (2012)
2. Decree of the Government of the Russian Federation of June 26, 2018 N 733 "On approval of the Rules for the provision of subsidies from the Federal budget to Russian organizations for the reimbursement of part of the costs of research and development work in priority areas of the development of the aviation industry" (2018). https://www.garant.ru/products/ipo/prime/doc/71878910/. Accessed 09 Jan 2020
3. Efimova, N.P., Mokretsova, O.I.: Theoretical assumptions of the program-target management of the budget expenditures in Russia. Econ. Entrep. **12**(4), 810–818 (2015)
4. Efimova, N.S., Kalachanov, V.D.: Simulation of production processes at aircraft building enterprises. Amazonia Investiga **8**(24), 335–345 (2019)
5. Federal Law of the Russian Federation dated June 28, 2014 No. 172-FZ "On Strategic Planning in the Russian Federation" (2014). http://base.garant.ru/70684666/. Accessed 09 Jan 2020
6. Gafiatullin, V.A.: Features of project management of innovative development of a complex of aircraft manufacturing enterprises: parameters and models. Fund. Res. **5–3**, 559–563 (2016)
7. Gurova, E., Larinina, T., Zakorin, N., Andreeva, L., Manukhina, L.: Program-target methods of management small business. In: Murgul, V. (ed.) Proceedings of the International Science Conference SPbWOSCE-2016 "SMART City". MATEC Web of Conferences, vol. 106, p. 08085. EDP Science, Les Ulis (2017)
8. Munns, A.K., Bjeirmi, B.F.: The role of project management in achieving project success. Int. J. Project Manag. **14**(2), 81–87 (1996)
9. Strategy for the development of the aviation industry for 2013–2025. Approved by Decree of the Government of the Russian Federation of April 15, 2014 No. 303 (2014). http://fundamental-research.ru/ru/article/view?id=40341. Accessed 09 Jan 2020
10. Technological Platform Air Mobility and Aviation Technologies: Government funding of the aviation industry (2017). https://aviatp.ru/statefunding#01012020. Accessed 15 Jan 2020
11. The state program of the Russian Federation "Development of the aviation industry for 2013–2025." It is approved by the order of the Government dated December 24, 2012 No. 2509-r(2012). http://government.ru/rugovclassifier/849/events/. Accessed 09 Jan 2019
12. Vasetskaya, N.O.: Program-target management as a tool of financial implementation of special federal programs. Econ. Sci. **5**(3), 160–169 (2019)
13. Xiao, M., Yang, B.: Optimization study of earned value method in construction project management. In: Cheung, E., Yongsheng, Y. (eds.) Proceedings of the International Conference on Information Management, Innovation Management and Industrial Engineering, pp. 201–204. IEEE, New Jersey (2012)

Extending the Confidentiality Regime to Tax Information: Comparative Legal Research

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Abstract. The research goal is to conduct a comparative analysis of norms of national and foreign law regulating the extension of the confidentiality regime to tax-relevant information and to identify problematic issues in this area. In this article, the author classifies tax information as confidential and considers the problem of extending the confidentiality regime to the tax secrecy. The ratio between tax information (tax secret) and other data that is subject to a similar regime is analyzed. The problem here lies in the ambiguity of the definition of "tax secret". This makes it difficult to determine the volume and content of tax-relevant information that can be subject to such a confidentiality regime, leads to an increase in the number of entities that have the right to access such information and, as a result, the possibility of violating the constitutional rights of taxpayers. In this research, the author used both general scientific and private scientific methods. Based on the results of a comparative legal study of Russian and foreign legislation, the author outlines a direction of reforming the national legislation system regulating the procedure for extending the confidentiality regime to tax-relevant information.

Keywords: Access mode · Confidential information · Information · Regime · Tax secrecy

1 Introduction

In the modern realities of the democratic society development, issues of ensuring the security of the state and society as a whole, especially economic security, are of particular importance [19]. At present, information is crucial for almost all spheres of public life. In these conditions, the role of the information sphere increases. This sphere is a set of different data, subjects that collect, form, distribute and use it, as well as the system of legal regulation of public relations arising in this case. The era of digitalization, which began at the end of the XX century, creates a need to ensure the information security of relations between various economic entities. In this regard, it is

particularly important to protect data in the economic sphere, and especially those whose access is restricted by their confidential nature.

The growth of informatization and digitalization of the modern society, the presence of legal conflicts in the regulation sphere of relations related to the confidentiality of tax-relevant data as part of economic information, and the increase in data turnover in the public administration highlights the need to increase the protection degree of individuals who have the right to the tax secrecy [9].

2 Methodology

In the research process, the following methods were used: general scientific methods (abstraction, analysis and synthesis, deductive, ascent from the abstract to the concrete), private scientific methods (special legal research methods): a systematic approach, formal dogmatic (normative), comparative legal, formal logical method. In order to carry out a large-scale study, the synthesis method was used, that is, the use of the above methods in combination. This allowed us to reflect the real level of knowledge of this subject area.

3 Results

Information in the taxation field should be defined as a type of financial information, and therefore part of economically significant information. In the Russian legislation and the legislation of a number of former Soviet republics, the definition of "tax secret" is formulated by listing data that cannot be subject to such a regime. Confidential tax-relevant information (tax secret) is a type of official secret, since such information can be obtained by a subject only when performing official duties in the field of taxation. As for confidential information with the access mode "personal data" and "tax secret", the first one is primary. However, the volume of such information types is different.

Today, the concept of tax secrecy is enshrined in part 1 of Article 102 of the Tax Code of the Russian Federation (part one) of 31.07.1998 No. 146-FZ, according to which it includes any information received by the tax authority, internal affairs agencies, investigative bodies, bodies of the state extra-budgetary fund and the customs authority about a taxpayer, a payer of insurance premiums [25] indicating a number of exceptions stipulated in the same article. However, tax secrecy as a separate institution is not included in the list of information endowed with the regime of confidential information, which includes information constituting, for example, commercial secrets, official secrets, private information, etc. [8]. It can be concluded that the institute of "tax secrecy" is an integral part of another and/or other institutions of confidential information, such as official secrets and/or commercial ones. But despite this, tax secrecy is defined as one of the objects of the criminal law protection together with commercial and banking secrets (Art. 183 of the Criminal Code of the Russian Federation of 13.06.1996 N 63-FZ) [6].

Therefore, the legislator does not include it as an integral part of either commercial or banking secrecy. Tax secrecy as a separate information institution is a subject to the

confidential information regime is also mentioned in Federal law of 07.08.2001No. 115-FZ (as amended on 16.12.2019) "On countering the legalization (laundering) of income from crime and financing of terrorism" [10] altogether with official, commercial, bank and secret secrecy. The concept of a "tax secret" is formulated in the form of a list of information included in it through the enumeration of data not included in it. And this information contains data of restricted access, that is, it has characteristics typical for the legal regime of information with a restricted access. The legal regime of information resources is defined in the legal literature as the possibility of performing or not performing certain actions with the object of law that entails a certain legal result, including the procedure for documenting information, provisions on access to information resources, depending on their categories, taking measures to protect information [20].

Scientists distinguish several regimes of confidential information: state secret, official secret [17], professional or commercial secret [14], banking secret [22], and privacy secret. Based on understanding official secrets as information about individuals and legal entities that become known to various officials according to the nature of their official activities, but due to their special nature cannot be freely distributed, the secret information that we are investigating can be attributed with full confidence to one of its types. A number of scientists consider it as a type of professional secret, including information about the "hidden" official activities of state and municipal bodies (for example, information related to the organization and conduct of operational activities of tax authorities in order to perform tasks assigned to them by law) [27] together with such secrets as lawyer, medical, investigative secrets, etc.

In our opinion, this approach limits the volume of the tax secrecy to information obtained by tax authorities and their officials with control measures. It is advisable to define tax secrecy as one of the types of official secrets, since it includes information that is obtained by official subjects in the performance of their official duties in the state or municipal service. Considering a relation between the tax secrecy and personal data, we note that personal data in the Russian legislation is defined as any information relating directly or indirectly to a specific or identifiable individual (subject of personal data) [12]. The list of such data is not fixed at the legislative level and it can include: surname, first name, patronymic, address of residence, profession, social status, as well as any information containing data directly or indirectly mediating a certain or defined individual. Based on this wording "personal data", we can say that the legislator does not associate personal data with a restricted access regime, but in fact most of them may be subject to the regime of various types of confidential information: medical, banking secrets, etc. Although this information is included in the list of confidential information and Federal law of 27.07.2006 No. 149-FZ (as amended on 02.12.2019) "On information, information technologies and information protection" [11] indicates limited access to these data, without calling them confidential or restricted access information, specifying a special procedure for accessing it, which is provided by a special law. But this legal act does not guarantee the confidential nature of such information. Based on this state of affairs, scientists suggest that personal data should not be considered as restricted access information, but as "confidential personal data" [2], which includes personal data to which the legislator has extended the confidentiality requirement. You can define personal data as a "primary" secret, and tax data as a "secondary" secret, but the tax secrecy regime and the personal data regime do not coincide [26].

4   Discussion

Tax secrecy may also include data that is considered as personal. In this case, they simultaneously fall under the personal data regime, in addition to the tax secrecy regime, and then we can talk about the transition of confidential information from one regime to another and, as a result, the need to meet special requirements for the protection of such data. And as it is correctly noted in the legal literature, the provisions of the Federal law of 27.07.2006 № 152-FZ (as amended on 31.12.2017) "On personal data" will also apply to activities of tax authorities and credit institutions, since the law applies to all relations related to processing of personal data using (or without) automation tools, if processing of data without the use of such tools corresponds to the nature of actions (operations) performed with data using automation tools [12].

We agree with the opinion expressed in the scientific literature about the tax secrecy regime that applies to both economically significant information and personal data. The totality of such information is usually defined as tax-relevant information, which is a special type of information intended solely for tax purposes, containing information about the taxpayer's economic activities and personal data. Based on this, we can define the purpose of the "tax secrecy" regime, which is to ensure the protection of the rights and legitimate interests of taxpayers in relation to information classified by the tax legislation as protected objects.

In our opinion, to eliminate discrepancies, it is advisable to include the tax secrecy as a separate institution of confidential information in the list of information of a similar nature approved by the decree of the President of the Russian Federation. So, as we can see, the volume of information covered by the "tax secret" regime is not precisely defined by the legislator, and the consequence of this state of affairs is ambiguity in determining the volume of its content, which causes difficulties in the law enforcement practice. This is also complicated by the increase in the number of entities that have the right to access information related to the tax secrecy. Together with the Tax Code of the Russian Federation, in the Russian legislation there are other normative legal acts containing norms on the tax secret regime (part 2 of article 11 Code of Administrative Procedure of the Russian Federation, article 11 of the Arbitration Procedure Code of the Russian Federation, article 10 of the Code of Civil Procedure, article 241 of the Criminal Procedure Code of the Russian Federation) [1, 3, 4, 7]. "Disclosure" in Russian tax law means the use or transfer to another person of information constituting a commercial secret (secret of production) of a taxpayer or payer of insurance premiums [25] by an official who became aware of it in the course of performing his official duties.

In this regard, we note the inaccuracy of the definition of this concept, enshrined in article 102 of the Tax Code of the Russian Federation [25]. The range of information constituting a tax secret is much broader and includes, in addition to information constituting commercial and industrial secrets, also other data about the taxpayer. In addition, disclosure can be expressed not only in the use and transmission of information, but also in making it public, for example, by publishing it in the media. We agree with Shekhovtseva, who suggests that disclosure should be understood as a guilty illegal violation of the tax secrecy regime, expressed in the action (inaction) of an official of a tax authority, internal affairs body or customs body, as a result of which it became available to third parties [21].

It should be noted that the tax secrecy (Steuergeheimnis) in the German law is defined as the obligation to keep secret by tax officials or experts of information about taxpayers that became known to them in connection with the performance of their official duties [18]. The tax secrecy regime applies to information received by an official in the course of taxation [15]. At the same time, the law stipulates cases when such a regime can be removed, for example, if it is necessary for the tax process; disclosure is permitted by law; the consent of the owner of the secret is obtained; this serves to conduct a criminal process that is not related to a tax crime, and if the information was obtained because of a tax crime or violation of the procedure for collecting taxes and fees; there is a forced public interest for disclosure [13].

According to the Tax Code of the Republic of Belarus 166-Z of 19.12.2002, the regime of the tax secrecy applies to information held by tax, customs and financial bodies, state control bodies, republican bodies of the state administration, bodies of local government and self-government, authorized bodies, organizations and officials who are participants of tax relations, any information about payers in the presence of exceptions, which are enshrined in Tax Code of the Republic of Belarus (Art. 29) [24]. Disclosure of such information is recognized as an offense that entails legal liability.

The concept of tax secrecy in the Code of the Republic of Kazakhstan of December 25, 2017 No. 120-VI "On taxes and other mandatory payments to the budget (Tax code)" is similar to the Russian tax legislation regulating this regime of confidential information (article 30) [5]. Violation of these rules under the legislation of the Republic is recognized as an offense, and information with the "tax secret" regime cannot be disclosed by persons who became aware of them either during their employment or after. It should be noted that this provision differs from the provisions of the Russian legislation. In our opinion, it is necessary to clarify the obligation of non-disclosure of tax secrets by persons who became aware of it during the performance of their official duties and after being removed from such a service.

According to Art. 30 of the Tax Code of the Republic of Azerbaijan No. 905-IQ of July 11, 2000, any information received by the tax authority and its officials about a taxpayer is considered a tax secret and personal life information, with the exception of a certain kind of information [23]. Separately, the legislator refers to commercial secrets, referring to the norms of the Law of the Republic of Azerbaijan No. 224-IIQ of December 4, 2001 "On commercial secrets" [16].

Tax officials of the tax authorities are required not to disclose tax secrets both while serving and after being dismissed from service. Another distinctive feature of the Azerbaijani tax legislation is the indication that the violation of the "tax secret" regime can be carried out both in the form of the information loss and its disclosure which is not limited only to the use or transfer of it to another person. It is worth mentioning the principle of "tax publicity" implemented in a number of European countries: Norway, France, Italy, Sweden. In these countries, tax authorities are required by law to maintain the tax secrecy, while the legislator also provides for the possibility to publish a certain list of strictly defined tax data. This principle is based on the constitutionally established right of citizens to get acquainted with documents and materials of state authorities that directly affect their rights and freedoms, and since the duty to pay taxes is public, a number of tax data are recognized as publicly available, which allows each taxpayer to control the performance of this duty by other citizens.

5   Conclusion

The legislator creates the concept of tax secrecy by listing information that is not covered by the tax secrecy regime. Similarly, the concept of tax secrecy is formulated in the legislation of the CIS countries. The tax secrecy regime applies to economic information and personal information about a taxpayer from the moment of its registration with the tax authorities, and is therefore regulated by the Federal law of 27.07.2006 № 152-FZ (as amended on 31.12.2017) "On personal data" [12]. The extension of the tax secrecy regime to information is aimed at ensuring the protection of rights and legitimate interests of taxpayers in relation to information classified by the tax legislation as protected objects.

References

1. Arbitration Procedure Code of the Russian Federation dated 24.07.2002 N 95-FZ (2002). http://www.consultant.ru/document/cons_doc_LAW_37800/. Accessed 15 Feb 2020
2. Bobrova, N.A.: The paradoxes of application of the legislation on personal data. Law Enforc. Rev. **2**(1), 54–62 (2018). https://doi.org/10.24147/2542-1514.2018.2(1).54-62
3. Code of Administrative Procedure of the Russian Federation dated 08.03.2015 N 21-FZ (2015). http://www.consultant.ru/document/cons_doc_LAW_176147/. Accessed 15 Feb 2020
4. Code of Civil Procedure of the Russian Federation dated 14.11.2002 N 138-FZ (2002). http://www.consultant.ru/document/cons_doc_LAW_39570/. Accessed 15 Feb 2020
5. Code of the Republic of Kazakhstan of December 25, 2017 No. 120-VI "On taxes and other mandatory payments to the budget (Tax code)" (2017). https://online.zakon.kz/document/?doc_id=36148637. Accessed 15 Feb 2020
6. Criminal Code of the Russian Federation of 13.06.1996 N 63-FZ (as amended on 27.12.2019) (2019). http://www.consultant.ru/cons/cgi/online.cgi?req=doc&base=LAW&n=341913&fld=134&dst=1000000001,0&rnd=0.5549880538831127#0935947766169215. Accessed 15 Feb 2020
7. Criminal Procedure Code of the Russian Federation dated 18.12.2001 N 174-FZ (2001). http://www.consultant.ru/document/cons_doc_LAW_34481/. Accessed 15 Feb 2020
8. Decree of the President of the Russian Federation of 06.03.1997 No. 188 (ed. from 13.07.2015) "On approval of the list of confidential information" (2015). http://www.consultant.ru/cons/cgi/online.cgi?req=doc&base=LAW&n=182734&fld=134&dst=1000000001,0&rnd=0.10986309365482638#040199190553240194. Accessed 15 Feb 2020
9. Dvinskikh, D.Yu., Talapina, E.V.: Risks of data turnover development in public administration. Public Adm. Issue **3**, 7–30 (2019)
10. Federal law of 07.08.2001 № 115-FZ (as amended on 16.12.2019) "On countering the legalization (laundering) of income from crime and financing of terrorism" (2019). http://www.consultant.ru/cons/cgi/online.cgi?from=32834-0&rnd=70E67DDC6B8910637807798E65978293&req=doc&base=LAW&n=330804&REFDOC=32834&REFBASE=LAW#2ksgd00zfow. Accessed 15 Feb 2020
11. Federal law of 27.07.2006 № 149-FZ (as amended on 02.12.2019) "On information, information technologies and information protection" (2006). http://www.consultant.ru/cons/cgi/online.cgi?req=doc&base=LAW&n=339396&fld=134&dst=1000000001,0&rnd=0.5068544565616508#08511244644299816. Accessed 15 Feb 2020

12. Federal law of 27.07.2006 № 152-FZ (as amended on 31.12.2017) "On personal data" (2017). http://www.consultant.ru/cons/cgi/online.cgi?req=doc&base=LAW&n=286959&fld=134&dst=1000000001,0&rnd=0.537934809419724#09084059841657302. Accessed 15 Feb 2020

13. Geiger, H., Mürbe, M., Lederer, S., Obenaus, W.: Beck'sches Rechtslexikon: Rund 1.800 Rechtsbegriffe für Beruf und Alltag. Deutscher Taschenbuch Verlag, Auflage (1992)

14. Halt, G.B., Donch, J.C., Stiles, A.R., VanLuvanee, L.J., Theiss, B.R., Blue, D.L.: Trade Secret. Springer, Cham (2019)

15. Köbler, G.: Juristisches Wörterbuch. Vahlen Studienreihe Jura, 14 (2004). http://www.agmiw.org/wp-content/uploads/2016/05/K%C3%B6bler-Juristisches-W%C3%B6rterbuch-.Auflage.pdf. Accessed 15 Feb 2020

16. Law of the Republic of Azerbaijan No. 224-IIQ of December 4, 2001 "On commercial secrets" (2001). https://online.zakon.kz/Document/?doc_id=30612904. Accessed 15 Feb 2020

17. Purdon, J.: Secret Agents, Official Secrets. Oxford Scholarship, Oxford (2016)

18. Regulations on the procedure for collecting taxes and fees in Germany (2017). https://www.gesetze-im-internet.de/englisch_ao/englisch_ao.html. Accessed 15 Feb 2020

19. Revina, S.N., Sidorova, A.V., Zakharov, A.L., Tselniker, G.F.: Economic relations and economic systems. In: Popkova, E. (ed.) The Impact of Information on Modern Humans, HOSMC 2017. Advances in Intelligent Systems and Computing, vol. 622, pp. 549–554. Springer, Cham (2018)

20. Sellheim, N.: Legal regimes. Seal Hunt **3**, 111–216 (2018)

21. Shekhovtseva, E.V.: Tax secrecy: legal protection regime. Leningr. Law J. **1**(31), 38–42 (2013)

22. Sidorova, A.V., Cherevichenko, T.S., Efremova, E.A., Medentseva, E.V., Azarkhin, A.V.: The institute of banking secrecy in the CIS: rather-legal analysis. J. Adv. Res. Law Econ. **9** (3), 1110–1115 (2018)

23. Tax Code of the Republic of Azerbaijan No. 905-IQ of July 11, 2000 (2000). https://online.zakon.kz/Document/?doc_id=30414629. Accessed 15 Feb 2020

24. Tax Code of the Republic of Belarus 166-Z of 19.12.2002 (2002). http://www.nalog.gov.by/uploads/documents/NK_ot_2018-12-30_N_159-z.pdf. Accessed 15 Feb 2020

25. Tax Code of the Russian Federation (part one) of 31.07.1998 No. 146-FZ (ed. from 27.12.2019) (2019). http://www.consultant.ru/cons/cgi/online.cgi?req=doc&base=LAW&n=327825&fld=134&dst=1000000001,0&rnd=0.07002359312554685#014932158127365236. Accessed 15 Feb 2020

26. Tikhomirov, Yu.A.: Vectors in the focus of law. Public Adm. Issues **1**, 136–159 (2019)

27. Tumanova, L.V., Snytnikov, A.A.: The Promotion and Protection of the Right to Information. Urite, Moscow (2001)

Railway Vehicles Enhancement in the Course of Rail Freight

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Abstract. The rail transportation market in Russia is monopolized by PJSC "Russian Railways". In this regard, the operator dictates the interaction terms to cargo owners, which results in searching optimal ways to do business. The issue of interaction between cargo owners and PJSC "Russian Railways" is to determine the sources of efficiency to deliver cargo to consignees. The purpose of the paper is to find ways to enhance the railway vehicles use in the course of rail freight. The author carried out a comparative study of working efficiency indicators of cargo owners' fleet of cars, own and leased, through the example of PJSC "SG-Trans". The main difficulties and sources of cost in the course of rail freight were identified, and the ways to neutralize and minimize these problems were offered.

Keywords: Carrier · Cargo · Cargo owner · Efficiency · Enhancement · Railway vehicles

1 Introduction

Railway vehicles in Russia play an important role in the country's economy. They provide high mobility and speed for goods and passengers delivery, develop markets, international trade, supply chains, etc. [1, 2] Investments in the rail transport infrastructure development bring numerous benefits to the state in the context of the country's region development, which should not be limited only to the physical aspect in terms of new railway tracks increase [4]. In general, investments should contribute to improve the quality of cargo owners service and speed of freight traffic and passenger trains, and to increase the rail freight volume, the capacity growth of transportation hubs, etc. [5, 6, 8–10].

In fact, PJSC "Russian Railways" is a monopoly at the market of freight rail transportation in Russia. The company dictates the terms how to use public tracks, fleet of freight cars, etc. Therefore, the issues to coordinate the carriers and cargo owners' actions are relevant. First of all, this concerns issues of railway vehicles enhancement in the course of rail freight. The study subject is PJSC "SG-Trans", which is a leader in the oil and gas and petrochemical cargoes transportation and provides transportation of half cumulative volume of all liquefied petroleum gases in Russia. To achieve this purpose, the author analyzed the working efficiency indicators of cargo owners' fleet of

cars (own and leased), justified the need to reduce delay time of cars at train stations, identified the main cost items in the course of rail freight, and proposed ways to minimize them.

2   Methodology

The research draws on the mathematical logic methods based on such principles as scientific approach, system approach, completeness and reliability of the infobase, and practical feasibility of the research results. To justify on logical grounds the decisions of railway vehicles enhancement in the course of rail freight, quantitative and qualitative methods of economic research were used. The largest Russian operator of the rail transportation of liquefied gases was the experimental base for making optimal decisions in the course of rail freight.

3   Results

The beginning of 2020 can be characterized by an increase in the presence of PJSC "Russian Railways" at the container transportation market. According to January 2020 data, the growth rate of container rail traffic was 118.2%, compared to the same period in 2019. As compared to 2016, the container traffic volume in the country increased by 98.3%. The total PJSC "Russian Railways" fleet of cars increased in January 2020 by 67 thousand cars, while the fleet of empty cars increased by 98.7 thousand units, and loaded cars decreased by 31 thousand units. As for the rail freight structure, it should be noted that according to January 2020 data, the largest relative share in freight traffic is occupied by coal (29.3%), oil and petroleum product (19.9%), construction cargo (8.4%), and ferrous metals (6.4%) [7].

Under current conditions of traffic intensity increase at the rail freight market, coordination of actions between carriers, consignors and consignees is becoming relevant. First of all, this is important to PJSC "SG-Trans", a railway operator of the oil and gas and petrochemical cargoes transportation, which provides transportation of half cumulative volume of all liquefied petroleum gases in Russia. It should be noted that the interaction policy at such an activity scale requires competent coordination of actions between PJSC "SG-Trans" and PJSC "Russian Railways". Therefore, the companies' cooperation in the course of rail freight should be developed in order to optimize the railway vehicles use in the course of rail freight. This implementation requires an economic justification of the problem how to use own or leased railway vehicles. In this regard, the following input data are the conditions to solve the problem of PJSC "SG-Trans" own or leased railway vehicles enhancement in the course of rail freight: analyzed period is 1 year with monthly detailed elaboration; considered fleet of cars is 30 units (both for own and leased fleet); costing rate for repair and steaming of the own fleet of cars is 238 rubles; costing rate for repair and steaming of the leased fleet of cars is 208 rubles. The calculations are presented in Tables 1 and 2.

In the case of operating the own fleet of cars, the costs of PJSC "SG-Trans" will consist of the costs for cars repair and steaming, entry lines lease, and the company's

Table 1. Calculation of operating efficiency indicators of the own fleet of cars

Indicator/Month	01	02	03	04	05	06	07	08	09	10	11	12	Total
Car turnover coefficient	1.6	1.5	1.8	1.7	1.9	1.7	1.7	1.6	1.7	1.6	1.5	1.6	–
Static load, tons per car	56	57	57	58	57	57	57	56	57	57	58	56	–
Quantity of shipments, tons, in thousands	1.68	1.71	1.71	1.74	1.71	1.71	1.71	1.68	1.71	1.71	1.74	1.68	–
Own fleet of cars, units	30	30	30	30	30	30	30	30	30	30	30	30	–
Operating revenue (at a rate of 256 rubles per ton), RUB, in thousands	688	657	788	757	832	744	744	688	744	700	668	688	8,699
Costs for repair and steaming, RUB, in thousands	640	610	733	704	773	692	692	640	692	651	621	640	8,087
Entry lines lease at oil refineries and gas processing plants, RUB, in thousands	1.45	1.45	1.45	1.45	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	17.53
General economic expenses (depreciation, communication service, wages, etc.), RUB, in thousands	7.03	7.03	7.03	7.03	7.04	7.04	7.04	7.04	7.04	7.04	7.04	7.04	84.5
Total costs, RUB, in thousands	648.2	619.0	741.1	712.5	781.8	700.4	700.4	648.3	700.4	659.7	629.7	648.3	8,190
Profit, RUB, in thousands	39.9	37.7	46.9	44.7	50.0	43.8	43.8	39.9	43.8	40.7	38.5	39.9	509.6

Source: authors.

Table 2. Calculation of operating efficiency indicators of the leased fleet of cars

Indicator/Month	01	02	03	04	05	06	07	08	09	10	11	12	Total
Car turnover coefficient	1.6	1.5	1.8	1.7	1.9	1.7	1.7	1.6	1.7	1.6	1.5	1.6	–
Static load, tons per car	56	57	57	58	57	57	57	56	57	57	58	56	–
Quantity of shipments, tons, in thousands	1.68	1.71	1.71	1.74	1.71	1.71	1.71	1.68	1.71	1.71	1.74	1.68	–
Leased fleet of cars, units	30	30	30	30	30	30	30	30	30	30	30	30	–
Operating revenue (at a rate of 256 rubles per ton), RUB, in thousands	688	657	788	757	832	744	744	688	744	700	668	688.	8,699
Costs for repair and steaming, RUB, in thousands	559	534	640	615	676	605	605	559	605	569	543	559	7,068
Cars leasing, RUB, in thousands	97.7	94.5	97.7	100.8	104.0	100.8	97.7	104.0	104.0	97.7	107.1	104.0	1,210
Entry lines lease at oil refineries and gas processing plants, RUB, in thousands	1.45	1.45	1.45	1.45	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	17.53
General economic expenses, RUB, in thousands	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03	72.44
Total costs, RUB, in thousands	664	636	745	724	787	713	710	671	716	674	657	671	8,368
Profit, RUB, in thousands	23.9	21.1	42.6	33.7	44.5	31.2	34.4	17.6	28.1	26.2	10. 7	17.6	331.5

Source: authors.

general economic expenses (including depreciation). In the case of operating the leased fleet of cars, the costs of PJSC "SG-Trans" will consist of the cars leasing costs, cars repairing and steaming, entry lines lease, and general economic expenses. Figure 1 shows a comparative histogram of the cost and profit dynamics of PJSC "SG-Trans", including two versions of the railway vehicles use.
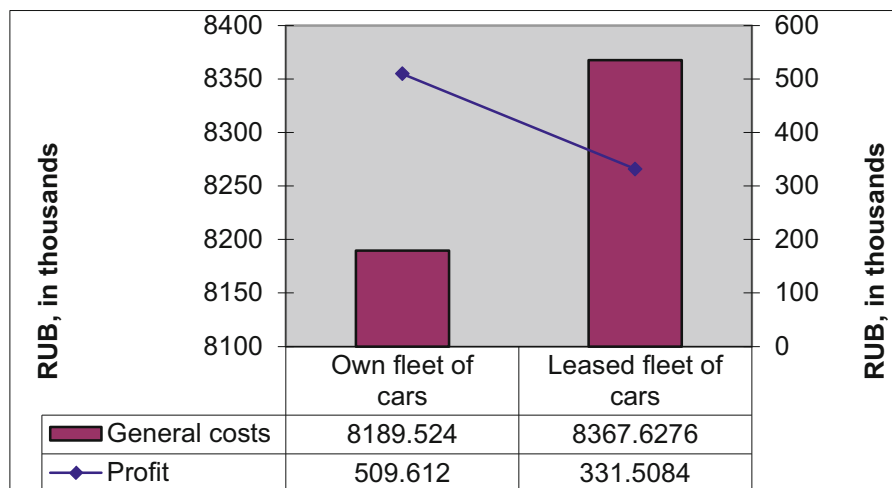
Fig. 1. Histogram of the cost and profit dynamics of PJSC "SG-Trans", including two versions of the railway vehicles use (Source: authors).

According to the calculations, the total cost of PJSC "SG-Trans", while in operation of 30 own fleet of cars, will amount to 8,189.52 thousand rubles in a year, and while in operation of the leased fleet of cars, it will be 8,367.62 thousand rubles.

The company's profit, based on the rate of 256 rubles per ton, will amount to 509.612 thousand rubles in a year while operating the own cars, and 331.5084 thousand rubles while operating the leased cars.

The efficiency of the rail vehicles use in the company for two options were calculated:

1. Operating efficiency of the own fleet of cars will be: 509.612/8,189.52 * 100% = 6.22%.
2. Operating efficiency of the leased fleet of cars will be: 331.5084/8,367.62 * 100% = 3.96%.

Thus, the operating efficiency of the own fleet of cars is higher than the efficiency of the leased fleet of cars. The operating efficiency of the railway vehicles in Samara gas transportation branch of PJSC "SG-Trans" was evaluated. The initial data for analysis is presented in Table 3.

According to Table 4, the empty mileage coefficient of the company's cars is very high and continues to grow. This is primarily due to the type of cargo being transported. For comparison, it should be noted that this coefficient is lower for building

Table 3. Performance indicators of railway vehicles use in Samara branch of PJSC "SG-Trans"

Indicator	2017	2018	2019
Loaded run (km)	250	277	300
Empty run (km)	210	220	230
Schedule speed (km/h)	42	42	42
Average number of train stations a car does at turn-around time	2	2	2
Average car detention at one train station (h)	36	51	60
Average car detention during load/discharge (h)	63	70	80
Average car static load (amount of cargo loaded) (tn)	20	20	20
Average length of haul (km)	400	380	400
Ratio of operating ton-km and tariff ton-km	1.045	1.3	1.3
Amount of transit cars with shunting service	20	28	35
Amount of transit cars without shunting service	24	35	50
Local operations coefficient	0.5	0.5	0.7

Source: authors.

materials transportation, since cars (low-sided cars, dumping cars, etc.) do not require such careful preparation for transportation. And rail tanks for liquefied gases transportation can be loaded only with gas but nothing else.

Table 4. Indicators of operating efficiency of railway vehiclesin Samara branch of PJSC "SG-Trans"

Indicator	2017	2018	2019
Average car dynamic force (tn)	33.44	35.67	34.67
Empty run coefficient	0.76	0.74	0.77
Coefficient of cars shunting service at train stations	0.83	0.8	0.7
Car turn around (24-h day)	4.77	6.2	7.86
Average daily car mileage (km)	96.46	80.14	67.44
Car efficiency (ton-km net)	20,160	13,892	10,019

Source: authors.

The table also shows that car detention at train stations is increasing. This is due to the low train-handling capacity of the stations. Recently, there have been difficulties in developing large train stations that are part of railway hubs. Although there were some difficulties with this development in earlier times, it was quite simple to increase the arrangement of tracks (adding and lengthening of tracks, etc.). At present, in most of the hubs, the territorial possibilities for expanding the railway economy have already been exhausted, and new equipment (electric interlocking, catenary system, mechanical and automated gravity humps, handling equipment on the tracks, etc.) leads to a significant cost increase in reconstruction, and it is necessary to find new ways to develop the hubs.

Car detention during load/discharge also tends to increase. According to the standards, delay time should not exceed 6 h during the load and 24 h during the

discharge. But in fact, the cars delay for several days, and PJSC "Russian Railways" fines for it. The author believes that this is primarily due to the fact that the factories, when sending a request for loading, indicate only the amount of cargo and the terms to provide it, without attaching a shipping schedule. Scheduling is done by a specialist in PJSC "SG-Trans" logistics department, who does not know the plant's production schedules and makes a shipping schedule evenly. For example, the factory sends a request for 1,200 tons, which must be shipped within 30 days (from 1 to 30 June). The shipping schedule will look like this: 200 tons on 1 July, 200 tons on 5 July, 200 tons on 10 July, 200 tons on 15 July, 200 tons on 20 July, 200 tons on 25 July. As a result, loading is not performed at all on some days, but on others 500 or more tons are loaded at once, and PJSC "Russian Railways» fines for deadline violation.

Also, in the course of the study, it was found that the most expensive item of expenditure in the company is repair services of railway vehicles. This is due to the strong depreciation of the car fleet. The shelf life of 1,375 oil cars will have expired by 2020, which is 9% of the rail tank fleet of PJSC "SG-Trans" for the transportation of liquefied gases and light hydrocarbon raw materials. 48% of the specialized cars fleet of PJSC "SG-Trans" to transport liquefied gases and light hydrocarbon raw materials consist of oil cars of outdated design with a boiler volume of 54 m^3. These models have the following main disadvantages: increased specific metal content of the oil car compared to other types of cars (high empty weight-to-carrying capacity ratio), due to the large thickness of the boiler wall; underutilization of the allowable axial load (23.5 tn/axle); high operation and maintenance costs per unit.

As part of the update program, the company has already made the following changes to the car fleet:

- 37 oil cars with a boiler volume of 54 m^3 and 5 oil cars with a boiler volume of 54 m^3 were discarded because of their technical conditions and service life,
- in accordance with the Innovative Development Program, the outdated oil cars were replaced with the new large-capacity ones with a boiler volume of 75 m^3 or more. In 2019, PJSC "SG-Trans" acquired 225 oil cars from domestic manufacturers PJSC "Ruzhimmash" and PJSC "Salavatneftemash", including:
- 200 units of railway vehicles with a boiler capacity of 75 m^3, which were delivered under leasing agreements (121 units were put into operation in 2018 and 79 units in the first quarter of 2019),
- 25 oil cars with a boiler capacity of 83.9 m^3, which were delivered under the sales contract and put into operation in 2018.

The author believes that updating the fleet of rail tanks and using the models with improved technical and economic parameters should be a priority in the company's development.

4   Discussion

Railway transport occupies a leading position in the Russian transport system. PJSC "Russian Railways" is one of the world's largest companies at the rail transportation market. It ensures the safety and accessibility of Russian transport and reduces the

traffic load in the economy [6]. PJSC "Russian Railways" also covers rail freight in the country using the capacity of its logistics infrastructure: railways, train stations, cars, containers, oil cars, etc. Cargo owners are forced to adapt to the monopolist's activity and look for ways to minimize the rail freight costs under current circumstances.

The study revealed a number of problems of a major railway operator, which ships oil and gas and petrochemical cargoes in Russia. First, freight owners have increasing coefficient of cars empty mileage. Secondly, the car detention at train stations increases, which is due to their low train-handling capacity. Third, the oil cars detention during load/discharge also tends to increase, which results in penalties increase for deadline violation on the part of PJSC "Russian Railways". Fourth, the most expensive item of expenditure in the company is repair services of rail vehicles. According to the experts, the potential for strengthening the coordination relationships between a carrier and a client is based on awareness of the clients' needs and increasing the cargo handling speed on the part of PJSC "Russian Railways", and on increasing the shipment planning quality on the part of the client. The most significant potential to improve the efficiency and quality of customer service is based on improving the interaction between the commercial services of cargo owners and the management of PJSC "Russian Railways", as well as increasing the speed of handling cargo, cars and locomotives directly at the holding's stations. In exchange, the potential for increasing cargo owners' satisfaction is also associated with a deeper understanding of the different cargo owners' needs on the part of the subdivisions of PJSC "Russian Railways". On the one hand, these needs have some common features, such as cargo safety and provision with immediate information about its location. On the other hand, they may differ significantly. For example, for the largest consignors with a continuous production cycle (oil-processing plants, chemical and metallurgical enterprises), the key values are the rhythm and accomplishing supplies for rail vehicles, while in the segment of container and perishable goods transportation, speed and delivery terms guarantee is more valuable [3].

5   Conclusion

The research has shown that the optimal solution in the course of rail freight is to use the own fleet of cars. Thus, the operating efficiency of the own fleet of cars in the course of rail freight is almost twice as high as the operating efficiency of the fleet of cars leased for this purpose from PJSC "Russian Railways". Also, the study revealed that the freight owner has an increasing coefficient of cars empty mileage. This is primarily due to the type of cargo being transported, that is liquefied gas. To transport it, rail tanks are used, and only liquefied gas can be poured into them but nothing else. This results in their empty mileage growth. In addition, the car detention at train stations is increased, which is due to their low train-handling capacity. This is caused by the fact that there are some technical difficulties in territorial expansion of railway hubs. The rail tanks detention during load/discharge also tends to increase, which leads to an increase in penalties for terms violation on the part of PJSC "Russian Railways". This is primarily due to the fact that the factories, when sending a request for loading, indicate only the amount of cargo and the terms to provide it, but they do not attach a

shipping schedule. The most expensive expenditure item in the company is repair services of railway vehicles. This is due to the strong depreciation of car fleet in PJSC "SG-Trans". The author believes that updating the fleet of rail tanks and using the models with improved technical and economic parameters should be a priority in the company's development.

References

1. Butko, T., Prokhorov, V., Kalashnikova, T., Riabushka, Y.: Organization of railway freight short-haul transportation on the basis of logistic approaches. Procedia Comput. Sci. **149**, 102–109 (2019)
2. Dolgopolov, P., Konstantinov, D., Rybalchenko, L., Muhitovs, R.: Optimization of train routes based on neuro-fuzzy modeling and genetic algorithms. Procedia Comput. Sci. **149**, 11–18 (2019)
3. Ishmukhammetov, F., Skorlygina, N.: Tandem of the carrier and the consignor. Kommersant (2019). https://www.kommersant.ru/doc/3969767. Accessed 11 Mar 2020
4. Jarocka, M., Glińska, E.: The state and prospects for development of railway transport infrastructure in Eastern Poland – secondary data analysis. Procedia Eng. **18**, 299–305 (2017)
5. Karpova, N., Noskov, S., Toymentseva, I., Shvetsova, E.: Strategically supplier oriented management in the procurement process of JSC "Russian Railways". Problems Perspect. Manag. **16**, 14–27 (2018)
6. Karpova, N., Noskov, S., Toymentseva, I., Shvetsova, E.: Sources of rail transport efficiency in supply chains. Helix **8**(5), 3607–3614 (2018)
7. PJSC "Russian Railways": RR in figures (2020). http://www.rzd.ru/static/public/ru?STRUCTURE_ID=5232. Accessed 11 Mar 2020
8. Romanova, A., Luzhnov, Y., Vygnanov, A., Sokolova, E., Ivashkovska, N.: Resource-saving management on sections of high-speed railway lines. Procedia Comput. Sci. **149**, 297–300 (2019)
9. Štefancová, V., Nedeliaková, E., López-Escolano, C.: Connection of dynamic quality modeling and total service management in railway transport operation. Procedia Eng. **19**, 834–839 (2017)
10. Yan, Z., Li, X., Han, B.: Collaborative optimisation of resource capacity allocation and fare rate for high-speed railway passenger transport. J. Rail Transp. Plann. Manag. **10**, 23–33 (2019)

Finance of Public-Private Partnership in the Russian Federation

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Abstract. The paper deals with the role of finance in public-private partnership and the procurement system in the development of the real sector of economy. Under the conditions of market relations, the economy is becoming the determining factor of social development, and the state is intended to harmonize its interests with the interests of economic entities. One of the means of such harmonization is a public-private partnership (PPP) mechanism, which has been rapidly developed in the Russian Federation in recent years and is used primarily to implement significant state infrastructure and innovative projects. At the same time, the federal contractual system in procurement is aimed to ensure the public commitments of the Russian Federation. Under the contractual system, the state is interested in timely and complete performance of contracts concluded on behalf of the Russian Federation to supply products, works and services, as well as to save budget funds. In the current context, the achievement of these goals is due to such new factors as integration of public and private finance.

Keywords: Public finance · Private finance · Public-private partnership · Real sector of economy · State procurement

1 Introduction

Public investment in infrastructure and innovation projects can be considered as one of the measures to improve the Russian economy. However, this implementation is associated with many problems, and the most serious one is the lack of budget funds. The investment process allows to earn income in the future, but these days, searching for resources may not give the desired result. Gratuitous financial assistance is not always available, and bank loans are too expensive, when interest rates are high. As for private businesses, their interest in the project is often limited to very short terms, due to the rapid capital cycle and the short life cycle of individual enterprises.

Therefore, it is advisable to build an integrated model of the state financial policy to exploit advantages of public finance: large volumes, tax preferences, social benefits, financial control, and private investment. To implement such a policy, it is necessary not only to integrate managerial efforts of the state authority and commercial companies, but also build interaction between public and private finances. Such interaction creates approaches to define PPP finance.

One of the mechanisms to unify private business and state activities is the sphere of procurement that requires a state contractual system. It involves the state and municipal customers' activities in interaction with one another, including a commercial sector: suppliers (contractors, performers) and banks. There is a convergence of public and private finance in this interaction.

2   Methodology

The methodological and theoretical ground of the research is based on the fundamental propositions of economic theory, and public and corporate finance. The authors of the study examined the leading foreign and national researchers' works on public-private partnership and the public procurement system. The methodology used in this study combines general scientific methods (synthesis, analysis and collation, analogy, and historical and logical methods) and methods of empirical knowledge (classification, observation, description, and comparison).

3   Results

One of the relatively new forms of interaction in Russian practice is public-private partnership. Interaction between public and private finance can be carried out through the use of the following instruments: budget subsidies, lending, shared and joint participation, tax and other allowances, and contractual system in the field of procurement. PPP is broadly defined in the national literature as an institutional and organizational alliance between the state and business in order to implement national, international, large-scale and local, but always socially significant, projects in a wide range of areas.

It is important to mention that public-private partnership is a specific relationship that has a number of features which affect the finance organization as:

– *PPP subject of is state and municipal property, as well as the services provided by the state and local authorities,*
– *PPP is formed by a special contract, and its life cycle includes not only the stages to build and place the unit in operation, but also the process to make a profit for the investor by meeting the society needs in the project products,*
– *a mandatory condition for PPP is the state and private companies' co-financing and risk sharing between them (sometimes the project can be 100% funded by the private sector),*
– *PPP project is carried out within a certain period established under the contract, but the partnership can be continued on the basis of a new contract,*
– *distribution of financial risks and costs, as well as results achieved, which takes place among the parties within predetermined proportions.*

Basically, the state is the introducer of PPP, that is to say, it invites businesses to participate in the implementation of socially significant projects, but not vice versa. The main forms of PPP in the economy and management of public and private finance include: mutually beneficial forms of interaction between the state and business, state

contracts, state assets lease, financial leasing, establishing and operation of joint public-private enterprises, implementation of production sharing agreements, and conclusion of concessionaire agreements.

The scope of public-private partnership is very diverse, from road building to hospitals and universities construction. Improving the PPP system makes it possible to increase efficiency and competitiveness of a country in the world market. Consequently, PPP finance is a form to build money relations where the participants are the state and specific economic entities. PPP finance is a set of economic relations concerning the formation and distribution of financial resources, which are necessary to the state and economic entities for implementing socially significant projects. The need to form PPP is due to its profitability and effectiveness for both participants: public authorities get additional opportunities to solve their specific tasks, and business gets favorable economic management conditions and guarantees for profit. At the same time, PPP is a way to avoid the extreme forms of relations between business, government and society, when they range from privatization to nationalization, depending on the economic cycle. A significant state contribution to the PPP project is granting of a monopoly right to its implementation. However, in exchange for it, the state demands the right to interfere in affairs. Such intervention takes various forms: first of all, tariff and price regulation. Under the conditions of PPP, business is not free to determine the price of its services, since monopoly privileges and protection from competitors provided by the state are the ground to obtain the natural monopolist status. Public-private partnership has a number of advantages that make it possible to effectively implement infrastructure projects, taking into account the strengths of each partner.

The main advantages of PPP finance in Russia are:

– budget savings,
– overcoming problems related to insufficient budget funding,
– use of private investors' experience in project management,
– flexible and balanced risk sharing between the parties of the PPP agreement,
– improvement of services quality to the public.

The PPP advantage is that the state uses the private sector efficiency in the construction process. It is achieved through a system of payments that are linked to the phased implementation of work within the time specified. If these terms are not respected, the agreement includes fines. PPP contracts typically define rights and obligations regarding the design, build, operation and maintenance of infrastructures and the mechanisms for their supervision but also may include provisions about tariffs, access and interconnection rights or levels of service, conditions that are conceptually considered as economic regulation [4].

Another advantage is costs improvement during the entire life cycle of the project. A private investor is responsible for operating costs in well prepared PPP contracts. This leads to the fact that the investor is interested in the highest quality of construction in contrast to conventional projects where different companies carry out building and operation. The advantages also include the provision of services focused on qualitative results. Since in infrastructure PPP projects, the investor depends on payments by the population or the concessor (related to the results of PPP object operation), the private

sector is directly interested in the high quality of service provision. On the other hand, there is a number of risks that participants of public-private partnerships have to face.

These risks include a lower quality of control and management compared to conventional projects. This is due to the long terms of PPP contracts and complex project management, which does not have enough mobility to adapt to rapidly changing external conditions. Financial risks are an integral part of public-private partnership projects, since financial flows in such projects depend on a number of factors which are very difficult to predict. Depending upon the national legislation, there may also be problems with changing the essential terms of agreements, which are required to be included due to the force majeure circumstances or unethical practices at the hands of one of the parties. The practice to use PPP in a number of foreign countries shows that this mechanism is applied when the state and business have intercomplementary interests, but they are not able to perform all alone and independently of each other.

Concessionary partnerships are successfully developed in transportation (roads, railways, airports, ports, and pipeline service), social infrastructure (health, education, entertainment, and tourism), housing and utilities (water, electricity and gas supply, water cleaning, etc.) and other areas (prisons, defense, and military facilities). At the same time, the leading position in the total number is occupied by projects implemented in transportation and social infrastructure.

As for increasing the role of the state to develop the real sector of the Russian economy, as a system of public procurement, we can mention the following. Under the conditions of the contractual system, the integration of public and private finances is observed. It is clearly evident in the expansion of the bank guarantees to ensure the performance of government contracts.

An application for participation in a competition or auction may be made either through a cash deposit or a bank guarantee, that is to say, at the option of the participants. Starting from January 1, 2014 to ensure tender security and performance of contracts, participants of procuring activity can provide bank guarantees issued exclusively by those banks that are included in the list of banks, according to Article 176.1 and Article 74.1 in Tax Code of the Russian Federation [11, 12].

Generally, it can be noted that commercial companies, participating in the contractual system as suppliers, seek to obtain budget funds in order to produce goods and perform labour. The state, under the conditions of the contractual system, should not only have budget savings, which is achieved by selecting a supplier on a competitive basis, but also timely execution of contracts. Therefore, to ensure their performance, funds of commercial banks, which are guarantors of the work performed by contractors, are attracted and used [8]. As a result, there is an active interaction and integration of public and private economic finance.

A bank guarantee, offered by a participant of procurement activity to ensure tender and closed auction security or contract performance must be included in the bank guarantees register [5]. According to Decree of the Government of the Russian Federation of November 8, 2013, No 1005 "On bank guarantees used for the purposes of the Federal Law "On the contractual system in procurement of goods, works, and services to ensure the state and municipal needs", the function of maintaining the

register of bank guarantees is executed by the Federal Treasury on the official website of the Russian Federation [3].

As the federal executive authority, the Treasury of Russia is currently performing the function of maintaining the register of bank guarantees, and the process of close interaction between public and private finances also clearly demonstrates it.

It should be noted that under the current conditions of the contractual system, the issues to increase participants' responsibility for the contract execution, intended use of payments in advance, and bringing budget funds to the real sector of the economy are becoming urgent. Therefore, it is important to shift in emphasis from follow-up financial control to preliminary and current monitor, intense control of the Russian Treasury over state contracts execution, and building the legal and organizational basis for the mechanism to support state contracts by the Treasury.

The practice of Treasury support for contracts of corporate bodies' that are not participants of the budgeting process provides for payment under the state contracts only with the authorization of Federal Treasury through the opened checking accounts. This ensures maximum control over the budget funds that are granted with confirmation of their use in accordance with the conditions and purposes they were provided to performers (contractors). This is another important aspect of the interaction between public and private finance that makes it possible to identify and assess possible risks, prevent financial misconduct before it occurs, and avoid non-execution of the government contracts.

4   Discussion

The problems of public-private partnership development in the current economy, its role in forming the innovative component of the country's economic system and improving this country's competitiveness are constantly in the focus of many scientists' attention.

The issues of how to develop public-private partnership in the innovation sphere are considered in the works of Cheng, Wang, Xiong, Zhu, Cheng [2]. The authors, using the example of different countries, proved that the mechanism to form PPP resources differently depends on the state sustainable development. Along with bank lending and tax preferences, public-private partnership is an effective form to finance small and medium-sized businesses. Such points are reflected in the works of the following authors: Luo, Chen and Liu [9]. Hueskes, Verhoest and Block consider the sustainability of projects implemented under PPP. This study identifies varios options for governing for sustainability [6]. Korab-Karpowicz considers PPP as a tool to deal with international issues. PPPs can lead to the increase of both the effectiveness and the legitimacy of global governance in terms of democratic participation and accountability [7].

Some aspects of the state contractual system are presented in the works of foreign authors such as Buchanan [1] and Williamson [13]. Tammi, Saastamoinen and Reijonen consider public procurement as a means of innovation. In their research, the scientists determine the features of the relationship between competition and the innovative activity of small and medium-sized businesses [10]. This paper contributes to the literature on the role of public procurement in encouraging innovations in the

economy by empirically examining how the in verted-U relationship between competition and innovation is related to SME behavior in public procurement [10].

5   Conclusion

The lack of national practice in interaction between public and private finances is a significant obstacle to form and develop an effective model of the state financial policy through the use of current market methods and tools. In turn, this development is impossible without studying the world experience and adapting it to the Russian conditions. The successful solution of this task will allow to find new sources of financial resources, increase the investment attractiveness of the Russian Federation, and ensure the expansion of the innovation sector. Development of this process is aimed at increasing the profit of commercial companies, which is the basis to provide money to the budget at all levels of the country's budget system, social insurance funds, and national welfare. Consequently, creating optimal conditions for investment activity is an important factor for economic growth. In this regard, the issue of investor protection and risk management of investment projects is becoming more and more urgent.

The main factors hindering the development of PPP finance in Russia include:

– changing the "rules" in the project implementation process,
– low level of competitive selection of projects and lack of actual competition,
– insufficient transparency of project management procedures and poor qualification of state and municipal employees in the field of project management,
– low borrowing capacity of regions and municipalities,
– unclear division of possible risks and responsibilities when they occur.

The limiting factors can often include difficulties to define the roles and tasks that private institutions should assume, as well as the associated responsibilities for results. In the near future in Russia, the development of PPP finance will be carried out at the expense of projects which:

– have regional and interregional significance (building a modern infrastructure of the national innovation system); in particular, they are the projects that are aimed at developing a network of technological parks, business incubators, and technology transfer centers,
– are related to improving competitiveness of the basic industries such as energy, oil and gas, and chemical sector,
– develop the mineral resource base and increase efficiency of resource exploitation including projects to create high-tech enterprises for extraction and processing of natural raw materials,
– are aimed at restructuring the economy of non-diversified communities, which can be financed by attracting budget allocations from the Investment Fund of the Russian Federation,
– are focused on developing competitive agriculture and transport infrastructure, in particular, high-speed rail passenger traffic and regional airport networks.

As a result, the trends in the state financial policy of the Russian Federation noted above reflect beneficial transformation in the relations between public and private finance and the emergence of PPP finance. This all enriches the essence and form of appearance of these relations in the public finance system. It can also be noted that the interaction between state and municipal customers and suppliers (contractors), banks, and Federal Treasury bodies generates integration of public and private finance which ensures contractual system effectiveness.

References

1. Buchanan, J.: Is economics the science of choice? In Streissler, E. (ed.) Roads to Freedom: Essays in Honor of F.A. Hayek, pp. 47–64. Routledge&Kegan, London (1964)
2. Cheng, Z., Wang, H., Xiong, W., Zhu, D., Cheng, L.: Public-private partnership as a driver of sustainable development: toward a conceptual framework of sustainability-oriented PPP. Environ. Dev. Sustain. (2020). https://doi.org/10.1007/s10668-019-00576-1. Accessed 20 Mar 2020
3. Decree of the Government of the Russian Federation of November 8, 2013, No 1005 "On bank guarantees used for the purposes of the Federal Law" "On the contractual system in procurement of goods, works, and services to ensure the state and municipal needs" (2013). http://base.garant.ru/70502258/. Accessed 20 Mar 2020
4. Diaz, G.R.: The contractual and administrative regulation of public-private partnership. Util. Policy **48**, 109–121 (2017). https://doi.org/10.1016/j.jup.2016.04.011
5. Federal Law of April 5, 2013 No 44-FL «On the contractual system in procurement of goods, works, and services to ensure the state and municipal needs» (2013). http://www.consultant.ru/document/cons_doc_LAW_144624/. Accessed 20 Mar 2020
6. Hueskes, M., Verhoest, K., Block, T.: Governing public-private partnerships for sustainability: an analysis of procurement and governance practices of PPP infrastructure projects. Int. J. Project Manag. **35**(6), 1184–1195 (2017)
7. Korab-Karpowicz, W.J.: The united citizens organization: Public-private partnerships in global governance. Research in Globalization (2020, in Press). https://www.sciencedirect.com/science/article/pii/S2590051X20300010. Accessed 20 Mar 2020
8. Kovaleva, T.N., Milova, L.N.: Integration of public and private finance in the field of public procurement. In: Sotova, A.S. (ed.) Proceedings of the International Scientific and Practical Conference «Development and Interaction of the Real and Financial Sectors of the Economy in the Context of Globalization», pp. 343–345. Orenburg State University, Orenburg (2019)
9. Luo, P., Chen, B., Liu, F.: Investment and financing for SMEs with bank-tax interaction and public-private partnerships. Int. Rev. Econ. Finance **65**, 163–172 (2020)
10. Tammi, T., Saastamoinen, J., Reijonen, H.: Public procurement as a vehicle of innovation – what does the inverted-U relationship between competition and innovativeness tell us? Technol. For. Soc. Change **153**, 119922 (2020)
11. Tax Code of the Russian Federation (Part 1), July 31, 1998, No 146-FZ (1998). http://www.consultant.ru/document/cons_doc_LAW_19671/. Accessed 20 Mar 2020
12. Tax Code of the Russian Federation (Part 2), August 5, 2000, No 117- FZ (2000). http://www.consultant.ru/document/cons_doc_LAW_28165/. Accessed 20 Mar 2020
13. Williamson, O.: The theory of the firm as governance structure: from choice to contract. J. Econ. Perspect. **16**(3), 172–173 (2002)

Economic Security Theory: State Support for Real Sector and New Political Economy

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Abstract. This article investigates various views on the problems of ensuring the economic security, presented in both Russian and international scientific literature. These views are often contradictory and do not cover the entire problem as a whole. Concepts and categories used by researchers are often not fully formed. This paper presents the political and economic analysis of the theory of economic security. It is proposed to use a conceptual spatial approach to overcome the existing contradictions. This approach is theoretically justified, since the research objects are not only economic entities (individuals, households, firms, municipalities, federal subjects, sovereign states), but also economic objects (phenomena and processes). It is proposed to apply this approach to the analysis of state support for the real sector of the economy. The methodological basis of the research includes methods of new political economics. The author takes into account the problem of state support development for subjects of the real reproductive process.

Keywords: Methodology of economic science · New political economy · Real sector of the economy · Theory of economic security · Spatial approach · State support

1 Introduction

The turbulence of maintaining and developing the economic security of the Russian macroeconomic system determines the economic sovereignty of our country. The question of whether our economy is sovereign was raised at the economic department of Moscow State University 10 years ago. A monograph was published under the editorship of Osipov, Sinelnikov and Zotova [11]. In general, the country's economic security can be considered as a condition for self-sufficient development of the national economy. But what is the essence of the category of economic security as an economic category?

Economic security is often defined as guaranteed protection of national interests and socially oriented development of a country [1]. Let us, however, question this thesis. If the economy is a system, then statics and dynamics are not friends in it. Scientific articles also tend to avoid realities of the public life. But the problem of ensuring the national economic security and its essence cannot be fully understood without reference to real facts. The identification of socio-political factors of the society instability, their recognition and not only economic threats and risks that are traditionally considered by scientists, will form the theory of economic security in close

continuity of the theory and socio-political practice, taking into account interests of different subjects of economic relations [6], and the priority of the state support of the real sector of the economy. Otherwise, "economic security" as a category of the economic science is not the security of economic entities, countries, regions, enterprises, organizations, but the protection of nature and the human from the operational processes (business processes).

2   Methodology

Creating a theory of economic security within the framework of maintaining and developing the national security is an attempt to understand the system of economic sovereignty. It should be emphasized that while economic sovereignty has been studied by many foreign and domestic scientists, economic security abroad is not studied. It may also be so because the economic security is not an independent problem, but a dependent part of the overall security of the existence and functioning of an institutionalized society as a state.

Apparently, the question of creating a theory of economic security is caused by the presence of a mass of near-scientific conversations about types of industrial security (energy, food, etc.), similar to conversations about types of capital (technological, technical, cultural, organizational, etc.). There are even different methods for determining threshold values, for example, food security or energy security, which are based on production indicators (not consumption or consumption prices, etc.).

This leads to the possibility of "pressure" on the population in the form of a pension policy, restrictions on energy consumption, restrictions on housing, taxes on buildings in suburban areas, etc. And why is the consumption of water and air not regulated by social norms?

Is there no theory of economic security today? What then is presented in the content of textbooks on economic security, for example, in the textbooks prepared by Senchagov's team from the Institute of Economics of the Russian Academy of Sciences [13], as well as in the mass of articles on economic security issues [2, 4, 5, 9, 14].

So, the question is whether the theory of economic security is necessary. Who is it useful for? How does it relate to the modern role of the state in the economy, and the state support for its real sector?

3   Results

The possible answers are based on a list of subjects (hence the types of security) and a list of threats. Paradoxically, today there is not the slightest factual reason to assert that the problem of creating a theory of economic security has been satisfactorily solved. We need a theory of economic security protecting people from internal threats. We will name the most significant threats. These include the development of distorted economic relations, the "vulgarization" of pensions, the "optimization" of healthcare and education, the growth of managerial personnel as a commodity with a load on the people's

trust in the president, and the productive impotence caused, in particular, by the lack of the state support for the real sector of the economy.

Why may some types of economic relations be considered as a threat to the Russian economic security? Because the political economy defines economic relations as one side of the production way of material products and conditions for the human life [10].

Structuring economic relations into technical-economic, socio-economic, and organizational-economic ones [8], plus an assessment of the pace, rhythm, and stages of the development of organizational-economic relations allows us to identify very productively some of them (with appropriate characteristics) as threats to the economic security. This methodological approach is especially important when analyzing deformations of economic relations, which allows distinguishing such types of deformed economic relations "arvarny", "refouler" ones (refouler is a type of dredging machine that transfers selected soil immediately to the shore, through a special sleeve with a conveyor inside).

Disclosure of their content as a threat to the maintenance and development of the country's economic security can become part of the theory of economic security. Here there are just a few examples that illustrate the proposed approach. The first example is from the sector "energy security" outside of its traditional interpretation. Here (as in housing and utilities), there are "refouler" economic relations, when there are intermediaries between producers and consumers (sales companies).

We remember the statements made by the Russian Prime Minister Vladimir Putin to the state-owned company JSC "RusHydro" after a terrible tragedy that occurred in 2009 at the Sayano-Shushenskaya hydroelectric power station. Vladimir Putin said that from 352 people of the management staff of the energy complex checked after the accident, 169 officials have affiliation with 385 commercial organizations. There are far from isolated cases when the energy complexes of entire regions of the Russian Federation are controlled by family clans. From this example, there is considerable material for the development of the theory of economic security. Now let's give another example from the "food security" sector.

We called deformed economic relation with the term "arvarny" economic relations. Arvarny economic relations arise in the destruction process of a created food product or its withdrawal from a specific reproductive system. The mass media provides a lot of illustrations of arvarny relations: the destruction of black caviar obtained by poachers; the destruction of meat products, cheese, and apples imported to Russia illegally.

Here are the events of October 2018. Kamchatka is littered with tons of rotting salmon. What comments did the Deputy Prime Minister of the Association of fish market enterprises Alexander Fomin give on this situation? He explained that fishermen worked in the sea according to the usual scheme for the required number of days. It became necessary to finish the catch earlier, realizing that they had already obtained enough raw materials for processing. As a result, the catch is 540 thousand tons, which is 2 times more than usual [12]. It seems that the problem is a fault of the fish itself. Probably, some of the problems could be solved by changing the role of the state in the modern economy.

4   Discussion

A theory of economic security is needed, but it should be structured according to the types of threats and economic activities. This position was voiced by Kuznetsova, doctor of economics, professor of economic security of Moscow University of the Ministry of the Interior Affaires named after V. Kikotya in the report "Theory of economic security in the evolutionary development of modern science" on Senchagovsky readings in April 2019 [3].

Are food, information, financial, and energy securities types of the economic security? No, they are not! Because these are types of security, but not types of the economic security.

Economic security is the ability to function for achieving goals and objectives of a system without disrupting its functioning and deforming its goals. This is risk management and prevention (protection) from threats, elimination of consequences from the aftereffect of threats, i.e. from any deviations in functioning, return to a specified state. Protection as a warning (in humans – prevention). Protection as a return (in humans – treatment). Protection as (quasi-strength of functioning) an ability to ignore threats (in humans – immunity). Hence the importance of increasing the modern role of the state and developing the state support for the real sector of the economy.

5   Conclusions

The definition of the content for the concept "economic security", and especially the essence of the category "economic security" (as a category of economic science) "branched out" into a huge number of areas. In particular, the question of whether the word "economic" is related to the economy (the goal is to protect economic interactions) and/or to nature (the goal is to protect the nature from consequences of the economic interactions development). That is, the economic activity of people in terms of inconsistency with the Nature laws is a threat to the Nature (and to humans as part of the Nature) and, consequently, economic security (Nature and Society) is considered as an appropriate economic activity of people.

We will try to determine approximate elements of the theory of economic security that, in our opinion, require priority development:

– the concept of economic security of education systems of different levels,
– the analysis of the efficiency of the state support for the real economy,
– the role of the educational system in the economic security structure of municipalities, regions and the country as a whole,
– the relation between the formation of a personality, the prospects for its socialization and the economic security of the Russian society and the state,
– socio-cultural and value grounds for maintaining and developing the economic security,
– economic security as a factor for the formation of a new management paradigm for the socio-economic development (within the framework of the conceptual system of economic institutionalism),

– economic security in the context of interaction between a formal economy (in the legal field of the state), a "shadow" one (outside the boundaries of the legal and economic regulators, economic development from the state side) and an "informal" economy,
– the place and role of economic security in the structure of ensuring and implementing strategies for the development of economic systems of various ranks – the Russian economy, regional economy, and enterprise economy,
– maintaining the economic security in the context of innovative development of the Russian economy,
– economic security measure as a system of economic risks,
– prospects for reindustrialization of the Russian economy in the context of ensuring the country's economic security [7].

So, is it possible to create a theory of economic security? Yes, it is possible if the collective creativity is under the patronage of the Russian Academy of Sciences.

References

1. Bogomolov, V.A.: The Scale of the Shadow Economy and Economic Security of the Russian Federation. ROAT, Moscow (2010)
2. Eminova, N.E.: Investment security of Russia in the context of globalization. Russian Entrep. **16**(20), 3377–3386 (2015). https://doi.org/10.18334/rp.16.20.2013
3. Kuznetsova, E.I.: Theory of economic security in the evolutionary development of modern science. Ensuring Russ. Econ. Secur. Mod. Conditions **2**, 253–258 (2019)
4. Kuznetsova, Yu.L., Ipatieva, I.A.: Provision of the logistic system safety: issues and solutions. Russ. J. Retail Manag. **3**(2), 163–172 (2016). https://doi.org/10.18334/tezh.3.2.35407
5. Manyaeva, V.A., Piskunov, V.A., Fomin, V.P., Noskov, V.A.: Accounting policy for purposes of ensuring economic security of a commercial organization. Bull. Samara State Univ. Econ. **8**(154), 76–84 (2017)
6. Mikhalenok, N.O., Noskov, V.A.: Problems of Managing the Development of Formal and Informal Institutions in the Education System. SNC RAN, Samara (2007)
7. Noskov, V.A., Chekmarev, V.V.: The issue of ensuring economic security in the process of re-industrialization. Innov. Dev. Econ. **2**(38), 340–346 (2017)
8. Noskov, V.A., Chekmarev, V.V.: Political economy assessment of the educational system promotion in Russia in the conditions of digital economy formation. In: Ashmarina, S., Mesquita, A., Vochozka, M. (eds.) Digital Transformation of the Economy: Challenges, Trends and New Opportunities. Advances in Intelligent Systems and Computing, vol. 908, pp. 518–528. Springer, Cham (2020). https://doi.org/10.1007/978-3-030-11367-4_52
9. Noskov, V.A., Nesterov, O.V.: Contradictions of the Russian economy in the context of economic security theory. In: Mantulenko, V.V. (ed.) Proceedings of the 18th International Scientific Conference "Problems of Enterprise Development: Theory and Practice", European Proceedings of Social and Behavioural Sciences, vol. 82, pp. 266–274. European Proceedings, London (2020). https://doi.org/10.15405/epsbs.2020.04.34

10. Noskov, V.A., Nesterov, O.V., Abramov, D.V.: A critical infrastructure background of the economic security of regional development. In: Ashamrina, S.I., Mantulenko, V.V. (eds.) Proceedings of the 2nd International Scientific Conference GCPMED 2019 "Global Challenges and Prospects of the Modern Economic Development", European Proceedings of Social and Behavioural Sciences, vol. 79, pp. 1039–1047. European Proceedings, London (2020). https://doi.org/10.15405/epsbs.2020.03.150
11. Osipov, Yu.M., Sinelnikov, Yu.S., Zotova, E.S.: Economic Sovereignty and Sovereign Economy. MAKS Press, Moscow (2007)
12. Putin, V.V.: Be strong: Guarantees of National Security for Russia. Editorial URSS, Moscow (2012)
13. Senchagov, V.K.: Economic Security of Russia: General Course. Delo, Moscow (2005)
14. Skipin, D.L., Bystrova, A.N., Kutyreva, E.V., Trufanova, K.N.: Corporate fraud: the essence, risks and impact on economic security of business. Russ. J. Entrep. **18**(22), 3605–3614 (2017)

Business Group Contradictions as a Factor of Integration into the Global Economy

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Abstract. The purpose of the article is to identify contradictions of business groups as a development source of the real economy sector and theoretical justification of tools for constructive conflict resolution in the context of globalization. To achieve this goal, the authors analyzed economic interests of stakeholders of Russian and foreign business groups, which allowed them to identify and reveal the economic essence of general, special and specific contradictions that determines the development of affiliated industrial enterprises and the dynamics of transnationalization of the real sector of the economy. The research work provides a theoretical justification for integrated planning and market tools for constructive resolution of business groups' contradictions, as well as suggests ways to improve planning tools for coordinating interests of Russian business group stakeholders in order to develop and transnationalize the real sector of the domestic economy.

Keywords: Business groups · Economic contradictions · Economic interest · Stakeholder

1 Introduction

In a globalized market infrastructure, under conditions of production and capital transnationalization, and the expansion of global value chains, business groups have a decisive influence on the development of real-sector enterprises. Institute of business groups concentrates enormous investment of resources, but the contradictions that exist between stakeholders undermine the meaningful use of these funds. The model of interaction of economic interests (that has developed in Russian business groups) blocks the development of industrial enterprises and hinders the transnationalization of the real sector of the domestic economy. Taking into account these problems, the research on contradictions of economic interests that develop in the course of business groups' economic activity, as well as the search for an optimal combination of market and planning mechanisms for their constructive resolution in the context of globalization, become particularly relevant. The development of business groups is given considerable attention in the works of modern economists. This range of research includes: factor analysis of the limit of expanding boundaries of the hierarchy [11, 15], problems of placing property rights [13, 14], changes in information flows and financial

markets in the context of globalization and their impact on the integration trends of business groups [6, 12], the relation of innovations with trends of changing firm boundaries [2, 3, 5, 8], analysis of the business groups' development in the process of structural transformations in the economy in the context of globalization [1, 9, 10]. Under-researched are issues associated with achieving constructive conflict resolution of business groups in the context of globalization based on a combination of planning and market instruments for the coordination of economic interests.

2 Methodology

In the context of globalization, the instability and heterogeneity of the institutional and economic environment is increasing, while factors of increasing the business competitiveness are innovations, development of human capital and increase in social activities. The activities of business groups in the process of adapting to these changes are contradictory. The contradiction of a business group is understood as an interaction of opposite, mutually exclusive economic interests of its stakeholders, concerning production, distribution, exchange and consumption, which at the same time are in the internal unity and interpenetration, being a source of self-movement and development of this business group. Business groups' contradictions arise as a result of the interaction of economic interests in several axes: "shareholders – experts", "shareholders – managers", "shareholders – shareholders", "professionals – managers" "shareholders – external stakeholders", "management – external stakeholders." Resolving contradictions of a business group from the perspective of the Eurasian perspective requires the formation of an integrated mechanism for coordinating economic interests – a planning and market one. The combination of planning and market tools will allow, on the one hand, to more effectively support functional trends in the development of business groups (the practice of socially responsible business, increasing competitiveness through investment in human capital and innovations) and, on the other hand, to counteract strengthening of dysfunctional trends – the disproportionate redistribution of income in favor of the parent holding, financial speculation, and opportunism of managers and shareholders. In general, the solution of a complex of contradictions consists in creating such conditions for the interaction of subjects of economic relations, in which it is possible to freely coordinate their interests, and its effectiveness largely depends on achieving the right balance or combination of the market and the plan.

3 Results

Based on the analysis of the specifics of interaction between stakeholders of Russian and foreign groups, it is concluded that in the context of globalization, business groups are characterized by the following general contradictions: between formal and real economic growth; between current and investment consumption. However, changes in the external environment during the period of financial globalization and, in particular, the global economic crisis allowed us to identify special and specific contradictions.

In the first case, these are contradictions between the social and economic performance of the business group; in the second case – between public and private forms of ownership (Fig. 1).
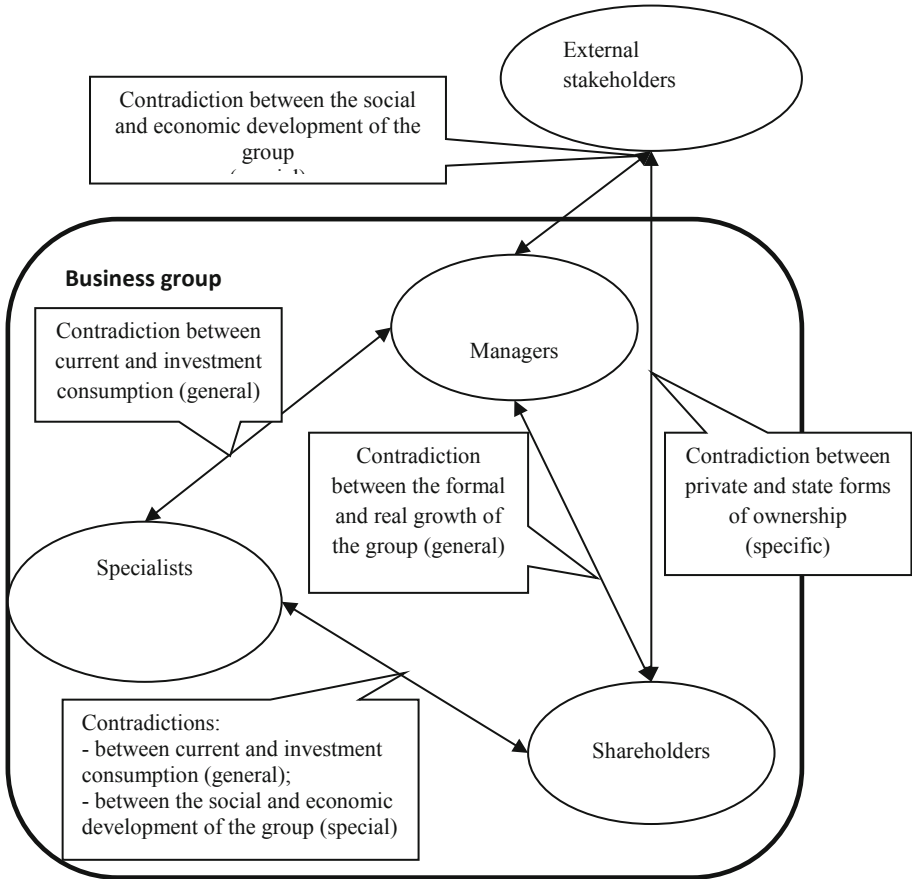
Fig. 1. Contradictions of a business group (Source: authors).

The Contradiction Between the Formal and Real Economic Growth of the Group. In the context of globalization, business groups are increasing investment in innovative development, but as a result of the faster pace of development and implementation of financial innovations, there is a relative independence of the movement of financial capital in relation to real capital. The growth of financial capital dominates. The development of this contradiction is facilitated by the tendency to dilute shares of large shareholders as a result of the business alliances formation. It is common for several groups to control individual key firms, which increases the likelihood of shareholders' conflicts and in some cases hinders the development of other firms in the industry chain. Another consequence is a reduction of the time horizon of large shareholders'

interests and strengthening of the managers' positions against this background. Strengthening the power of management, first, exacerbates a contradiction between income growth and investments in the real capital of the business group, and, second, expands the conflict field between the management levels in the business group hierarchy. As a result, the dynamics and structure of the group's growth are mainly influenced by the balance of managers' power factor, while the factor of economic efficiency becomes secondary.

The Contradiction Between Current and Investment Consumption. The economic practice of business groups indicates an increase in investments in human capital, however, this trend is accompanied by a growing disparity in the distribution of income of the group's firms. The multinational structure of the group is designed in such a way that income is redistributed in favor of controlling shareholders and top managers of business units, while the lost profit of specialists is not compensated by investments in human capital, which reduces incentives to work.

The Contradiction Between Social and Economic Efficiency. As a result of the institutionalization of the concept of corporate social responsibility, some business groups (transnational corporations), and later a number of sub-holdings, began to adapt the practice of socially responsible behavior, which allowed resolving contradictions between their internal and external stakeholders. However, social responsibility is characterized by a dual nature – as a significant tool for coordinating interests, it requires investments which causes a decrease in the competitiveness level of firms. As a result, there is a dilemma between the social and economic performance of the business group.

The Contradiction Between Public and Private Forms of Ownership. In the period 2008–2019, positions of state and quasi-state structures as shareholders and creditors of business groups in both developing and established markets have strengthened. Moreover, transnational state ownership has expanded at an unprecedented rate. Investments of sovereign funds from developing countries in the corporate control market in the amount of more than $ 91.5 billion led to the redistribution of part of the capital of multinational banks, investment funds, exchanges and transnational corporations from private business groups in the Western economy to public investors in developing countries. At the same time, the expansion of the financial base due to the state participation is accompanied by a decrease in incentives to increase the economic efficiency of investments. The business group, as a mechanism for coordinating the economic activity, is a meso-level planning and administrative mechanism. At the macro level, planning is implemented through the state regulation, while the market permeates the entire economic system.

Internal mechanisms of the business group aimed at resolving its contradictions are implemented in the field of corporate governance. Planning and administrative coordination of companies' activities within the group allows for a long time to smooth out contradictions of economic interests, preventing their development. Cross-meeting in the director boards is widespread among the group's firms, so that the implementation of the personal union mechanism helps prevent conflicts of interests between firms at different levels of the hierarchy, but from the point of view of the economic relations

development, this factor plays a rather negative role. The main mechanisms of self-regulation of the group in the field of conflict resolution should include ensuring the proportional participation of stakeholders in the income of firms, and in a broader sense – the group's adherence to principles of social responsibility. However, the corporate governance mechanisms that have developed in business groups are primarily aimed at protecting the contractual rights of management and the property rights of shareholders of firms located at the highest levels of the group hierarchy, while the economic interests of the management of ordinary firms, employees and external parties to conflicts are implemented on a residual basis. In this regard, the internal mechanism for resolving contradictions in some cases is ineffective.

Prerequisites for the transition of stakeholder relations to a new level are created when the state, institutions and mechanisms of global markets exert a disciplining influence on the group. In general, the role of the state is to create a framework for the constructive coordination of interests, institutionalization of incentives for the development of functional trends, and regulation of destructive trends in the development of business groups. The main instruments are corporate and antitrust laws and regulations that determine the movement of financial capital. The market ensures the participation of groups in the competition, however, given the actual status of business groups as a meso-level institution, the full implementation of the market mechanism in the process of resolving contradictions is possible only at the global level. In this case, the function of a "regulator" is performed by the labor markets and the global capital market, in particular the corporate control market. The incentive role belongs to institutions: exchanges, rating agencies, audit companies and institutional investors. The regulatory influence of the market mechanism in domestic markets is limited with the increasing market power of business groups, but the lack of competition in local markets is compensated by the openness of groups to forces of the global competition. According to the specifics of the Russia's economic development, we believe that the state's capacity as a regulator and its role in growing institutions should be taken into account. The optimal balance of planned and market mechanisms for coordinating interests varies depending on how the subject composition of the group's contradictions changes. The planned-market tools for resolving contradictions are differentiated for one or another axis of interaction between stakeholders.

Integrated Planning and Market Tools for Constructive Conflict Resolution of Business Groups. The analysis of contradictions of business groups allowed us to reveal some conditions for their constructive resolution, which are to ensure: proportional participation of subjects of contradictions in the income of the group's firms; medium-term balance of income and investments; implementation of principles of corporate social responsibility for the purpose of private redistribution of public goods. The creation of these conditions is based on the integrated impact of corporate governance instruments (dividend policy, incentive system for managers, staff pension programs, social investments), state macroeconomic regulation, self - regulation of global markets (stock indexes as an instrument) and institutional impact (ratings, audit control, etc.). Further, we present the implementation of these conditions in the framework of separate conflict areas of economic interests of Russian business groups.

Axis "Shareholders-Specialists". Coordination of interests in general is determined by the state regulation of labor relations. Corporate governance mechanisms are based on the staff participation in profits, management and ownership, as well as human capital development based on the group's investments in professional development, improving knowledge sharing mechanisms, social support programs for staff, and improving the group's corporate culture. The authors found that the development of functional trends is facilitated by the long-term ownership of fictitious capital in the form of staff pension if the shares of key firms are used for stimulation. However, this mechanism is negatively affected by the cyclical nature of financial markets.

Axis "Shareholders – Managers". When forming a group structure, a number of contradiction sources are excluded due to the division of ownership and management at the level of sub-holdings, but such a structure becomes effective when the incentive system for managers focuses on criteria of economic rather than financial efficiency, i.e. the productivity of factors and the structure of economic growth of the group are taken into account. A tool for coordinating interests is the inclusion of managers in the shareholders' list. Contradictions that have entered the conflict stage are resolved through the labor market. If a significant share of joint-stock ownership is concentrated by the management, a market for corporate control starts operating.

Axis "Shareholders – Shareholders". The resolution of contradictions depends on the effectiveness of the law in the field of dividend policy, but in case of a business group's collapse, the mechanisms of the corporate control market will be activated. The development of the real sector depends largely on the reallocation direction for resources of the group's firms. The regulatory role in this case is played, first, by the high level of legal protection tolls for investors' rights, which in the case of a group takeover of individual firms prevents the redistribution of cash flows of the absorbed firm in favor of the parent holding. Second, important is the state regulation of transfer pricing in order to bring intra-company and market prices into line.

Coordination of interests of shareholders, managers and external stakeholders of the business group is based on the integration of socially responsible behavior tools into one economic mechanism. The planned basis for this process is laid within the framework of the social budget and the corporate code of conduct of the business group, however, increasing the level of social responsibility of the group is facilitated by: legislative consolidation of environmental and social responsibility standards, tax incentives, public-private partnership in the field of socially significant projects. Russian business groups are adapting their social responsibility practices to meet demands of the global financial market to its participants. Stock indexes respond to information from social reports. That increases reputational risks in the context of globalization and provides stimulating pressure from institutional investors, audit companies and rating agencies.

The Main Directions for Improving Planning Tools and Coordinating Stakeholders' Interests in Russian Business Groups. Analysis of the dynamics of contradictions between Russian business groups in the process of transnationalization revealed that the ongoing constructive transformations of economic relations in Russian business groups as a whole are determined by the impact of global markets. The main factor

hindering the development of the real sector is the low potential of planning instruments for coordinating economic interests. Several key issues are highlighted. First, there are no trends in the formation of an employee-owner in Russian business groups. Second, there is an inefficient mechanism for transferring knowledge. Third, it is the orientation of the incentive system for managers to increase in the fictitious capital. Fourth, there is inefficient coordination of shareholders' interests within the framework of transnational alliances of business groups. Fifth, there is a low level of activity in implementing corporate social responsibility practices.

Axis "Shareholders – Specialists". It is necessary to increase the volume of social investments; encourage employees of the group's firms, and not only top managers of sub-holdings, to acquire equity shares of key transnational companies; and improve the efficiency of knowledge transfer mechanism based on the staff rotation between Russian and foreign firms of the group.

Axis "Shareholders – Managers". The growth of the group's real capital should be encouraged by introducing additional criteria for evaluating the performance of managers. These criteria should be based on integrated indicators of the economic efficiency that take into account changes in the labor productivity and the structure of investment in long-term assets and innovations. It is necessary to extend the time interval of remuneration programs up to 5 years.

Axis "Shareholders – Shareholders". The economic development of the real sector requires the expansion of transnational strategic alliances between business groups. Preliminary cooperation of groups in the framework of "soft" forms of integration will help to develop a mechanism for reconciling conflict interests, the implementation of which will stimulate the mutual development of partners in the conditions of the subsequent transformation of alliances into unions of groups.

Axis "Shareholders – Managers – External Stakeholders". Increasing the level of the information disclosure concerning the content of non-commercial activities of business group firms is required not only at the level of transnational corporations, but also at the level of firms serving them, as well as business groups in general. It is necessary to introduce the practice of making social and human capital investments by the head holdings of Russian business groups.

4 Discussion

Further research on the constructive resolution of contradictions in the development of business groups seems to be productive from the perspective of the concepts of integration of neoclassical and neoinstitutional schools, and the theory of financial capital. Scientific analysis of the dynamics of contradictions in the process of business group diversification is of particular interest [13]. Additional results will be obtained by introducing the risk management optimization factor into the analysis of economic interests of business group stakeholders when entering the corporate control market [14]. A number of researchers consider the transformation of the ownership structure in business groups, namely, the change in the ratio of private and state forms of ownership

[1, 10]. There is a tendency to strengthen the position of the state ownership by investing national wealth funds in fictitious capital of private corporations and banks. Of interest is the analysis of this trend in the context of general structural transformations of business groups from the Eurasian perspective [15]. The main trend in the development of the real sector in the era of globalization is the expansion of global value chains. Business groups are the main participants and coordinators of this process [9]. In recent years, one of the main goals pursued by Russian business groups through cross-border mergers and acquisitions is to control value chains based on the Russian natural resource potential. Thus, the issue on constructive resolution of contradictions of business groups in the conditions of forming new factors for the technological development of the real economy sector requires further research [4, 7].

5   Conclusion

The analysis expands scientific understanding of contradictions that determine the development of the real sector of the economy within business groups, as well as mechanisms for resolving these contradictions and development trends in the context of globalization. The article investigates tools for resolving conflicts of economic interests of business group stakeholders, which will allow this institute to ensure the development of the real sector of the Russian economy in the context of globalization. The formulated provisions, conclusions and recommendations can be used in practical activities of state bodies and corporate structures aimed at developing and improving tools for coordinating the economic interests of group stakeholders and creating economic incentives for the development of the real sector of the Russian economy.

References

1. Antipina, Z.P., Gordeeva, E.S.: Business groups, innovation and structural transformations in developing economies. In: Mantulenko, V. (ed.) Proceedings of the International Scientific Conference "Global Challenges and Prospects of the Modern Economic Development". The European Proceedings of Social & Behavioural Sciences, vol. 57, pp, 102–112. Future Academy, London (2019)
2. Bessonova, E., Gonchar, K.: Incentives to innovate in response to competition: the role of agency costs. Econ. Syst. **41**(1), 26–40 (2017)
3. Chepurenko, A.: Innovation entrepreneurship in transition economies: problems and outlook. Foresight STI Gov. **11**(3), 6–9 (2017)
4. Chetverikova, A.S.: Cross-border value chains in ferrous metallurgy: Russian participation. World Econ. Int. Relat. **62**(8), 97–103 (2018)
5. Golichenko, O.: Public policy and national innovation system failures. Econ. Issue **2**, 97–108 (2017)
6. Gupta, G., Mahakud, J.: Alternative measure of financial development and investment-cash flow sensitivity: evidence from an emerging economy. Financ. Innov. **5**, 1 (2019)
7. Kondratev, V.B., Popov, V.V., Kedrova, G.V.: Transformation of global value chains: experience of three industries. World Econ. Int. Relat. **64**(3), 68–79 (2020)

8. Lee, C.Y., Lee, J.H., Gaur, A.S.: Are large business groups conducive to industry innovation? The moderating role of technological appropriability. Asia Pac. J. Manag. **34**, 313–337 (2017)
9. McKinsey: Globalization in transition: the future of trade and value chains (2019). https://www.mckinsey.com/featured-insights/innovation-and-growth/globalization-in-transition-the-future-of-tradeand-value-chains. Accessed 15 Oct 2019
10. Morck, R., Nakamura, M.: Japan's ultimately unaccursed natural resources financed industrialization. J. Jpn. Int. Econ. **47**, 32–54 (2018)
11. Oh, W.-Y., Chang, Y.K., Lee, G., Seo, J.: Intragroup transactions, corporate governance, and corporate philanthropy in Korean business groups. J. Bus. Ethics **153**, 1031–1049 (2018)
12. Purkayastha, S., Kumar, V., Lu, J.W.: Business group heterogeneity and the internationalization-performance relationship: evidence from Indian business groups. Asia Pac. J. Manag. **34**, 247–279 (2017)
13. Singh, D., Pattnaik, C., Gaur, A.S., Ketencioglu, E.: Corporate expansion during pro-market reforms in emerging markets: the contingent value of group affiliation and diversification. J. Bus. Res. **82**, 220–229 (2018)
14. Yang, K., Schwarz, G.M., Multilevel, A.: A multilevel analysis of the performance implications of excess control in business groups. Organ. Sci. **27**, 1219–1236 (2016)
15. Zhang, L., Sjogren, H., Kishida, M.: The emergence and organizational persistence of business groups in China, Japan, and Sweden. Ind. Corp. Change **25**, 885–902 (2016)

Government Contract as State's Economic Support Instrument: Legal Regulation, Enforcement and Dispute

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Abstract. The article is devoted to the problems of the state contract as a tool of support to the real sector of the economy in the context of the analysis of certain issues of legal regulation, conclusion, execution and dispute of such contracts. The author, using the example of the Federal Law "On the Contract System in the Sphere of Procurement of Goods, Work, and Services for the Provision of State and Municipal Needs" (hereinafter referred to as the Law on the Contract System), analyzes the law enforcement practice on certain issues of concluding, executing, monitoring the execution of a state contract, its legal nature as a tool of support to the real sector of the economy. The research uses both general scientific research methods, and a formal logical, systematic method of cognition, a method of analyzing judicial practice. As a result of the work, the author singles out the characteristic features of the state contract as a tool of support to the real sector of the economy.

Keywords: Government contract · Public interest · State support · State customer

1 Introduction

Interest in this research topic shows in various scientific circles of the world community [12]. An analysis of foreign experience can be used to develop new approaches to organizing public procurement in Russia, presenting the issue of researching this experience as relevant [3]. An analysis of world experience shows that government contracts are an important tool for developing the market and supporting economic and social stability, as well as for ensuring growth in the real sector of the economy. State contract is one of the contract types to which the general provisions of the Civil Code of the Russian Federation [2] apply, as the question of its legal regulation, conclusion, dispute, invalidation is rather important. The conclusion of a state contract is a complex legal structure, which consists of procurement planning, documentation preparation, including of a draft contract, placing an order in a single information system, identifying the winner that will subsequently be the winner of the contract. All the conditions created by law are aimed at state support of the real sector of the economy, they are enforced to prevent the creation of competitive advantages in public procurement for some participants over others, and violation of competition rules.

2   Methodology

The methodological basis of the work is a combination of such general scientific research methods as the analysis of the phenomena studied and the synthesis of the research results, as well as induction and deduction. In the process of developing various aspects of the research topic, formal-logical, systemic methods of cognition were used. To define the concepts of public interest and explicit prohibition, the comparative legal method was used when comparing with related categories, the method of analysis of judicial practice.

3   Results

The subject of the study is the process of improving state contract as a tool of support to the real sector of the economy, and certain issues of the conclusion, execution, control of the state contract.

The law on the contract system regulates relations aimed at realizing state needs in order to support the real sector of the economy, increase the efficiency, effectiveness of procurement of goods, work, services, ensure transparency of state purchases, and prevent corruption and other abuses in the field of such purchases.

When making purchases, customers use competitive methods to identify suppliers (contractors) or purchase from a single supplier (contractor). Competitive methods of determining suppliers (contractors) are tenders (open tender, tender with limited participation, two-stage tender, closed tender, closed tender with limited participation, closed two-stage tender), auctions (electronic auction, closed auction), request of quotations, request of proposals. Paragraph 5 of Article 24 of the Law on the Contract System states that the customer selects the method for determining the supplier (contractor) in accordance with the provisions of Chapter 3 of this law. Moreover, the customer is not entitled to perform actions that entail an unreasonable reduction in the number of participants in the procurement. Purchasing from a single supplier does not apply to competitive procurement methods, the use of such a procurement method can only be carried out in cases established by Article 93 of the Federal Law № 44-FZ "On the Contract System in the Sphere of Procurement of Goods, Works, and Services to Ensure State and Municipal Needs" [5].

At the same time, the content of the specified legal provision provides for the customer the opportunity to conclude low cost procurements in cases where competitive selection procedures are impractical due to the inconsistency of organizational costs for the procurement of the purchase price itself. Based on law enforcement practice, the artificial "splitting" of a single procurement into many procurements in order to avoid public procedures does not meet the goals of introducing such an opportunity to conclude a contract without conducting competitive procedures. In accordance with paragraph 9 of part 1 of Article 93 of the Law on the contract system, the customer has the right to make purchases from a single supplier due to an accident, other emergency situations of natural or man-made nature, force majeure, in case of need for emergency medical assistance or medical assistance in urgent form, when the use of other methods for determining the supplier (contractor) requires much time and

thus is impractical. Part 2 of article 93 of the Law on the contract system states that in such a case placement of a notice on the purchase by the customer in a unified information system no later than five days before the date of conclusion of the contract is not required [5]. However, the customer is obliged to notify the procurement control body no less than one business day from the date of conclusion of such contract and justify the impossibility or inappropriateness of using other ways to determine the supplier (contractor), as well as the price of the contract and other essential terms of the contract.

In part 2 of Article 8 of the Federal Law № 44-FZ "On the Contract System in the Sphere of Procurement of Goods, Work, and Services to Ensure State and Municipal Needs", the prohibition set for customers, specialized organizations, their officials, procurement commissions, members of such commissions, and procurement participants to perform any actions that contradict the requirements of the Contract system law, including limiting competition, in particular, unreasonably limiting the number of procurement participants [5]. Failure to comply with the procurement procedure violates the rights of third parties - procurement participants with whom no contracts have been concluded as the advantage is given to a party that does not meet the requirements of the Law on the contract system. Based on the legal position of judges of the arbitration courts of the Russian Federation, a systematic interpretation of the provisions of the Law on the contract system indicates that state and municipal contracts pursue public interest and are aimed at meeting public needs through the use of budgetary funds. The law protects the public interests and the interests of other persons who are entitled to participate in the conclusion of state contracts on the basis of competitive procedures. In addition, in the preparation and execution of budgets, participants in the budget process, within the framework of the budgetary powers established by them, must proceed from the need to achieve specified results using the smallest amount of funds (economy). In accordance with paragraph 2 of Art. 168 of the Civil Code of the Russian Federation [1], a transaction that violates the requirements of the law or other legal act and, at the same time, infringes on public interests or the rights and interests of third parties protected by law is void if the law does not imply that such a transaction is disputable or other consequences of violation are not related to the invalidity of the transaction. The nullity of the transaction connects the literal meaning of the rule of law not with any violation of the law, but only with that which encroaches on the public interests or rights of the interests of third parties protected by law. According to paragraph 75 of the Resolution of the Plenum of the Supreme Court of the Russian Federation № 25 of June 23, 2015 "On the application of certain provisions of Sect. 1 of the Part One of the Civil Code of the Russian Federation by courts" [10], in relation to Articles 166 and 168 of the Civil Code of the Russian Federation, under the public interest, in particular, the interests of the uncertain circle of persons, ensuring the safety of life and health of citizens, as well as the defense and security of the state, and the protection of the environment. A transaction that violates explicit prohibition established by law is void as it harms public interests, for example, a pledge transaction or assignment of claims inextricably linked with the creditor's identity (clause 1 of article 336, article 383 of the Civil Code), insurance of illegal interests (Article 928 of the Civil Code of the Russian Federation) [2].

According to paragraph 18 of the Review of the Presidium of the Supreme Court of Russia of June 28, 2017, "Review of the judicial practice of applying the legislation of the Russian Federation on the contract system in the field of procurement of goods, works, services to meet state and municipal needs" [11], violation of prohibition (concluding transactions for an amount exceeding 100 thousand rubles with a single supplier and concluding an agreement with a party that does not comply with the requirements of the law) indicates the nullity of the transaction.

Currently, article 93 of the Federal Law № 44-FZ "On the Contract System in the Sphere of Procurement of Goods, Work, and Services to Ensure State and Municipal Needs" regulates cases of procurement from a single supplier (contractor), according to which procurement from a single contractor can be carried out by the customer in the event of procurement of goods, work or services for an amount not exceeding 300 thousand rubles (clause 4 of part 1 of this article). In our opinion, the explicit prohibition is set by paragraph 4 of part 1 of Article 93 of the Federal Law № 44-FZ "On the Contract System in the Sphere of Procurement of Goods, Work, and Services to Ensure State and Municipal Needs": the annual volume of purchases that the customer is entitled to carry out on the basis of this paragraph should not exceed two million rubles or should not exceed five percent of the total annual volume of purchases customer and should not be more than fifty million rubles [5].

We believe that the part 4 of paragraph 1 of Article 93 of Federal Law № 44-FZ "On the Contract System in the Sphere of Procurement of Goods, Work, and Services to Ensure State and Municipal Needs" does not establish any other explicit prohibition on the conclusion of a transaction not exceeding 300 thousand rubles [5]. The specified position is confirmed by the executive authority, the competence of which includes state regulation in the field of the contract system – the Ministry of Economic Development of the Russian Federation in the explanations of the Ministry of Finance of the Russian Federation. It seems that the interpretation of the "small volume" procurement as a single lot is an assessment of the activities of the parties to the transaction by bodies and persons who oversee and monitor compliance with the legislation on the contract system. The concept of "artificial split of procurement" is absent in the legislation, it is vague, it is formulated by law enforcement bodies independently for each case under consideration, and therefore cannot be perceived as an explicit prohibition.

4   Discussion

In Russia, public procurement operates a shorter period compared to other countries, so it is relevant to search for effective ways to address the participation of suppliers of goods, works, services in public procurement [13]. Public procurement and the subsequent conclusion of state contracts fulfill several important functions in regulating the economy as reproduction, stimulating, and the function of price regulation, as well as strategic and innovative functions [9]. So, in Sweden, government procurement of organic food has led to a significant effect in agricultural policy [6]. In China, the effectiveness of public procurement is determined not only by price, but also by the time and labor aspects of efficiency [15]. In Russia, every year there is an increase in

the number of government contracts, but problems with their use continue to be important [7]. One of the most pressing problems associated with the use of state contracts in different countries [8], including Russia, is the assessment of the actions of customers selecting public procurement participants for the interests of society and the state [14]. We believe that government contracts cannot be considered as those violating public interests if their conclusion does not violate the principles of openness, transparency, competition on them is unlimited, and if work was carried out in accordance with a publicly accepted, openly posted regulatory act, all information about the contracts was openly placed in the public procurement information system.

Also, government contracts cannot be assessed as violating public interests, if the conclusion of the contracts in question did not lead to restriction of competition, that is, to the emergence of facts and circumstances specified in the Federal Law № 135-FZ "On Protection of Competition" [4]: a reduction in the number of business entities that are not included in one a group of persons in the product market, an increase or decrease in the price of a product that is not related to relevant changes in other general conditions for the circulation of goods in the product market, refusal of business entities, not included into one group of persons, from independent actions on the commodity market, determination of the general conditions for the circulation of goods on the commodity market by agreement between business entities or in accordance with binding instructions of another person or as a result of coordination by business entities not included in the same group of persons, their actions on the commodity market, other circumstances that create the possibility for an economic entity or several economic entities to unilaterally influence the general conditions Commodity circulation in the commodity market, and the establishment of public authorities, local authorities, organizations involved in the provision of public and municipal services, with the participation in the provision of such services requirements for goods or business entities not covered by the legislation of the Russian Federation. The conclusion on absence of signs of restriction of competition may follow if the antimonopoly body does not find signs of violation of the law on protection of competition when considering the circumstances associated with the conclusion of state contract in the process of conducting inspection. Also, a similar conclusion can follow if the body authorized to monitor compliance with the requirements of the legislation on the contract system does not reveal the fact of violations in determining the price of the contract when considering an administrative case and there is no proof of the presence of signs of violation of the principle of efficient spending of budget funds in the actions of the customer, and therefore there is no reason to conclude there was violation of public interest.

5   Conclusion

The state contract as an instrument of support to the real sector of the economy has a special place in the system of support tools, it is an independent type of civil contract with special features: the presence of special entities; the presence of the special nature of legal relations arising in the process of its conclusion and execution; the special purpose of the conclusion is to satisfy state needs; special conditions for concluding

and executing a state contract. By increasing the requirements of state customers for suppliers' products, work, services of public procurement participants, improving the legal regulation of state contracts, the state contributes to the formation of demand for modern products. State contracts form the economic and legal space in which there are opportunities for the development of all economic entities, including the real sector of the economy.

References

1. Civil Code of the Russian Federation (Part One) 51-FZ (1994). http://www.consultant.ru/document/cons_doc_LAW_5142/. Accessed 29 Apr 2020
2. Civil Code of the Russian Federation (part two) №. 14-FZ (1996). http://www.consultant.ru/document/cons_doc_LAW_9027/. Accessed 29 Apr 2020
3. Esqueda, O., Ngo, T., Susnjara, J.: The effect of government contracts on corporate valuation. J. Bank. Financ. **106**, 305–322 (2019)
4. Federal Law № 135-FZ "On Protection of Competition" (2006). http://www.consultant.ru/document/cons_doc_LAW_61763/. Accessed 29 Apr 2020
5. Federal Law № 44-FZ "On the Contract System in the Sphere of Procurement of Goods, Works, and Services to Ensure State and Municipal Needs" (2013). http://www.consultant.ru/document/cons_doc_LAW_144624/. Accessed 29 Apr 2020
6. Lindström, H., Lundberg, S., Marklund, P.: How green public procurement can drive conversion of farmland: an empirical analysis of an organic food policy. Ecol. Econ. **172**, 106622 (2020)
7. Melnikov, V., Lukashenko, O.: Developing the public procurement system in the post-soviet and modern Russia: challenges and opportunities. Terra Economicus **15**(4), 109–126 (2017). https://doi.org/10.23683/2073-6606-2017-15-4-109-126
8. Nesterova, N., Hans, Q., Streng, J., van Dijk, L.: Public procurement as a strategic instrument to meet sustainable policy goals: the experience of Rotterdam. Transp. Res. Proc. **46**, 285–292 (2020). https://doi.org/10.1016/j.trpro.2020.03.192
9. Popova, O.: Public procurement as an effective tool for regulating the development of the regional economy. Econ. Enterp. Reg. Ind. **6**(90), 61–63 (2014)
10. Resolution of the Plenum of the Supreme Court of the Russian Federation № 25 "On the application of certain provisions of Section I of Part One of the Civil Code of the Russian Federation by courts" (2015). http://www.consultant.ru/document/cons_doc_LAW_181602/2015/. Accessed 29 Apr 2020
11. Review of the judicial practice of applying the legislation of the Russian Federation on the contract system in the field of procurement of goods, works, services to meet state and municipal needs "(approved by the Presidium of the Supreme Court of the Russian Federation) (2017). http://www.consultant.ru/document/cons_doc_LAW_218867/. Accessed 29 Apr 2020
12. Swensson, L., Tartanac, F.: Public food procurement for sustainable diets and food systems: the role of the regulatory framework. Glob. Food Secur. **25**, 100366 (2020)
13. Tedeeva, Z.: Analysis of public procurement mechanism when implementing financial policy of state. In: Bataev, D.K.-S., (ed.) SCTCGM 2018 - Social and Cultural Transformations in the Context of Modern Globalism. The European Proceedings of Social and Behavioural Sciences, vol. 58, pp. 1166–1174. Future Academy, London (2019)

14. Voronin, B., Chupina, I., Pustuev, A., Semin, A., Potekhin, N., Lysenko, Yu., Rubaeva, O., Bukhtiyarova, T.: State procurement mechanism for agricultural products in modern Russia. Int. J. Adv. Biotechnol. Res. **8**(4), 1363–1369 (2017)
15. Wang, Q., Zhang, R., Liu, J.: Price/time/intellectual efficiency of procurement: uncovering the related factors in Chinese public authorities. J. Purch. Supply Manage. **26**, 100622 (2020)

Subsidiary Liability of Controlling Persons of Industrial Enterprises: Main Legal Conflicts

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Abstract. This work describes specific features of applying the institute of subsidiary liability of controlling persons of the enterprise. Creditors who have claims of non-fulfillment of obligations have been given the opportunity to pursue unlimited civil law actions against persons that are not directly related to them, which creates a certain imbalance and hinders the legitimate interests of other participants in the legal relations under consideration, in particular, the interests of managers. This research is aimed at studying the state and practice of applying the institute of subsidiary liability of controlling persons at enterprises and the doctrine of "removing the corporate veil" in Russia using methods of system and comparative analysis. The conducted research allowed us to establish a significant discrepancy between the Russian and international practices of applying the doctrine of "removing the corporate veil", and the presence of a clear imbalance in favor of creditors. As a result, it is concluded that there is a need for detailed regulation in the relevant legislation of terms and procedures for applying subsidiary liability of controlling persons at enterprises. The methodology of the research comprises historical, comparative, formal-legal and functional methods, systemic approach.

Keywords: Bankruptcy · Controlling persons · Doctrine of "removing the corporate veil" · Liability of controlling persons · Subsidiary liability

1 Introduction

One of the most effective methods of protecting rights of participants in economic relations is to create an effective consistent legal framework that excludes the possibility of double interpretation or abuse of definitions used in the law. Subsidiary liability is a key institution that ensures a balance between rights and obligations of creditors and a debtor. Recently, there has been quite a lively debate about the responsibility of controlling persons of the debtor, which include the parent companies, directorate, top management, members of the management board, majority shareholders, as well as group members who actually manage the company [7–9, 14, 15].

In the foreign scientific literature and practice, the doctrine of "removing the corporate veil" is widely used, which assumes the existence of "alterego" of the enterprise in the face of shareholders or other controlling persons at the enterprise as interested

ones in the implementation and satisfaction of their personal self-interest through the enterprise activities and avoiding responsibility [2, 17].

The doctrine of "removing the corporate veil" was practically inapplicable to the corporate legal landscape of Russia in the 1990s and 2000s. Representatives of the business community learned about the owners of entire sectors of the economy through the press to the extent that they themselves desired it. Tens of thousands of offshore companies formally owned businesses in the Russian Federation. Many of them had quite an "overseas facade", were headed by Western managers, but de facto and de jure control belonged through trusts to domestic businessmen. The largest jurisdiction from which investments were directed to the Russian economy was small Cyprus with a population of 790 thousand people. The legal directors signed all the title documents. The most popular legal product of foreign consultants was the support of transactions, business purchases, structured under English law and subject to the jurisdiction of a foreign arbitration tribunal. Such constantly cultivated constructions provided two fundamental things: invulnerability of investors, which implied the confidentiality of asset ownership; the best opportunities for raising funds through banks, issuing shares, bonds, and large-scale long-term development.

The designated system was an adaptation to the hegemony of large international banking groups (from the United Kingdom and the United States) with unlimited financial resources, which is the personification of the movement of world money. Credit institutions participated in major projects and determined the contractual structures and names of the consultants involved. Accordingly, the market for legal services was built with a dominant presence of Anglo-Saxon firms in all countries – recipient of investment. It was not realistic to bring controlling persons to justice, in the case of bankruptcy because of ruinous operations that reduce the real value of the participation interest. Rules on the liability of actual managers and owners of legal entities existed in the 1990s, but in Russian legal practice, this institution, despite its existence, was applied only at the end of 2000. For many years, these institutions did not work, and the requirements were not met, although they were repeatedly reviewed. The reason for this is the passivity of courts requiring proof of causation, actual influence, control, etc.

However, the active use of this institution has created a number of new legal problems. Despite repeated assertions in the Russian legal literature that subsidiary liability should be exceptional and extraordinary, it has become a major segment of dispute resolution practice [10].

This legal trend seems to lead gradually or immediately to rethinking the institution of a legal entity as independently responsible for all its assets, as a separate unit in the sense that it does not shift the property burden on the founders and other persons, including its managers. But today, the existing institution of subsidiary liability of controlling persons of enterprises cannot be considered as satisfactory and providing a balance of interests of all participants, because of the imperfection and outright contradiction of legislative acts regulating the bankruptcy procedure.

2 Methodology

The research methodology includes historical, comparative, formal-legal and functional methods, and a systematic approach. When processing the actual material, traditional scientific methods such as dialectical, logical, scientific generalization, content analysis, comparative analysis, synthesis, source studies, etc. were used. The use of these methods allowed us to ensure the validity of the research results, theoretical and practical conclusions, and developed proposals.

3 Results

The origins of problems with subsidiary liability were legal barriers laid down in Paragraph 2 of Article 56 of the Civil Code of the Russian Federation, which presupposes the exclusion of mutual responsibility of the founder (participant) of a legal entity or the owner of its property and the legal entity itself for obligations [3].

This important principle allows you to take risks without incurring liability if financial investments were unsuccessful so much that, having assumed obligations, the created entity could not pay or repay them at the expense of its profits and current earnings. This is captured in the Roman formula *si quid universitati debetur singulis non debetur, nec quod debet universitas singuli debent* (what belongs to the Corporation doesn't belong to its individual members, or: what the Corporation owes, its individual members do not owe).

This canon has been based since the 16th century on the desire of the business community, which has always had levers of influence over the government and can create organizations characterized as "associations of capital", put into circulation surplus funds while being in formal financial security [1, 6].

Reputation, trust in the organization, and its "credit" were measured to a greater extent by two factors: ownership, as well as the prospects of the business idea for which it was created; and to a lesser extent by people behind it, since it is clear that if the project fails, its creators will not be responsible [16].

Paragraph 3 of Article 15 of the civil legislation of the USSR and the republics provided that in case of bankruptcy (insolvency) of a legal entity as a result of unlawful actions of the owner, insufficient funds and its property to meet the creditors' claims, the owner bears responsibility for obligations of the legal entity.

Nowadays, similar provisions are contained in Article 53.1 of the Civil Code of the Russian Federation, Paragraph 1 of which establishes the obligation to compensate for losses caused to an organization by requiring (1) a person authorized to act on its behalf, (2) members of collegial management bodies, (3) a person that had the actual ability to determine actions of the legal entity, as well as to give instructions [3].

It is important to note that now the responsibility of controlling persons comes for bad faith and unreasonableness (indīligentia et insapientia), while most authors firmly believe that these important legal categories replace guilt [11, 12]. For example, a real manager, having issued loans to non-operating organizations on the eve of bankruptcy proceedings, goes abroad in order to obtain permanent residence there. As a result, middle managers are also subject to criminal prosecution: members of the credit

committee, accountants, lawyers who make contracts and are not at the top of the hierarchy of labor relations, receive salaries, and so on. The inevitable plot in such a situation is to open a bankruptcy case and direct a group of individuals to full repayment of all creditors' claims. There is a curious phenomenon of group responsibility. The involved circle of allegedly involved citizens begins to testify or give evidence against each other in order to protect themselves from strict liability. The prescribed procedure for establishing a real imbalance between the assets forming the bankruptcy estate and the liabilities provides an incentive for a throwaway sale of assets, the implementation of which is realistic and not time-consuming. Therefore, in Russia, debts to creditors are never repaid in full, or only in a percentage.

4   Discussion

It is argued that failure to satisfy the claims of the company's creditors because of harm to their rights should result in tort liability in accordance with Chapter 59 of the Civil Code of the Russian Federation, as well as for violation of corporate rights [3, 4]. There is, however, another point of view that considers subsidiary liability as non-contractual, but not tort [13]. The defendants compensating for losses, in this case – causing harm and damage to property, in the true sense of the word, did not commit it. So far, the prevailing view is of direct tort liability in indirect claims and special subsidiary liability when controlling persons have caused the organization to lose its full functioning.

We assert that these legal institutions are an expression of the consistent implementation of the principle of full compensation and restoration of subjective rights, and in terms of the imposition of damages, legal claims are doctrinally unified.

Creditors in so-called subsidiary liability and participants in indirect claims lose not so much property as the value of a subjective right. Controlling persons become obligated to restore it only if they are involved and behave culpably. This situation should be regulated by Article 15 of the Civil Code, but in any case not by Chapter 59 of the same document on "direct" tort liability [3]. The tort liability construction is not appropriate for several reasons. Classic harm is a legal action that creates an obligation to replace and correct things that are experiencing physical damage. If it is not present, the need to perform certain actions does not arise, because in the first place, it is unclear what to do. A creditor in bankruptcy has claims that do not change because of the insolvency of an insolvent legal entity. It is not the property that suffers, or so much the property in the form of things, etc., it is a subjective civil right, which is based on expectations of creditors that some actions will occur or will be performed, the claim is repaid, etc. Controlling person, and not the bankrupt, through the outward manifestation of guilt becomes a violator of the civil right that can give effect to Article 15 of the Civil Code and not the Chapter on torts, which should not be applied because the nature of the harm is not so [3].

5   Conclusions

In general, it should be noted that the doctrine of "removing the corporate veil" in Russia, because of the imperfection of the legal technology and the lack of established law enforcement practice, not only has not fully formed, but has transformed into something completely different from the basic idea underlying the Western doctrine. The doctrine, which has an extraordinary character, has become a tool for "influencing" the controlling persons of enterprises.

The Civil Code of the Russian Federation has secured mechanisms for insurance (in the broad sense of this word) of creditors, allowing them to request awards not only from debtors, offenders, but also from other persons, primarily accomplices, obligated to debts, liable by law, named alternative, subsidiary, joint addressees of claims, etc. [3]. These are tools that are increasingly introduced to strengthen the stability of turnover, the fair distribution of the burden of property and losses of persons who relied on law-abiding behavior, the imposition of the risk of loss on other subjects, the preservation of property and material status. The fundamental rule that the causer and no one else is responsible for causing damage has undergone a significant transformation. Since the 19th century, it has been supplemented by a provision on compensation for persons specifically named in the law: representatives, guardians, employers, etc.

But these cases do not end with the imposition of responsibility on an innocent person. Needs called to life contractual structures of insurance, the role of the employer and others, in which, regardless of the fame of the main debtor, who may be a secret, not found criminal, losses are compensated. For this reason, tort liability has a too narrow scope to cover and give a legal foundation to modern legal configurations of liability, for example, in bankruptcy, etc., since in the mass of episodes, the person who caused the damage should not be held as responsible one.

Just the identification of the guilty activities of controlling persons with the offence creates a destructive basis for collective responsibility, making it impossible to file a claim to each other because the extent of their unlawful roles is always different, and requirements of the controlling person, showed slight negligence to the deliberate offender, are possible only with full compensation for the harm, but not earlier (Article 1081 of the Civil Code).

According to Article 15 of the Civil Code of the Russian Federation, some individuals may have losses in the form of "expenses" that they "will have to bear". Article 15 of the Civil Code allows you to recover damages from the guilty party outside of contractual and tort relationships [3]. Unfortunately, the key laws already have adopted concepts that prevent the approval of this simple and understandable logic. For example, the following definition is used: "the transaction caused harm", etc. The result of this terminology is a provision that can make recovery of losses in the field of bankruptcy and in the corporate area unworkable.

The main purpose of the insolvency procedure is to create a bankruptcy estate by returning assets and challenging transactions. In practice, there is legal uncertainty and inconsistency in the actions of courts, as a result, legal activity in the field of insolvency has become the most unpredictable according to many practicing lawyers. The reality is

that money transfers are disputed as transactions for the purpose of restitution, and payments are awarded to non-participating individuals who may be part of "groups of controlling persons" and therefore jointly liable.

In our opinion, a detailed study and unified judicial enforcement practice of applying the mechanism of "removing the corporate veil" are necessary, following the example of foreign jurisdictions [5, 18], which will ultimately allow us to maintain a balance between applying new rules and preserving, without distorting the essence and form, the principle of limited liability of participants and shareholders for the obligations of legal entities.

References

1. Asai, K.: Limited liability and corporate efficiency. Int. Rev. Law Econ. **62**, 105886 (2020)
2. Boubaker, S., Chebbi, K., Grira, J.: Top management insider debt and corporate social responsibility? Evidence from the US. The Quarterly Review of Economics and Finance (2019). https://doi.org/10.1016/j.qref.2019.12.001. Accessed 12 Apr 2020. in Press
3. Civil Code of the Russian Federation dated 30.11.1994 N 51-FZ. http://www.consultant.ru/document/cons_doc_LAW_5142/. Accessed 20 Apr 2020
4. Egorov, A.V., Usacheva, K.A.: Subsidiary liability for bringing to bankruptcy – an unsuccessful equivalent of the Western doctrine of removing corporate cover. Vestnik VAS RF **12**, 20–65 (2013)
5. Erhemjamts, O., Huang, K.: Institutional ownership horizon, corporate social responsibility and shareholder value. J. Bus. Res. **105**, 61–79 (2019)
6. García-Granero, A., Fernández-Mesa, A., Jansen, J.J.P., Vega-Jurado, J.: Top management team diversity and ambidexterity: the contingent role of shared responsibility and CEO cognitive trust. Long Range Plan. **51**(6), 881–893 (2017)
7. Kamyshansky, V.P., Tarasenko, A.N.: Some problems of the institute of subsidiary liability of persons controlling the debtor. Civ. Law **1**, 40–42 (2016)
8. Littlewood, D.: Corporate responsibilities. Int. Encycl. Hum. Geogr. **2**, 403–410 (2020)
9. Lomakin, D., Gintovt, O.: Responsibility of controlling persons: the legal nature and mechanism of attraction to it. Econ. Law **1**, 12–39 (2016)
10. Miftakhutdinov, R.: The plenary clearly indicated that subsidiary liability applies in exceptional cases: interview with. Law **7**, 12 (2018)
11. Novak, D.V.: Integrity in corporate law. Bull. Civ. Law **2**, 13–23 (2017)
12. Pletnev, D., Barkhatov, V.: Business success of small and medium sized enterprises in Russia and social responsibility of managers. Proc. Soc. Behav. Sci. **221**, 185–193 (2016)
13. Shitkina, I.S.: Responsibility in corporate legal relations. Econ. Law **6**, 51–117 (2015)
14. Slonevskaya, A.Yu.: Institute of subsidiary liability of persons controlling a bankrupt debtor. Bull. Econ. Justice **1**, 103–115 (2017)
15. Suvorov, E.D.: Subsidiary liability for the debtor's obligations in the bankruptcy process: law enforcement issues. Law **12**, 148–155 (2013)
16. Tarasov, I.T.: The Doctrine of Joint-Stock Companies. Statut, Moscow (2000)
17. Wormser, I.M.: Piercing the veil of corporate entity. Columbia Law Rev. **12**(6), 496–518 (1912)
18. Zhao, T., Xiao, X.: The impact of corporate social responsibility on financial constraints: does the life cycle stage of a firm matter? Int. Rev. Econ. Financ. **63**, 76–93 (2018)

State Support of the Real Sector of the Economy: Legal Regulation

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Abstract. The problem of state support for business is the most important in today's conditions. The cataclysms that have occurred recently have affected the world economy. The world has ceased to be balanced. Business froze in fear of inevitable bankruptcy, unemployment and ruin. Political changes in Russia, which began in January 2020, the drop in oil prices, the collapse of the ruble, which followed the relative stability of the Russian national currency and reached the pandemic country, negatively affected business in the country. The development of urgent state measures to support small and medium-sized enterprises is the only way to maintain its viability. These measures should be based on a clear regulatory framework that does not allow vague interpretations and legal incidents. Using the comparative legal method, it is necessary to draw the experience of those countries in which there is a state policy in relation to small and medium-sized businesses, which is a system of socio-economic actions built on the principle of ensuring the favorable development of this sector of the economy and to develop measures that can preserve it in conditions of prevailing force majeure. The aim of this work is a comparative analysis of measures taken by the world community and Russia to support small and medium-sized businesses during the economic crisis caused by Covid19. Particular attention is paid to the legislative justification of measures taken in Russia and the identification of shortcomings of the newly adopted normative legal acts.

Keywords: Economic crisis · Government support · Pandemic · Small and medium business

1 Introduction

The economy of any modern state is divided into two interconnected sectors – financial and real. The financial sector deals with monetary relations and through the banking system, with its credit, financial and exchange instruments, has an impact on the demand and supply of goods and services. The real sector of the economy is engaged in their production. The real sector of the economy is engaged in the production of tangible and intangible products, since, along with industry and agriculture, it includes scientific enterprises and trade organizations. In each country, the real sector of the economy has its own specifics, which is formed on the basis of various factors – the geopolitical location of the state, the possession of natural resources and minerals, climatic conditions, etc.

Almost all states, even with very developed economy, subsidize certain sectors of the real sector of the economy in different ways to maintain economic balance, regulate supply and demand, and set prices for goods and services. This need exists in industry and agriculture, which often due to low labor productivity and technological backwardness feel the need for financial support from the state. With an increase in government spending to support small and medium-sized enterprises, an increase in aggregate demand in the economy is ensured [13]. And the point is not so much in budget financing, but in off-budget investments, subsidies, subventions, loans.

Of course, the situation of the industry often depends on the region where it is located. Here, both the specifics of the climate and the availability of labor are important. It is important to understand that government support for business should balance the financial capabilities of all regions. Such an inter-regional redistribution was characteristic of the post-war period in Italy [16]. The measures necessary to support the economy can be both long-term [2], and urgent, caused by emergency. Those events that occur in the world today must be considered taking into account the experience of past economic crises. But at the same time, one cannot ignore the fact that modern world economic crises have peculiarities. These features are manifested in their causes, not only financial, political, economic or demographic. In recent years, the modern world has undergone tangible disasters, caused not only by globalization processes, but also by environmental disasters.

The research and analysis of factors leading to global crises is not the purpose of writing this scientific article. Our aim is to analyze the legal regulation of the measures that the state has provided in support of small and medium-sized enterprises in the emergency situation that has arisen today. The problems caused by the pandemic are not only momentary in nature. The consequences of a viral attack on the world are long-term and the likelihood that many entrepreneurs will not return to duty is quite high. Only about 5 months a new virus spreads all over the world, but the events following it pose a real menace to the relationships that exist in society [15].

2   Methodology

The research was conducted on the basis of general scientific methods of cognition. The systematic approach made it possible to generalize the existing problems in the legal regulation of small and medium-sized businesses. The comparative method made it possible to find common and identify individual problems in the legal regulation of state support for business in different countries.

The study of a large amount of material made it possible to draw a conclusion about the possible forecasting of economic crises caused by various reasons. An analysis of the legislative framework made it possible to hypothesize the advisability of developing legal norms providing for measures of state support for business in crisis periods "for the future" [17].

3   Results

The author of the well-known theory of the "Black Swan" Nassim Taleb in his work "On the Secrets of Sustainability" says that excessive globalization and interdependence, whether it is biological, cultural or economic, is alien to mother nature. The idea expressed by him is that a person is not able to prevent plagues and epidemics. Errors and accidents will always be present, despite the construction of various forecast models. It is necessary, following the laws of mother nature, to prevent the possible spread of these mistakes and fortuities throughout the system, isolate them in small zones [23].

Covid-19 overtaking the world turns its gaze to this theory and makes us think about the possible forecasting of such events. Crisis predictability was discussed after the global financial crisis in 2008. Due to the presence of clearly identifiable signs in this crisis, it was recognized as an extreme, but quite predictable event. Regardless of the name of the virus, the consequence of which was the concept of economic "sudden stop", it is necessary to develop emergency measures to contain it [5].

The financial and economic crises following the coronavirus pandemic indicate the necessity of serious lessons for all countries [12]. Was it possible to predict a situation that entailed the need for radical measures such as closing state borders, shutting down enterprises, stopping communication between countries, restricting freedom of movement of citizens? The answer to this question will most likely be positive.

Accordingly, it was necessary to be ready for such situations in advance: at the legislative level, develop state measures to support the population and business, create special funds, the funds from which can be used to support citizens and businesses. Clear rules and regulations governing the actions of authorities at all levels, legal entities, and citizens during the arrival of the "black swan", enshrined at the legislative level, would eliminate the need to create them in a hurry and contradict constitutional norms. What measures are being taken in states to prevent the economic consequences of a pandemic? The European Union has allocated 37 billion euros to protect the economies of the block. Of these, 8 billion euros to enterprises and companies that may suffer significant losses. The European Commission allowed the block countries to take loans without restrictions to help business.

In Germany, a package of measures has been adopted to assist private entrepreneurs and companies that could be significantly affected by the pandemic. The total amount of state support will be 750 billion euros. Small firms and private entrepreneurs are able to receive direct subsidies of up to 15 thousand euros, 50 billion euros have been allocated for this purpose. Hospitals will receive 3 billion euros, in all, Germany will spend up to 37% of the country's GDP on the fight against the pandemic.

The Ministry of Finance of England will provide companies with loan guarantees of 330 billion pounds, which is about 15% of the country's GDP, while interest can be paid for 6 months. Small enterprises are exempted from paying business tax for the duration of the epidemic. The Italian Council of Ministers has allocated 25 billion euros to support families and companies in emergency situations. Payments on loans and credits to businesses and households are suspended under state guarantees for banks. In total, 10 billion euros have been reserved for supporting families and entrepreneurs.

The Spanish government has allocated 200 billion euros or 20% of the country's budget to combat the pandemic and its consequences. Of these, 117 billion euros are public funds, the rest is private resources. 100 billion are presented in the form of state loan guarantees. The Polish government has allocated 46.2 billion euros. Part of this money will be provided to entrepreneurs. In addition, credit guarantees, microloans, and operating leasing are provided. For companies that will not lay off employees, the state will cover 40% of the payroll. 1.6 billion has been allocated for healthcare. In the United States, the law "On the provision of financial assistance to casualties of the epidemic" allocated $ 100 billion. The Senate approved a package of measures stimulating the economy in the amount of 2 trillion. dollars, in particular, 500 billion dollars. transferred to the support fund for enterprises, cities, and states, of which 25 billion to airlines, 17 billion to strategically important companies. The government will pay 500 billion dollars to Americans with incomes up to 75 thousand a year – $ 1,200 per adult and $ 500 each. per child. To support small businesses for measures on tax holidays allocated 350 billion dollars. In France, the enterprises that suffered losses were allocated 45 billion euros. Of the same amount, benefits are paid to employees who are transferred to the partially unemployed regime. A state guarantee was provided for bank loans of the enterprise in the amount of 300 billion euros. Small businesses will receive assistance in the amount of 1,500 billion euros. €500billion has been allocated for airlines that incurred losses.

In the world, the main measures taken in support of small and medium-sized businesses are to provide tax and credit holidays, lower interest rates on loans and income taxes, up to full exemption for an emergency, and direct cash support. It is the expediency of measures in the form of direct cash injections, both in business and provided to citizens, that causes the most controversy. The negative impact on the economic efficiency of investments and scientific and technological innovations was expressed even before the pandemic [16]. In the current situation in Russia, the possibility of direct cash assistance to both citizens and businesses finds opponents. The measures chosen by each country depend not only on the economic structure, but also on domestic opportunities. According to many economists, the difficult situation in Russia, caused by the decline in oil prices and the depreciation of the ruble, does not allow "distributing" money to citizens, as in America. For the rest, Russia takes actions similar to those of other states - introduces tax and credit benefits, provides a lease on the lease of municipal and state property for business, and exempts from a number of mandatory contributions until the end of the year.

4   Discussion

What measures and for whom were developed in Russia in the context of the spread of coronavirus to save business?

The measures taken by the Russian Federation are aimed at supporting small and medium-sized enterprises, which, in the opinion of the government, have fallen into a difficult economic situation. The list of such sectors of the economy is approved by Resolution of the Government of the Russian Federation of 03.04.2020 N 434 [18]. Currently, this list is not closed, it is periodically updated.

In April 2020, in the Russian Federation in the direction of economic support for small and medium-sized enterprises, federal laws were adopted, resolutions of the Government of the Russian Federation were issued, numerous letters were published, information was posted. As support measures, the government provides for credit benefits, tax and rental holidays, and a moratorium on bankruptcy.

Of the laws, it is necessary to name the Federal Law of 01.04.2020 N 103 "On Amendments to the Federal Law" "On the Suspension of Certain Provisions of the Budget Code of the Russian Federation and the Establishment of Specific Features of the Execution of the Federal Budget in 2020" [6], Federal Law of 03.04.2020 N 106 "On Amendments to the Federal Law" On the Central Bank of the Russian Federation (Bank of Russia) "and certain legislative acts of the Russian Federation regarding the peculiarities of changing the terms of a loan agreement" [7], Federal Law of April 22, 2020 N 121 "On Amendments to Part Two of the Tax Code of the Russian Federation" [8], Federal Law of April 1, 2020 N 98 "On Amendments to Certain Legislative Acts of the Russian Federation Regarding Emergency Prevention and Response" [9].

A number of government regulations is aimed at supporting the economy. Resolution of the Government of the Russian Federation of 02.04.2020 N 422 approved the "Rules for the provision of subsidies from the federal budget to Russian credit organizations for the reimbursement of shortfalls in their income on loans issued to legal entities and individual entrepreneurs in 2020 for urgent needs to support and maintain employment" [19], Resolution of the Government of the Russian Federation of 04.04.2020 N 466 approved the "Rules for the provision in 2020 from the federal budget of subsidies to Russian air transport organizations for reimbursement of expenses incurred the implementation of measures for the removal of citizens from foreign countries in which there is an unfavorable situation associated with the spread of a new coronavirus infection" [20].

The forced speed of adoption of regulatory legal acts has led to the need to supplement and clarify them with all kinds of letters, information, instructions. The adoption of such serious regulatory documents in a hurry led to the difficulty of their enforcement. Clarifications of the relevant departments, as well as of the Supreme Court of the Russian Federation were required to clarify the concepts introduced by the new laws and decrees. The concept regarding which there is a need for clarification includes, for example, the term "non-working day". Decree of the President of the Russian Federation of March 25, 2020 N 206 "On the announcement of non-working days in the Russian Federation" [3], introduced a new concept that does not apply to a "day off" or to a "holiday". The introduction of the new term caused a number of difficulties, such as payroll, granting leave and dismissal during the "non-working" days. In the aspect of labor relations, clarifications were given by the Ministry of Labor [10], and the meaning that he put into the new term radically differed from the meaning given to the concept of "non-working days" by labor legislation.

An assessment of the term in the civil law sense was given by the "Review of Certain Judicial Practice Issues Related to the Application of Legislation and Measures to Counteract the Spread of the New Coronavirus Infection (COVID-19) No. 1 on April 21, 2020", approved by the Presidium of the Supreme Court of the Russian Federation [21]. According to the Presidium, these days cannot be considered non-working in the sense that gives this concept to the Civil Code of the Russian Federation. Accordingly,

they are not grounds for postponement of the fulfillment of obligations under Article 193 of the Russian Civil Code [2].

Many questions raise such a concept, used in regional restrictive acts, such as "high alert mode", expressions "temporarily suspend", "restrict". Firstly, they are not defined by law, and secondly, they do not allow the use of civil law to terminate obligations. Economic crisis is not only financial difficulties, unemployment and impoverishment of the population. It is also a manifestation of cruelty and violence, the criminalization of society. Studies have confirmed an increase in domestic violence from the economic downturn [22], and the experience of the crisis caused by the pandemic has shown an increase in the number of cases of child abuse [11]. Overcoming global crises should occur in interaction and mutual assistance, outside national interests. It is unacceptable, hiding behind the fight against the crisis, to forget about respect for human rights, justice and equality [25].

5   Conclusion

The number of risks that can cause global disasters is only increasing. Whether it is a problem with refugees, cyberattacks, environmental disasters or epidemics, all this affects the economic situation. The world is not always ready for these risks. In addition, factors that threaten our security are often related to each other and reinforce each other. The danger of events lies in their destructive distribution, as our world is interpenetrated, permeated by common networks [14]. It is this problem that mankind faced in the case of coronavirus. Such events should be predicted, and governments and businesses should be prepared for such events.

Small and medium-sized enterprises are included in the economic system of any country. Research on the identification of factors that have an effective impact on their work is given great importance [4]. The most important factors affecting the development of this sector of the economy and identified as a result of the study include government regulation and business support, which are based on a clear and understandable legal framework. Not all states can boast of such, so, according to entrepreneurs from the Czech and Slovak Republics, the level of legislation governing business and its state support is not very high [1]. The need for the functioning and development of small and medium-sized enterprises in accordance with laws and regulations, the solution to the problem of financing them on the basis of laws and regulations, say Chinese entrepreneurs [24].

It is necessary to improve the legal standards governing the support of small and medium-sized enterprises, providing for their effect, both in the normal course of events and in emergency situations. This will provide an opportunity to save time for solving super-urgent tasks in the event of a disaster. In addition, it will be possible to avoid those errors that usually arise during hasty rulemaking. Poor legal regulation leads to problems of law enforcement, free interpretation of legal norms and, accordingly, corruption loopholes. The ambiguity of the proclaimed norms often leads to the fact that they remain declared, but not enforceable. Small and medium-sized businesses always need state support, in a crisis situation, especially. The development of state

measures to support entrepreneurs, based on a clear regulatory framework, is the only guarantee of their viability.

References

1. Cepel, M., Belas, J., Dvorsky, J.: The impact of significant political factors on starting a new business. In: Liargovas, P., (ed.) Proceedings of the European Conference on Innovation and Entrepreneurship, ECIE, pp. 220–228. Sonning Common: Academic Conferences and Publishing International Limited Reading (2019)
2. The Civil Code of the Russian Federation (book 1). "Meeting of the legislation of the Russian Federation", 05.12.1994, N 32, Art. 3301 (1994). http://www.consultant.ru/document/cons_doc_LAW_5142/. Accessed 15 Apr 2020
3. Decree of the President of the Russian Federation of March 25, 2020 N 206 "On the announcement of non-working days in the Russian Federation" (2020). https://base.garant.ru/73793643/. Accessed 20 Apr 2020
4. Elver, H.: New constitutionalism and the environment. In: Gill, S., Cutler, A.C. (eds.) New Constitutionalism and World Order, pp. 261–276. Cambridge University Press, Cambridge (2012)
5. Faggini, M., Bruno, B., Parziale, A.: Crises in economic complex networks: black swans or dragon kings? Econ. Anal. Policy **62**, 105–115 (2019)
6. The Federal Law of 01.04.2020 N 103 "On amendments to the Federal Law "On the suspension of certain provisions of the budget code of the Russian Federation and the establishment of specific features of the execution of the federal budget in 2020" (2020). http://www.consultant.ru/document/cons_doc_LAW_349085/. Accessed 15 Apr 2020
7. The Federal Law of 03.04.2020 N 106 "On amendments to the Federal Law" On the central bank of the Russian Federation (Bank of Russia) "and certain legislative acts of the Russian Federation regarding the peculiarities of changing the terms of a loan agreement" (2020). http://base.garant.ru/73842090/. Accessed 15 Apr 2020
8. The Federal Law of April 22, 2020 N 121 "On amendments to part two of the tax code of the Russian Federation" (2020). http://base.garant.ru/73929695/. Accessed 15 Apr 2020
9. The Federal Law of April 1, 2020 N 98 "On amendments to certain legislative acts of the Russian Federation regarding emergency prevention and response" (2020). https://base.garant.ru/73828134/. Accessed 15 Apr 2020
10. Information of the ministry of labor and social protection of the Russian Federation of April 2, 2020 "Questions and answers on the organization of work and respect for the rights of workers during the non-working week" (2020). https://www.garant.ru/products/ipo/prime/doc/73734356/. Accessed 15 Apr 2020
11. John, N., Casey, S.E., Carino, G., McGovern, T.: Lessons never learned: crisis and gender-based violence (2020). https://onlinelibrary.wiley.com/doi/abs/10.1111/dewb.12261. Accessed 15 Apr 2020
12. Lucchese, M., Pianta, M.: The coming coronavirus crisis: what can we learn? Intereconomics **55**(2), 98–104 (2020)
13. Makrelov, K., Arndt, C., Davies, R., Harris, L.: Balance sheet changes and the impact of financial sector risk-taking on fiscal multipliers. Econ. Model. **87**, 322–343 (2020)
14. Masys, A.J.: Complexity and security: new ways of thinking and seeing. In: Masys, A.J., Lin, L.S.F., (eds) Asia-Pacific Security Challenges. Advanced Sciences and Technologies for Security Applications, pp. 1–17. Springer, Cham (2018)

15. McCullough, P.A., Eidt, J., Rangaswami, J., Lerma, E., Tumlin, J., Wheelan, K., Ronco, C.: Urgent need for individual mobile phone and institutional reporting of at home, hospitalized, and intensive care unit cases of SARS-CoV-2 (COVID-19) infection. Rev. Cardiovasc. Med. **21**(1), 1–7 (2020)

16. Öncü, T.S.: Triggering a global financial crisis: COVID-19 as the last straw. Econ. Polit. Wkly. **55**(11), 10–12 (2020)

17. Petraglia, C., Pierucci, E., Scalera, D.: Interregional redistribution and risk sharing through public budget. the case of Italy in times of crisis (2000–2016). Struct. Change Econ. Dyn. **53,** 162–169 (2020)

18. Resolution of the Government of the Russian Federation of 03.04.2020 N 434 (Rev. 18.04.2020), "On approval of the list of branches of the Russian economy most affected by the worsening situation caused by the spread of new coronavirus infection" (2020). http://www.consultant.ru/document/cons_doc_LAW_349344/. Accessed 15 Apr 2020

19. Resolution of the Government of the Russian Federation of 02.04.2020 N 422 (red. of 24.04.2020) "Rules for the provision of subsidies from the federal budget to Russian credit organizations for the reimbursement of shortfalls in their income on loans issued to legal entities and individual entrepreneurs in 2020 for urgent needs to support and maintain employment" (2020). https://www.garant.ru/products/ipo/prime/doc/73741776/. Accessed 16 Apr 2020

20. Resolution of the Government of the Russian Federation of 09.04.2020 N 466 "Rules for the provision in 2020 from the federal budget of subsidies to Russian air transport organizations for reimbursement of expenses incurred the implementation of measures for the removal of citizens from foreign countries in which there is an unfavorable situation associated with the spread of a new coronavirus infection" (2020). http://www.consultant.ru/document/cons_doc_LAW_349996/. Accessed 19 Apr 2020

21. Review of certain judicial practice issues related to the application of legislation and measures to counteract the spread of the new coronavirus infection (COVID-19) No. 1 on April 21, 2020 (approved by the Presidium of the supreme court of the Russian Federation) (2020). https://www.vsrf.ru/press_center/news/28855/. Accessed 15 Apr 2020

22. Schenck-Fontaine, A., Gassman-Pines, A.: Income inequality and child maltreatment risk during economic recession. Child. Youth Serv. Rev. **112**(C) (2020). https://ideas.repec.org/a/eee/cysrev/v112y2020ics019074091931014x.html. Accessed 15 Apr 2020

23. Taleb, N.: On the secrets of sustainability. In: Tyunkina, M., (ed.) The Black Swan. The Impact of the Highly Improbable, pp. 212–246. KoLibry, Moscow (2007)

24. Xi, W.: The modeling and simulation of the cloud financing model for technology-based small and medium-sized enterprises. In: Abawajy, J.H., Choo, K.-K.R., Islam, R., Xu, Z., Atiquzzaman, M., (eds) International Conference on Applications and Techniques in Cyber Intelligence ATCI 2019. Aplications and Techniques in Cyber Intelligence, vol. 1017, pp. 1057–1062. Springer, Cham (2020)

25. Xuan, V.N., Thu, N.T.P., Anh, N.T.: Factors affecting the business performance of enterprises: evidence at Vietnam small and medium-sized enterprises. Manage. Sci. Lett. **10**(4), 865–870 (2020)

State Support for the Russian Economy Affected by Covid-19 Consequences (Legal Aspects)

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Abstract. Measures aimed at combating the coronavirus have already negatively affected the Russian economy. In the future, macroeconomic indicators will deteriorate. The study considers the analysis of relevant government measures to protect the Russian economy in the new realities of the pandemic. For the first time the team of authors (using the method of economic analysis of law) studied the regulatory and analytical material on supporting the Russian economy in the crisis. As a result of the study, the authors come to the following conclusions: 1) the Russian authorities promptly adopted a package of legislative acts to protect the Russian economy; 2) most government measures can potentially be effective and capable of supporting the Russian economy in the context of the coronavirus epidemic, however, it is too early to talk about the final effectiveness and sufficiency of these measures; 3) some measures, despite the fact that they will accumulate funds in the budget, could potentially have a negative effect on the Russian economy in the future.

Keywords: COVID-19 · Economic measures · Financial crisis · State support · Russian economy

1   Introduction

On December 31, 2019, the whole world became aware of the outbreak of a new coronavirus infection in the Chinese city of Wuhan. The Russian authorities promptly responded to the new challenges of the pandemic by developing a kind of "rulemaking vaccine" – a package of legislative acts providing for a set of measures to combat the economic consequences of the coronavirus. These measures were developed considering the views of business representatives, for example the Chamber of Commerce and Industry of Russia presented its proposals for supporting the business, including some e-commerce initiatives [4].

Give to him that asketh thee, and from him that would borrow of thee turn not thou away. (Sermon on the Mount).

2   Methodology

The basis of this study is an extensive regulatory and analytical material on the regulatory impact on the Russian economy in the pandemic. The source and empirical base are the appeal of V.V. Putin, the President of the Russian Federation, a package of federal anti-crisis laws and regulations [10].

3   Results

To coordinate the activities of executive authorities during the pandemic, in accordance with Decree of the Government of the Russian Federation No. 236 dated 05.03.2020, the Government Commission was formed to increase sustainable development of the Russian economy (hereinafter referred to as the Commission) and the regulation on it was approved [7]. One of the tasks of the Commission is to develop measures to support the real sector of the economy, including reducing costs for businesses and systemically important enterprises.

On 25.03.2020 V. V. Putin, the President of the Russian Federation, addressed the citizens of Russia, within the framework of which he announced a list of measures to support the Russian economy. On 29.03.2020 the list of instructions of the President of the Russian Federation based on the results of this appeal was published [8].

On 01.04.2020 V.V. Putin signed a package of federal laws to amend certain legislative acts of the Russian Federation to support the Russian economy, which were published and entered into force on the same day. On 02.04.2020 the President of the Russian Federation signed a decree on the extension of "non-working days" in Russia for the whole of April this year with the suspension of the work of companies, banks and enterprises regardless of their form of ownership, which caused additional concern of a few economists. According to estimates by analysts of the Center for Macroeconomic Analysis and Short-Term Forecasting, the direct instant effect of the "non-working day regime" will be up to 20% of GDP losses, or almost 18 trillion rubles [12]. Now it is advisable to consider those measures that have been taken by the Russian authorities to support the Russian economy.

At the federal level, the Law came into force, according to which individual entrepreneurs whose average monthly income will decrease after March 1, 2020 by more than 30% due to the coronavirus are entitled to apply for the so-called credit holidays for up to 6 months, during which they cannot be charged fines and penalties, be foreclosed on collateral or mortgages etc. Federal Law dated 01.04.2020 introduced a new concept of "national guarantee system for supporting small and medium-sized enterprises", which means the system of providing entities with sureties and (or) independent guarantees for their obligations when accessing credit and other financial resources [6].

Other measures were promptly taken at the legislative level, e.g., a temporary moratorium on bankruptcy at the request of creditors was established, insurance contributions were reduced, rent payments were delayed (on municipal and state property), and tax, customs and other inspections of small and medium-sized enterprises (hereinafter referred to as SMEs) were suspended (from April 1 and until the end of 2020).

The Law on the Protection and Promotion of Investment in the Russian Federation was signed, which established a ban on actions that worsen the conditions for doing business related to the implementation of private and public investment projects.

The system-wide measures to support the economy described in the Government's "Plan of Priority Measures" dated 17.03.2020 can be divided into three blocks: (1) financial and budgetary measures – create a financial reserve of up to 300 billion rubles; create a guarantee fund for the restructuring of company loans; expand measures to support the budgets of the Russian Federation, faced with a fall in tax revenues, by exempting regions from repayment of budget loans in 2020; accelerate state capital investments by simplifying procedures and reducing the composition of documents related to amendments to the federal targeted investment program; (2) preferential and security measures – not apply penalties; extend terms and price adjustments under state and municipal contracts in case of violation of obligations by the contractor due to the consequences of the coronavirus; inform residents about necessary actions in case of non-fulfillment (to prevent the occurrence of non-fulfillment) of the delivery (payment) of goods by foreign counterparties under foreign trade contracts and non-return of funds previously paid by residents if such non-fulfillment is caused by force majeure; give the Government of the Russian Federation the right to determine the procedures for obtaining a deferral (installment plan) for the payment of taxes, fees and contributions, including with regard to the procedure, grounds and deadlines for their submission, as well as the right to extend the deadline for submitting tax returns (calculations); (3) provide operational monitoring of the financial and economic state of backbone organizations of the Russian economy (over 600 companies) [1].

In addition to system-wide support measures, two separate blocks were identified: (4) measures to support SMEs, and (5) priority measures to support sectors of the economy that are at risk (loan borrowers; transport organizations; cultural and physical education and sports institutions; tour operators; leasing companies; construction industry). The same example was followed by some regional authorities [3]. In relation to the subjects in the so-called "Risk areas of the economy" there are the following measures: restructuring loans in connection with the spread of the coronavirus; providing financial support for transport organizations; subsidizing interest rates on loans to developers in the framework of project financing; supporting leasing companies, including their additional capitalization; paying partial compensation for losses to national sports federations; granting a deferral of tax payments (for 3 months); extending labor permits to foreign workers, etc.

4 Discussion

State support measures for SMEs are the following: grant a deferral on loans and all taxes, with the exception of VAT for the next 6 months, and for microenterprises – also provide additional deferrals on insurance contributions to social funds; decrease in half (up to 15%) the amount of insurance contributions by the amount of the salary exceeding the minimum wage; introduce a moratorium on inspections of SMEs, including tax audits, with the exception of issues that pose risks to the life and health of citizens; expand the program for subsidizing the access of SMEs to borrowed funds;

restructure loans of the borrower – a subject of SMEs; subsidy (up to 1/2 the rate of the agreement, but no more than the key one) a part of the interest on loans of SMEs subjects to the postponement of the payment of interest without charging penalties to credit organizations; provide temporary postponement (or moratorium) on the payment of rental payments by subjects of SME-tenants of state or municipal property; provide coverage of preferential microloans by SMEs; expand the capabilities of SMEs to obtain soft loans in the absence of collateral; reduce requirements for securing contracts during public procurement from SMEs; not apply penalties, as well as extend terms and price adjustments in 2020 in case of violation of obligations by the contractor (within the framework of 223-FL) due to the consequences of the coronavirus [5].

In addition to the above, the President of the Russian Federation announced the following measures to support the Russian economy: ensure sustainable lending to the real sector, including the provision of state guarantees and subsidizing interest rates on loans; protect enterprises, that are in a difficult situation, from bankruptcy by introducing a moratorium on filing creditors' applications for bankruptcy of companies and collecting debts and fines for a period of 6 months; introduce a tax on interest income of 13% for citizens whose total amount of bank deposits or investments in debt securities exceeds 1 million rubles in 2021; increase withholding tax rate on dividends to 15% if they are remitted to foreign accounts in countries through which significant resources of Russian origin pass, and therefore the Government decided to review the network of bilateral double taxation agreements [10], starting with the Agreement with the Republic of Cyprus, Article 10 of which provides for the possibility of taxation of dividends at preferential rates of 5 and 10%, provided that they are paid to a company that is a beneficial owner of such dividends and complies with the investment criterion [2]. On 27.03.2020 in pursuance of instructions of the President of the Russian Federation, the Commission identified 22 sectors of the economy that were most affected by the spread of the coronavirus, to provide priority targeted state support [9]. By Order of the Government of the Russian Federation No. 767-r of 28 March 2020 1.5 billion rubles were allocated from the reserve fund of the Government of the Russian Federation to the Federal Air Transport Agency to reimburse the costs incurred by air transport organizations due to the return of Russian citizens from foreign countries with Covid-19 epidemic [11].

5   Conclusion

As follows from the analysis, the Russian authorities are already taking measures to protect the Russian economy and support enterprises (organizations). The measures introduced are undoubtedly intended to alleviate the situation of business entities by mitigating as much as possible the negative consequences of the outflow of visitors and clients against the background of quarantine measures. However, several measures can be ambiguously construed. E.g., the introduction of the above-mentioned tax on interest on deposits does not directly contribute to improving the economic situation, since in fact the state will receive the first revenue from such a measure only in 2022. At the same time, this measure will automatically reduce the attractiveness of deposits as an investment tool, which in fact does not contribute to the attraction of private funds

by banks. A potential 15% withholding tax for dividends paid by Russian companies is fraught with a decrease in the attractiveness of Russian jurisdiction for potential investors, which may have a negative cumulative economic effect in the future. In general, the "freezing of the Russian economy" currently being legalized will have the following result – a certain part of SMEs will simply not survive this suspension and will not pay off their obligations. Restructuring of loans to companies and citizens affected by the coronavirus will lead to a significant deterioration in the quality of the loan portfolio of many large banks in Russia.

References

1. Adamchuk, O., Trifonova, P.: The government has 3 times increased the list of backbone companies. Vedomosti (2020). https://www.vedomosti.ru/economics/articles/2020/03/23/825894-pravitelstvo-raza-sistemoobrazuyuschih. Accessed 01 May 2020
2. Agreement between the government of the Russian Federation and the government of the Republic of Cyprus for the avoidance of double taxation with respect to taxes on income and capital (1998). http://www.consultant.ru/document/cons_doc_LAW_23908/. Accessed 01 May 2020
3. Decree of the Governor of the Pskov Region dated March 19, 2020 No. 33-UG "On priority measures to support small and medium-sized enterprises operating in economic sectors which are at risk in connection with the implementation of measures to counteract the spread of the new coronavirus infection in the Pskov Region (2019-nCoV)". https://rg.ru/2020/04/08/pskov-ukaz42-reg-dok.html. Accessed 01 May 2020
4. Economy and Life: RF CCI sent Mishustin a second package of proposals on business support (2020). https://www.eg-online.ru/news/417215/. Accessed 01 May 2020
5. Federal Law No. 223-FL of July 18, 2011 "On procurement of goods, works, services by certain types of legal entities". http://base.garant.ru/12188083/. Accessed 01 May 2020
6. Federal Law No. 83-FL of 01.04.2020 "On amendments to the Federal Law "On the development of small and medium-sized enterprises in the Russian Federation" with a view to developing a national guarantee system for supporting small and medium-sized enterprises". http://base.garant.ru/73827394/. Accessed 01 May 2020
7. Government of the Russian Federation: government commission for improving the sustainability of the Russian economy (2019). http://government.ru/department/549/about. Accessed 01 May 2020
8. List of instructions based on the appeal of the President of the Russian Federation in connection with the spread of coronavirus infection in the country (2020). http://kremlin.ru/events/president/news/63080. Accessed 01 May 2020
9. List of selected areas of activity most affected by the deterioration of the situation due to the spread of the new coronavirus infection to provide priority targeted support (2020). https://www.economy.gov.ru/material/file/be6cf04db17a6caed6bfa9fd97684d7b/26032020.pdf. Accessed 01 May 2020
10. Official website of the President of Russia: meeting with members of the government of the Russian Federation (2020). http://kremlin.ru/events/president/news/63123. Accessed 01 May 2020
11. Order of the government of the Russian Federation No. 767-r of 28 March 2020. http://government.ru/docs/39308/. Accessed 01 May 2020
12. Yastrebova, S., Mereminskaya, E.: Extension of non-working days threatens with reductions and bankruptcies. Vedomosti (2020). https://www.vedomosti.ru/economics/articles/2020/04/02/827003-sokrascheniyami-i-bankrotstvami. Accessed 01 May 2020

State Support Mechanisms for Business in the Context of Coronavirus Pandemia

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Abstract. The spread of coronavirus infection and the subsequent introduction of restrictive measures have brought the economy into a new reality that has no examples of implementation in the past. The Russian government is faced with the acute problem of developing and implementing optimal management solutions. The article investigates the main support measures developed by the government of the Russian Federation. The authors compare these measures with measures implemented in other countries. Based on the comparison of the scale of the state participation, it is concluded that it is necessary to expand the package of anti-crisis measures and their preferential financing at the expense of the national welfare fund (NWF).

Keywords: Consequences of pandemic · Methods and tools of state influence · State support

1 Introduction

The research on the state influence on various spheres of the economy and society is a key focus of many studies. Some researchers analyze development patterns of the state regulation, the others try to establish a relation between the economic growth and the scale of governmental intervention into economy [10]. Researchers do this based on the analysis of empirical data, trying to establish the optimal limits of intervention, but do not see a clear correlation [13]. Some experts identify positive results of interaction between the state and private business [11]. Much attention is paid to the regulation of certain spheres and branches of the economy [2, 7].

Supporters of the state regulation highlight the key limitation for the amount of the state support – this is the budget capacity. Therefore, some authors analyze costs of such a regulation [12], investigate problems of public debt and default [8, 9]. Despite a wide variety of works on the considered subject, issues of the scope and specific instruments of the state regulation need to be refined and updated, since the spread of coronavirus infection has put the economy in a new reality that has no examples of implementation in the past.

2   Methodology

The methodological basis of this research is formed by fundamental provisions of the economic theory, scientific works of Russian and international scientists in the field of national and world economy. To date, certain methods and tools of the state regulation have been developed in the economic science. However, a comprehensive approach is needed to identify the main areas of support for the national economy and business. In this research, the authors used dialectical, system-functional, economic-statistical, formal-logical and scientific abstraction methods.

3   Results

The coronavirus pandemic has a significant impact both on the world and the Russian economies. There is no common position of experts on the pace of the economic decline and the GDP decline. Thus, experts of the state development corporation "VEB" of the Russian Federation ("Vnesheconombank") predict that the GDP will decrease by an average of 3.8%. Specialists of the Institute for strategic analysis ("FBK Grant Thorton") believe that the world economy will decline by 2–3% compared to the last year, and the Russian GDP – by 10–20% [1]. According to the forecast of the Central Bank analysts, the GDP decline in the second quarter will be 8% (because of quarantine restrictions) with a rapid recovery and a year-end decline of 4–6% [3].

Based on the macroeconomic theory, it can be noted that the GDP by expenditure is calculated using the formula:

$$GDP = C + Ig + G + Xn \qquad (1)$$

C – consumer expenditure,
Ig – gross investment expenditure,
G – government expenditure,
Xn – net exports (the difference between exports and imports).
Changes in the GDP occur as a result of changes in these components:

$$\Delta GDP = \Delta C + \Delta Ig + \Delta G + \Delta Xn \qquad (2)$$

According to the forecast of the Central Bank specialists, investments in fixed assets will decrease by 6–8% this year, and exports will fall by 10–15%. It is difficult to estimate the fall in consumer expenditure, but given the increase in the unemployment rate to 7% on average over the year and the fall in disposable income by 6.5% (17.5% in the second quarter), we can assume that even an optimistic forecast will make it 8–10%.

Government expenditure (G) can be considered as the only limiting factor for the fall in the GDP from the analyzed components. In crisis development periods, when most macroeconomic indicators are declining and the market economy does not provide optimal development rates, the state actively intervenes, increasing expenditures, and thus partially compensating for the fall in the remaining components of the

GDP. However, according to the Central Bank chairman E.S. Nabiullina, declared and implemented by the current government measures will support the GDP by only 2% [3]. According to the head of the Accounting Chamber A. Kudrin, the overall package of the state support measures should be at least 7% of the Russian GDP.

Further, we consider measures that the Russian Government has developed to support the economic development [4]:

1. Loans and grants for business (interest-free credit for payment of wages, grants for payment of salaries and other urgent issues, if at least 90% of the staff remain the same, and 2/3 of interest payments on new loans are covered by the state and banks).
2. Deferral and reduction of taxes (except VAT) and insurance payments for 6 months for small and medium-sized businesses in the most affected industries. For other organizations, the insurance premiums will be reduced by half for the amount of wages exceeding the minimum wage.
3. Deferred lease payments for state and municipal property.
4. Moratorium on the initiation of bankruptcy cases on applications from creditors for system-forming enterprises and organizations of the most affected industries. The most affected industries include road transport, air transport, tourism, exhibition activities, entertainment and leisure, culture and sports, public catering, and non-food retail. This list was approved by a government decree and can be expanded [5].

2. Reducing the administrative burden by:

– automatic renewal of 15 types of licenses and permits that expire in 2020;
– simplifying the conclusion of public contracts, easier requirements for public procurement;
– providing a "green corridor" for imported essential goods, introducing a simplified procedure for certification of imported products and abolishing customs duties on medicinal and medical products that serve to prevent the spread of coronavirus;
– reducing unproductive business costs by introducing a moratorium on inspections, control is planned to be carried out remotely: in the format of audio and video communications;
– cancellation of fines and penalties for contracts executed in 2020.

Support measures for the backbone enterprises include:

– granting preferential loans for 1 year to maintain working capital and save jobs;
– weekly monitoring of enterprises, stress testing and, if necessary, providing targeted support.

Let's consider the practice of applying various forms of the state support during the coronavirus pandemic by individual countries (Table 1).

The conducted analysis shows that he state support measures are implemented mainly in the credit sphere (preferential lending, provision of state guarantees, etc.) and in the tax sphere (reduction of tax rates, provision of deferred tax payments). We have conducted a comparative analysis of the amount of the state support in different countries.

Table 1. Government support for business during the coronavirus pandemic in various countries

Support direction	China	Great Britain	Sweden	Canada
Credit area	Loans for tax debts, simplification of the procedure for issuing loans	Interest-free loans for up to 1 year, credit and financial guarantees	Increased credit resources and state guarantees, special support for export industries	Affordable business loans and interest-free loans to cover operating expenses, issuing preferential loans to the lessee for reducing rental rates
Tax area	Reduction of taxes (VAT, income tax, cancellation of insurance and social benefits for employers)	Tax benefits, deferred VAT payments, tax holidays until the end of 2021 for certain industries	Deferred payment of social insurance contributions, payroll tax, VAT	Deferred income tax, federal goods and services tax, and sales tax
Gratuitous financial support, grants and state investment	Investment in industries that create jobs	Grants to cover current business costs, government payment of 80% of employees' wages for 3 months (maximum amount of 2500 lb per month)	SEK 1 million is allocated to support culture and sports	Subsidizing 75% of employees' wages (up to $ 874 per week), for individual enterprises – 100% compensation of employees' pension and social insurance contributions
Monetary policy	Reducing the mandatory reserve ratio for small and medium-sized banks, increasing the availability of funds	Ensuring financial stability and credit availability	Ensuring financial stability and credit availability	Reducing interest rates, supporting the financial market and liquidity of financial institutions

Source: authors.

Figure 1 shows that, in Russia, the scale of funding for state anti-crisis measures is the lowest (about 1.2% of the GDP). Almost all developed countries have undertaken

significant anti-crisis programs, including the use of various monetary and fiscal policy instruments. This is because of the high risk of losses on the part of the economy if SMEs leave the market not having any reserves. A reduction in the production, a sharp increase in unemployment, in poverty, and a reduction in real income will reduce the demand. For a clear demonstration of this development of negative consequences, let's consider the macroeconomic equilibrium graph (Fig. 2).
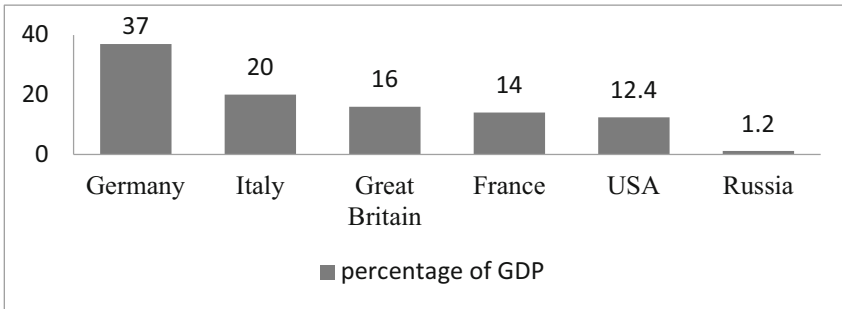
Fig. 1. Comparative scale of anti-crisis measures in Russia and other countries (as a percentage of the GDP). (Source)

Forced self-isolation during the pandemic led to the closure of most businesses. Disruption of production and economic chains and lack of working capital create a high risk of falling production volumes in the economy, which shifts the supply curve from AS1 to AS2. If aggregate demand remains constant, this leads to a decrease in real output (from GDP_{E1} to GDP_2) and an increase in the price level from r1 to r2. However, under current conditions, aggregate demand is also decreasing (as a result of increased unemployment and lower real incomes), which further reduces the real output.

Graphically, this is reflected by the shift of the curve from AD_1 to AD_2, the equilibrium point from E_1 to E_2, and a significant decrease in production volumes from GDP_{E1} to GDP_{E2}. The negative impact on macroeconomic processes occurs both from the factors of aggregate demand and from the factors of aggregate supply.

The high probability of threats being realized and significant losses being incurred forces countries to incur significant financial costs, since it is strategically more profitable to stop the main mechanisms of the crisis spreading at an early development stage than to deal with its negative consequences in the future.

Developing countries are taking more modest anti-crisis measures, but this is explained not so much by the required amount of financial support, but rather by the budgetary capabilities of a state.

For the Russian Government, the priority is to determine needs of the market and its individual subjects for the state support. The development of crisis phenomena in the Russian economy can be much more serious, as the situation is aggravated by the raw material orientation of the economy; that in turn, because of a sharp decline in demand
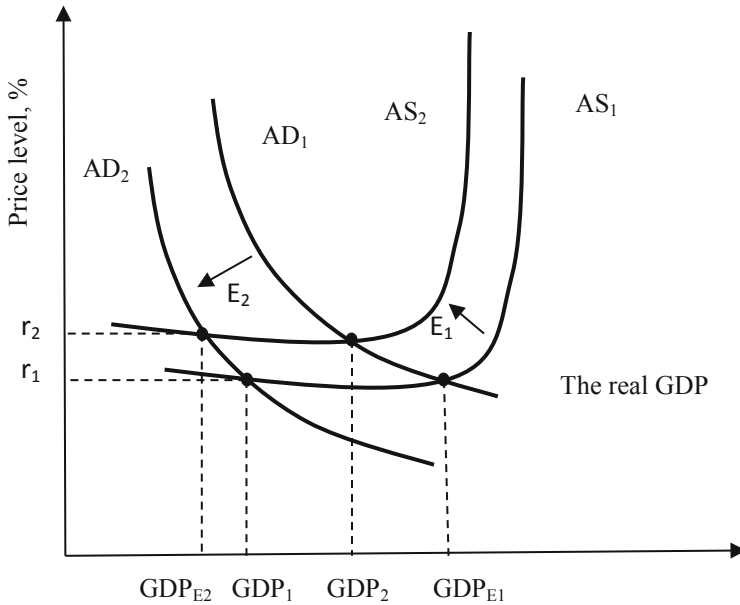
Fig. 2. Macroeconomic equilibrium (Source: authors)

for hydrocarbons, falling oil prices on the world market, will lead to a decrease in the revenue part of the budget.

In our view, the package of anti-crisis measures should be expanded and the scale of financial support from the state should be increased. This is possible as due to the use of funds from the National Welfare Fund (NWF), as well as various monetary and fiscal policy instruments.

In recent years, a strict budget policy has been implemented with the formation of a budget surplus, which will now cover some of the unexpected budget expenditures and budget deficits resulting from the crisis. In our opinion, the funds of the NWF should be used primarily for theses purposes. By April 1, 2020, the federal budget amounted to 12 trillion 855.75 billion rubles, or 11.3% of the GDP. The volume of liquid assets of the fund (funds on bank accounts of the Bank of Russia) amounted to 11,095 trillion rubles (9.8% of the GDP) [6]. Besides, additional budget expenditures can be financed by additional issue of government securities.

Analyzing the package of the Russian anti-crisis measures, it can be noted that the state has mainly limited itself to measures not related to direct expenditures (tax deferrals, state guarantees on loans, etc.). In our view, the state should more actively provide fiscal support to businesses by providing direct subsidies and providing free financial resources to strategically important and system-forming enterprises in case of crisis situations.

4   Discussion

Currently, the economy of Russia and the world economy are going through a crisis. In order to avoid the stage of a prolonged depression, government actions are necessary to revive the markets, maintain the business activity level by increasing public spending, that is, it is necessary to implement a policy of fiscal expansion. The development and implementation of budget policy are determined by goals and objectives of the society. At the same time, a balance should be maintained between public needs and the financial capacity of the state budget. A balanced state budget is an ideal development option, but it is often unattainable. The state's decision on the size of the state budget deficit should be based on an analysis of short- and medium-term development prospects. The choice of specific ways to cover the budget deficit should be based on the analysis of comparative advantages and possible consequences of alternatives.

5   Conclusion

The development of crisis phenomena in the world and Russian economies as a result of the spread of coronavirus infection and the application of restrictive measures puts states in need of rapid anti-crisis decisions. The analysis of methods and tools of the state regulation conducted in this work has shown that the main areas of influence are the tax and credit spheres. The Russian government has mostly limited itself to measures that are not related to direct expenditures (tax deferrals, state guarantees on loans, etc.). In our view, it should more actively implement fiscal expansion, providing direct subsidies and free financial resources to strategically important and system-forming enterprises. Currently, the share of anti-crisis government spending in the GDP is 1.2%, and it is planned to increase it to 4–5%. However, in our view, this is not enough. The state should more actively use fiscal policy tools, covering additional expenses at the base of the National Welfare Fund or placing government bonds on the open market. This policy may lead to a state budget deficit, but it will help to stop the main mechanisms of crisis spreading at an early stage of its development, prevent the development of a crisis phenomena spiral, which will allow us to achieve sustainable growth rates in the long term.

References

1. Bank of Russia: Bulletin of the Department for Research and Forecasting (2020). https://www.cbr.ru/Collection/Collection/File/27780/bulletin_20-02.pdf. Accessed 10 May 2020
2. Domrachev, T.B.: State and non-state support for the development of construction enterprises. Eng. Pers. Future Russia's Innov. Econ. **6**, 43–45 (2017)
3. Starostina, Yu.: Official Central Bank forecast for the Russian GDP (2020). https://www.rbc.ru/economics/24/04/2020/5ea19aff9a7947282c785981. Accessed 10 May 2020
4. Plan to overcome the economic consequences of a new coronavirus infection (prepared by the Government of the Russian Federation). https://www.economy.gov.ru/material/dokumenty/plan_preodoleniya_ekonomicheskih_posledstviy_novoy_koronavirusnoy_infekcii.html. Accessed 10 May 2020 (2020)

5. Resolution of the Government of the Russian Federation of 03.04.2020 N 434 (ed. from 18.04.2020) "On approval of the list of sectors of the Russian economy that are most affected by the deterioration of the situation as a result of the spread of a new coronavirus infection" (2020). https://www.minfin.ru/ru/document/?id_4=117699-svedeniya_o_razmeshchenii_sredstv_fnb_na_depozitakh_veb.rf_po_sostoyaniyu_na_1_aprelya_2020_goda. Accessed 10 May 2020

6. Teryutina, M.M., Tarasov, M.E., Sleptsov, I.I.: State regulation and state support of the agricultural sector of the economy. Econ. Entrepreneurship **9**(86), 365–367 (2017)

7. Cuadrado-Ballesteros, B.: Do progressive governments undertake different debt burdens? partisan vs. electoral cycles¿Se endeudan más los partidos progresistas? ciclo partidista vs. ciclo electoral. Revista de Contabilidad **14**(1), 29–57 (2011). https://doi.org/10.1016/s1138-4891(11)70021-8

8. Giordano, R., Tommasino, P.: What determines debt intolerance? The role of political and monetary institutions. Euro. J. Polit. Econ. **27**(3), 471–484 (2016). https://doi.org/10.1016/j.ejpoleco.2011.02.001

9. Heckelman, J., Wilson, B.: The growth-maximizing level of regulation: evidence from a panel international data. Euro. J. Polit. Econ. **59**, 354–368 (2019). https://doi.org/10.1016/j.ejpoleco.2019.05.001

10. Huanyong, J., Miao, Z.: Corporate social responsibility and collaborative innovation: the role of government support. J. Cleaner Produc. **260**, 121028 (2020). https://doi.org/10.1016/j.jclepro.2020.121028

11. Kearl, J.R.: Rules, rule intermediaries and the complexity and stability of regulation. J. Public Econ. **22**(2), 215–226 (1983). https://doi.org/10.1016/0047-2727(83)90066-x

12. Scuotto, V., Del Giudice, M., Tarba, S., Messeni Petruzzelli, A., Chang, V.: International social SMEs in emerging countries: do governments support their international growth? J. World Bus. (2019, in press). https://www.sciencedirect.com/science/article/pii/S1090951618301585. Accessed 10 May 2020

13. Polat, Z.A., Alkan, M.: The role of government in land registry and cadastre service in Turkey: towards a government 3.0 perspective. Land Use Policy **92**, 104500 (2020). https://doi.org/10.1016/j.landusepol.2020.104500

Decisions in Production and Project Management in the Context of the Digital Economy

Improving Credit Scoring Technology and Stability of a Commercial Bank

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Abstract. The technological evolution of credit scoring systems in the Russian consumer lending market deserves close attention in the context of the digital economy. This study investigates the works of leading experts in the development and application of scoring systems. An overview of the most applicable foreign software products in Russian practice is given. Some practical recommendations on the application of advanced technologies in credit scoring of individual borrowers are proposed. The conclusion is drawn about the main directions of credit scoring development in Russia.

Keywords: Consumer lending · Credit risk · Credit scoring · Machine Learning · Stability of a commercial bank · Unsecured consumer loan

1   Introduction

The banking sector in Russia is one of the key segments that supports the stability of the economic system. When making decisions on granting loans to individuals, commercial banks in Russia are faced with the need to minimize credit risks and increase the stability of their organization. In the field of credit risk management, some commercial banks rely on the experience of loan officers in the loan approval process. In assessing the credit risk of the applicant, commercial banks receive the applicant's profile through the application form and from the credit bureau, which checks the applicant's past credit history. The credit rating of the individual borrower is a numerical expression in points for assessing potential risk based on the analysis of the person's credit history. It characterizes the creditworthiness of the person. On this basis, classification of acceptable and unacceptable loan applications is carried out.

One of the most effective tools used by commercial banks to manage credit risks is the credit scoring model. These models allow analyzing a large amount of historical customer data, revealing patterns and characteristics of credit risk to assess new or existing individual borrowers.

When constructing them, traditional statistical and linear programming methods are used, as well as complex methods such as artificial intelligence and Machine Learning. Based on these models, the probability of default - the insolvency of the debtor-individual is determined.

With the rapid development of the credit card business, the credit scoring model has increased its value and prospects. At the same time, some existing scoring models

cannot effectively evaluate potentially dangerous customers due to the asymmetry of information in the field of credit card circulation. The introduction of new variable factors into the scoring model may cause their operational failure.

2   Methodology

The research materials are regulatory acts in the field of consumer lending, statistics from the Bank of Russia, the Association of Russian Banks, and research results of Russian and foreign scientists. In the theoretical part of the work, formal logical methods are widely used. In studying the evolution of bank credit scoring programs, system analysis is widely used, which makes it possible to comprehensively consider the transition to new information technologies that can increase the stability of a commercial bank.

Credit scoring analysis is based on a review of expert, statistical and hybrid methods. The expert method is to evaluate a scoring mode, based on subjective judgments of a loan specialist. The statistical method includes the use of logistic regression, decision trees, neural systems. The hybrid method is the most advanced method, based on a systematic analysis of expert and statistical methods, is a procedure fos evaluating all financial and non-financial indicators to build the final model for assessing the borrower's risk.

3   Results

In Russia, for several years until 2018, there was positive dynamics in the growth of consumer lending, especially in the provision of unsecured consumer loans (UCL). This has had a positive effect on maintaining economic growth. In 2019, there was a decrease in the growth rate of UCL. Over the 11 months, the UCL portfolio grew by 20.1%, compared with 22.8% in 2018 [4]. In October 2019, the growth rate of the volume of loans granted to individuals was minimal since February 2018. The share of UCL with overdue debts over 90 days decreased from 9.1 to 7.7% in 2019 [4].

The downward trend in consumer lending is primarily associated with increased regulation of the Bank of Russia. Among the measures taken, the introduction of premiums on the risk factor for high-margin UCL from April 1, 2019, and from October 1, 2019, additional premiums on risk factors for UCL depending on the borrower's debt load (BDL) and the total loan cost (TLC). Loans to borrowers with high debt burden (BDL > 50%) fell under restrictions. The introduction of premiums reduced the possibility of the commercial bank lending due to the need to increase the capital reserve [4].

The second factor influencing the decrease in the rate of growth of UCL was the decision of some of the largest Russian banks independent of the Bank of Russia to tighten lending conditions for individuals to increase their stability. Moreover, the growth of UCL still exceeds the growth of nominal cash incomes of the population, which indicates an increase in the debt burden of the population.

High risks in the field of granting UCL are associated with attempts of banks to increase the terms of loans granted to reduce monthly payments of individuals and, as a result, to reduce personal income tax. This approach can increase risks in the long term, especially in the conditions of economic recession.

The Bank of Russia policy to reduce the key rate, bringing it up to 6.00% does not have a short-term effect on reducing the cost of consumer loans. Current consumer credit rates are largely determined by market conditions, and they depend on the quarterly establishment by the Bank of Russia of the full cost of the loan. The reduction in the key rate has a more pronounced effect on stimulating refinancing in the consumer lending segment.

The consumer lending market in Russia is highly competitive, which increases the degree of risks. Therefore, commercial banks in Russia are striving to apply new methods and banking tools to maintain their competitiveness, increase return on equity, minimize risks, and increase financial stability. In modern conditions, special attention is paid to new information technologies.

The risk management system in Russian commercial banks includes an effective mechanism for assessing the creditworthiness of borrowers, which allows improving the quality of the loan portfolio, which affects profit growth and reduction of credit risk. The observed downward trend in the growth of arrears on loans to individuals is largely determined by modern methods of credit risk management. Among these methods, a special place is occupied by the most technologically advanced, efficient and rapidly developing way of risk assessment in consumer lending - scoring.

Credit scoring involves the use of mathematical and statistical modeling technology to assess the level of credit risk associated with a particular borrower. Credit scoring is used to classify and quantify risk factors for loan repayments by an individual. Commercial credit scoring was first developed in the 1950s in the United States. Currently it is used by most of the world's largest banks. In Russia, credit scoring began to develop with the advent of retail express lending. The high popularity of scoring systems is explained by their advantages due to the computerization of decisions made, which are as follows:

– increase operational efficiency,
– save time,
– increase the accuracy of credit decisions,
– improve the culture of making credit decisions through objective and standardized analysis,
– reduce human errors or bias,
– assign a credit limit based on risk,
– set the price of a loan product based on the analysis of the risk level.

At the same time, modern scoring models have a high cost, difficulties in use. A certain drawback of these models is that analysis is carried out based on historical data, it is assumed that the future period will be similar to the previous period.

On the Russian banking market, both Western and domestic scoring systems are used. The world leader in the development of scoring systems is the American company FICO. Its systems are used by more than 300 Russian banks. It is used in the practice of the Russian National Bureau of Credit Histories (NBCH). All potential

borrowers are rated in the range of 250 to 850 points. Borrowers with scores of more than 700 points almost automatically receive a consumer loan. Borrowers with scores of less than 500 points are considered insolvent. Thus, all customers are divided into groups, each of which has its own risk of default and, accordingly, the cost of the loan.

Russian scoring systems used by Russian design bureaus are less functional than foreign systems, but they have lower cost and use the development of Russian applied mathematicians. The largest banks in Russia use their scoring models, which improves the accuracy of credit risk assessment. Medium and small Russian banks, as a rule, use outsourcing services in this market.

The system of retail consumer lending uses 4 main types of scoring:

1. Application scoring. It is an assessment of the creditworthiness of the borrower when granting a loan based on the information available about it. This is the most active type of scoring in Russia.
2. Collection scoring is used for daily effective receivables management.
3. Behavioral scoring. It allows you to predict changes in the creditworthiness of the borrower based on the analysis of the existing history of his relationship with the bank to adjust the established credit limits or generate individual offers.
4. Fraud scoring. Used to statistically assess the possibility of fraud by the borrower.

The application of each type of scoring is carried out using scoring cards. The most famous and widespread model for assessing the creditworthiness of the borrower is compiling a credit card as a set of rating indicators, ranked by points. As a rule, design bureaus develop several variants of scoring cards depending on the type of scoring used.

Scoring cards are an integral part of the scoring model, which is the main tool for credit scoring. Design Bureau follow BASEL recommendations, according to which the assessment and management of credit risk should be based on internal ratings [2]. To do this, their own rating assessment models are created. Each design bureau has its own scores for assessing borrowers who group customers into different risk groups.

The credit rating system makes extensive use of the logistic regression model. As a rule, credit rating systems have ratings of up to 10 points from AAA to D. The algorithm for using the main scoring models in consumer lending is based on classical methods of statistical analysis. At the same time, modern information technologies allow us to expand the range of data being analyzed by studying information about customer activity on social networks, payment behavior, etc.

Currently, there is a global trend in the world for the total automation of banking activities and the widespread introduction of Big Data and Machine Learning financial instruments. The need to further improve the specialization of analytical software training to increase the speed and efficiency of processing large amounts of data has led to the introduction of a new class of technologies and new approaches to information processing, Machine Learning, in the credit scoring process. So, the largest American banks have developed automated Machine Learning models for analyzing documents and aggregating data from them, which has reduced a significant number of loan officers.

Big Data and Machine Learning tools are part of the group of artificial intelligence tools and are widely used in the practice of Sberbank. An important aspect of Machine

Learning is the ability to adapt and retrain on newly arrived data to obtain reliable and representative results.

4 Discussion

Risk is an integral part of the banking market. It cannot be eliminated, but it can be reduced by using appropriate methods. In international practice, there are different approaches to assess the cretitwortiness of the client and the risk of loan default (North American, English and European). The credit scoring system has been deeply and comprehensively studied. In existing works, credit scoring is considered as a process of determining a numerical score based on analysis of the borrower's profile. Many authors emphasize that credit scoring a current assessment of credit risks, the ability and willingness of a borrower to fulfill his financial obligations.

The modern credit scoring system involves scoring at all stages of the movement of the loan product and loan repayment. In credit schemes, a mathematical assessment is usually used in the analysis of historical experience working with the debtor, because of which quantitative models for classification of acceptable and unacceptable loan applications are created.

With the rapid development of bank credit cards, credit scoring models have strengthened their importance [5]. Logistic regression with a step-by-step method of selection is used to assess the parameters of the borrower's credit rating model [3].

The credit scoring method is the basis of the classification method for credit ratings of customers. Credit rating - the process of modeling the creditworthiness of the applicant. The hybrid model improves classification efficiency. The need for control and effectiveness of credit risk management have led financial institutions to improve information technologies and methods developed for this purpose [6].

In recent years, several new credit scoring models have been developed in addition to traditional methods of credit risk analysis. So, new algorithms were proposed and started to be used to increase the accuracy of credit scoring modeling. Among them are: decision trees, neural networks, nearest neighbor coefficient, intelligent Machine Learning, etc. In the short term, considering the pace of development of modern information technologies, self-learning systems will replace banking specialists. Switching to Machine Learning means a breakthrough in credit scoring [1]. Noteworthy is the proposed method for assessing the creditworthiness of the borrower on a continuous scale, in contrast to the binary scale. This method allows assessing each specific borrower, and not a group of "bad" or "good" customers. The results show the feasibility of such a method [7].

5 Conclusion

The study examined the features of the Russian consumer lending market. It is noted that unreasonably high growth rates of consumer lending increase systemic risks of the banking sector, affect the stability of commercial banks, can be an impetus to a recession in the economy, and create an opportunity for a "bubble" in this market.

At the same time, risks of the consumer lending market remain moderate, as the largest banks have enough capitalization and profitability and they can withstand a slight decrease in the quality of their assets.

The financial stability of Russian design bureaus is supported by accumulated reserves. Over the past year, the Bank of Russia has taken a few cardinal measures to cool this market. Among them, one can note a change in the approach of the Bank of Russia to the regulation of unsecured loans granted by commercial banks, which has already led to a decrease in the growth rate of the loan portfolio. These measures forced commercial banks to create a capital buffer that ensures their stability.

The Russian credit risk management system in the consumer lending market includes one of the most progressive, knowledge-intensive and effective methods – credit scoring of the borrower. In our country, this credit risk assessment system appeared much later than in the USA and Europe, where it has been observed the experience of using traditional and latest scoring methods for more than half a century. The largest Russian banks widely use both Western developments and their own models. Medium and small banks use these models on the outsourced basis.

References

1. Agafonova, V., Vishnever, V., Frumusaki, S, Tatishcheva, V.N.: Technological evolution of credit scoring in the banking consumer credit system. Bull. Volga Univ. **2**(3), 21–26 (2018)
2. Investopedia: BASEL accord (2019). https://www.investopedia.com/terms/b/basel_accord.asp. Accessed 12 Feb 2020
3. Bilginci, M.R., Kaya, G.O., Turkyilmaz, A.: Decision support system for credit risk management: an empirical study. Int. J. Inf. Syst. Serv. Sect. **11**(2), 14 (2019). https://doi.org/10.4018/IJISSS.2019040102
4. CBR: About banking's development sectors of the Russian Federation in 2019. Information and analytical material (2020). https://cbr.ru/Collection/Collection/File/25854/razv_bs_19_12.pdf. Accessed 12 Feb 2020
5. Hongmei, C., Yaoxin, X.: The study of credit scoring model based on group lasso. Proc. Comput. Sci. **122**, 677–684 (2017). https://doi.org/10.116/j.procs.2017.11.423
6. Louzada, F., Ara, A., Fernandes, G.B.: Classification methods applied to credit scoring: systematic review and overall comparison. Surv. Oper. Res. Manage. Sci. **21**(2), 117–134 (2016). https://doi.org/10.116/j.sorms.2016.10.001
7. Romanyak, K.: Credit scoring based on a continuous scale for on-line credit quality control. In: Sayed-Mouchaweh, M., Fleury, A., Angelov, P., Lughofer, E., Iglesias, J.A., (eds.) International Conference on Evolving and Adaptive Intelligent Systems IEEE, pp. 158–162. IEEE, New Jersey (2015). https://doi.org/10.1109/eais.2015.7368796

Digital Household Financial Behavior

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Abstract. In modern-day Russia a holistic perception of the country's economy is impossible without the development of households. According to recent censuses, there are approximately 53 million households in the Russian Federation. This suggests that households play a large role in the country's development and prove the need to study their place and role in the modern economy. A properly organized and efficiently operating financial system of a country has a positive impact on economic development and the growth of national wealth, especially in the context of digitalization. The structure of financial capital of the economic system is heterogeneous and diverse. The condition and development prospects of each financial source are of great importance for the functioning of the financial system as a whole. Household finances occupy a special place among the resources of the national financial market, characterizing not only the standard of living associated with household consumption, income and expenses, but also representing a significant investment resource in Russian economic conditions.

Keywords: Financial behavior · Households · Investment strategy

1 Introduction

At present, Russia faces an important task of transition from the resource-oriented economy to the information one. The experience of developed countries shows that they widely use market-based mechanisms to stimulate investment activity, form programs to attract domestic and foreign investments and a system of investment funds of various types is a standard form of economic behavior.

For the effective use of investments in Russia, it is necessary to attract "long money" into the economy, which has been accumulated, first of all, by households. However, this money plays a modest role in the Russian investment market due to issues of distrust of the population, low financial literacy, problems of using and developing financial institutions. The pace of development of mass investment processes, which Russian households are connected to in order to increase the return on their investments, is significantly behind the similar processes in other countries.

The formation and updating of the financial behavior of households, the financial strategies used by them, is quite complicated and contradictory, and requires a correct understanding of the motivation of potential investors. In this regard, theoretical and empirical studies of the problems of the financial behavior, aggravated in the context of the global financial and economic crisis, and geopolitical contradictions are becoming especially relevant.

The study of one of the most important components of the financial behavior of the population – investment – is carried out by scientists using a range of methods to identify the most significant motivating factors. The relevance of such studies is due to socio-economic problems of Russia, which do not allow our country to adequately develop in the context of digitalization. In this case, this is a weak level of investment activity, which affects the formation of the financial and resource base of the investment process, which characterizes a low effectiveness of the financial system. This system is not able to meet the needs of the national economy with sustainable sources of financing. This leads to difficulties in forming the resource base of commercial banks, increasing the dependence of the domestic stock market on foreign capital, and the lack of sustainable long-term sources of financing for the Russian economy.

A promising way to solve the problem may be household savings as one of the possible significant sources of investment resources for the effective restructuring and recovery of the domestic economy in the context of digitalization. In countries with a stable market economy, the investment-saving behavior of the population plays a special role, since savings are a valuable resource for economic development, an internal source of lending to the economy, the basis of the potential for domestic investment, which is a source of free cash that is resistant to fluctuations in the global capital market [1]. In Russia, mechanisms that would allow the effective implementation of these processes and incentives encouraging the population to make their choice in favor of saving and subsequent investment, rather than consuming durable goods, have not been finalized. The investment and savings behavior of the population should be aimed at ensuring the long-term financial needs of the individual or household and earning income from allocated funds.

2   Methodology

As the basic tools in the work, the principles of reproductive, functional, systemic and institutional approaches were used, as well as general scientific methods of cognition (analysis and synthesis, induction and deduction, abstraction), which made it possible to systematize and supplement knowledge in the field of studying the financial behavior of households. The methodological basis of the study was classical tools of formal logic: analysis, synthesis, induction, deduction, abstraction, comparison. Among the widely used methods, we can distinguish mathematical, statistical and graphical methods used to determine the development trend and dynamics of the volumes of the Russian sector. They made it possible to ensure the complexity of scientific research and the reliability of conclusions.

3   Results

Households as one of the most important subjects of the economy have significant financial resources. In modern society, the financial behavior of the population is studied very actively. In the context of geopolitical and economic tensions, household finances have become a vulnerable link in the financial system. At the same time, one should not

forget that financial resources of the population are a necessary source of the investment process in the country's economy and a condition for expanded reproduction.

The ability of the economy to overcome negative trends in the context of digitalization to a large extent depends on the financial choice and financial behavior of households. For example, the savings of the population are a powerful investment tool, and the issues of using various financial instruments and the financial literacy of the population show the degree of development of financial institutions in the country.

The financial behavior of the population is the subject of study of various social sciences, in particular economic theory, sociology, psychology. The financial behavior is an important component of the socio-economic behavior of people, an integral element of the life of a modern person. The financial behavior of the population in a broad sense is characterized as the activity of mobilizing and using financial assets. In our opinion, the financial behavior is a set of consumer, savings, and investment behaviors implemented by households aimed at mobilizing, redistributing, and investing money, built to meet their needs.

The financial behavior is determined by a financial strategy for using cash. In modern conditions, financial behavior strategies can be presented in pure form, as well as combined with each other. In our opinion, the key is an important circumstance – household savings are the basis for the formation of a savings and investment strategy. The savings – investment behavior is a guarantee of security of the individual household and one of sources that finance the state system. The financial well-being of the family and people's confidence in their future depend on how rationally and actively households manage their savings. Household cash savings represent a certain portion of cash income that does not go towards consumption and taxes. This part of the income must necessarily have a target structure, otherwise, savings turn into a simple accumulation of money. Household savings can be seed capital for business development or a source of investment [3].

As soon as household savings pass into investment, it should be said that the household carries out the investment behavior. In order to understand the mechanism of transformation of household savings into investments, that is, the formation and implementation of the investment behavior, it is necessary to determine the economic nature of these categories and factors affecting this transformation.

The savings behavior is a structural element of the financial behavior, the basis of which is the category of "savings". The term "savings" is extremely ambiguous and has many interpretations. In the narrow sense of the word, savings are only deposits in bank accounts. An expanded interpretation assumes that the subject has, in addition to all types of cash accumulations, various kinds of shares, liquid real estate goods. Savings are sometimes defined as the balance of household income after making mandatory payments and purchasing necessary goods and services, used to generate future income or ensure future consumption.

In our opinion, savings are the material basis of the saving behavior, the source through which this behavior is realized via the activities of economic agents. The savings behavior is a part of the financial behavior that reveals the activities of households in the formation and use of savings. Now, we examine the category of the investment behavior of households. The investment behavior is considered as actions of individuals and legal entities associated with the investment of their capital (values,

money and other liquid scarce resources) in various objects of economic life in order to obtain economic or social effect (profit) in the context of taking into account individual choice from a variety of socio-economic alternatives [4].

The investment behavior should be understood not only as a purely economic process of investing capital (money). This process is associated with the development of economic relations, in which many actors are involved: those who accumulate investment resources, those who carry out the functions of their redistribution, and those who market them. Thus, the essence of investment can be formulated as the investment of values in all various objects of the economic life of society in order to achieve a social and economic effect.

4   Discussion

The financial behavior of households is a complex category that includes various types of behavior that should be considered in a single bundle, synthesizing them into a multi-aspect continuous process. An example of such a symbiosis is the study of the savings and investment behavior. Today, in the context of digitalization, there is an acute problem to develop and implement the savings and investment behavior, rather than consumer activity of households. A weak level of investment activity of households affects the financial and resource base of the investment process, characterizing a stably low indicator of the financial system, which is not able to meet the needs of the national economy with sustainable sources of financing. This leads to difficulties in forming the resource base of commercial banks, increasing the dependence of the domestic stock market on foreign capital, and the lack of sustainable long-term sources of financing for the Russian economy. A promising way to solve the problem can be the development of the saving behavior of households as one of the possible significant sources of investment resources for effective restructuring and recovery of the domestic economy. In countries with a stable market economy, the saving and investment behavior of households plays a special role, since savings are a valuable resource for economic development, an internal source of lending to the economy, the potential for domestic investment, which is a source of free cash that is resistant to fluctuations in the global capital market [2].

In Russia, mechanisms that would allow the efficient implementation of these processes and incentives encouraging the population to make their choice in favor of saving and subsequent investment, rather than consuming durable goods, have not been finalized. The investment and savings behavior of the population should be aimed at ensuring the long-term financial needs of the individual or household and earning income from allocated funds. A multilateral analysis of factors affecting the financial behavior of households in the digital economy and the types of strategies they use in managing money resources is very relevant and requires an integrated approach to the study of the motivation of the population in the field of savings and investments [5].

The basis of the saving and investment behavior of households is the decision-making process, which depends on a whole range of external and internal, subjective and objective factors and motives. It should be emphasized that there are circumstances that bring together and at the same time distance the forming elements of the savings

and investment behavior. The logic of cause and effect ties brings together, since savings are the basis for investment. The level of savings and investment are not always determined by the same factors.

5   Conclusion

The research is focused on the issue of placing savings in various financial instruments. This process reflects the transformation of savings into national investment. Tools for investing, as well as how to use them, should be accessible and understandable to the public. Placing the savings of the population in the financial system should bring a positive financial result for the owners of these savings.

In recent decades, the role of household finance in the economy has been growing rapidly: the importance of personal consumption and personal investment is for the banking sector is growing for GDP. Against this background, the financial behavior of households in general and its specific elements (savings, investment, etc.) is attracting attention of scientists and researchers. Of particular relevance is the study of the saving behavior of the population in unstable socio-economic conditions, during periods of crisis. The way the population manages ist money in many respects depends on how the economy as a whole will survive the crisis.

Issues related to identifying the characteristics of the financial behavior of the population and determining the amount of savings accumulated by it are actively studied and discussed both in foreign and in Russian scientific and expert communities. There are several reasons for this. The structure and dynamics of savings are integral indicators of the material well-being of citizens and economic development of the state. They have a significant impact on development conditions of the banking sector and indicate the level of trust in financial institutions and government bodies that have developed in society. But, most importantly, the finances of the population are a significant investment resource, the use of which promises considerable benefits to the state.

References

1. Jünger, M., Mietzner, M.: Banking goes digital: the adoption of FinTech services by German households. Finance Research Letters (2019). https://www.sciencedirect.com/science/article/abs/pii/S154461231930296X. Accessed 11 Feb 2020. in Press
2. Kettlewell, N., Morris, R.W., Ho, N., Cobb-Clark, D.A., Cripps, S., Glozier. N.: The differential impact of major life events on cognitive and affective wellbeing. SSM Popul. Health, **10,** 100533 (2020)
3. Li, J., Meyer-Cirkel, A.: Promoting financial literacy through a digital platform: a pilot study in Luxembourg. Int. J. Financ. Econ. (2019). https://onlinelibrary.wiley.com/doi/abs/10.1002/ijfe.1777. Accessed 11 Feb 2020. in Press

4. Palakvangsa-Na-Ayudhya, S., Pongchandaj, S., Kriangsakdachai, S., Sunthornwutthikrai, K.: KeptAom: savings management system to increase long term savings behavior of children. In: Bartleson, K., (ed.) IEEE Region 10 Annual International Conference, pp. 2247–2252. IEEE, New Jersey (2017)
5. Savinova, V.A., Zhegalova, E.V., Semernina, J.V., Kozlova, A.S.: Problems of the development of the digital economy at the regional level. In: Ashmarina, S., Mequita, A., Vochozka, M., (eds.) Digital Transformation of the Economy: Challenges, Trends and New Opportunities. Advances in Intelligent Systems and Computing, vol. 908, pp. 260–268. Springer, Cham (2020). https://doi.org/10.1007/978-3-030-11367-4_25

Specific Features of Taxation for Foreign Companies Receiving Income from Russian Sources

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Abstract. In the current model of the economy global digitalization, the state is required to ensure the investment attractiveness of the country for foreign investors, since the involvement of foreign organizations in the economy directly depends on the current system of taxation of foreign organizations. The purpose of the contribution is to assess the current tax legislation determining the tax base and structure of accrued income tax for foreign organizations that receive income from sources in Russia. When receiving income from Russian companies, foreign organizations may form permanent establishments, or pay tax at the payment source of such income by a Russian firm that acts as a tax agent. The paper investigates tax accruals of permanent establishments and income received by foreign beneficiaries. The authors consider some specific features and actual taxation indicators of controlled foreign companies whose activities are controlled by Russian tax residents.

Keywords: Controlled foreign company · Dividends · Permanent establishment · Tax agent · Income tax

1 Introduction

Taxation of foreign organizations is a complex and multifaceted concept, which is especially relevant today in connection with the expansion of international relations, the globalization processes of the world economy, and the direction to the development of the innovative and digital economy in Russia. In recent years, there have been some changes in Russian tax policy related to foreign economic transactions. The application of the deoffshorization policy for the Russian capital in 2015 is already producing results. In 2018, 3,362 controlled foreign companies were registered by tax authorities, which indicates the effectiveness of the capital amnesty conducted in three stages, the last of which is completed in 2020. A lot of questions are raised about criteria for establishing a permanent establishment and the role of a tax agent – Russian individuals who are the source of income for foreign companies in Russia. The preparatory and auxiliary activities for the establishment of a permanent establishment are controversial.

In Russia, together with the domestic legislation, provisions of international treaties are applied too, which gives them priority over provisions of the Russian legislation. An example of the operation of international agreements is the common economic customs space of the Eurasian Economic Union, which allows using benefits and a simplified form of customs control and payment of customs duties and taxes for the Russian side and all member countries. Within the framework of international agreements, Russia applies 84 avoidance of double taxation agreements (hereinafter DTAs), which allow not to pay taxes twice under the laws of different countries on the same income, if it was received by a resident of one country from sources in another country. Agreements are also used as a guarantor of the exchange of tax information with other countries, although this provision is made separately, so many agreements are currently subject to changes.

2 Methodology

Different methods were used in the research. These include: theoretical (dialectical logic, rational cognition, etc.); diagnostic (diagnostic analysis of the state and causes); empirical (description of facts, measurement and generalization of research results). In Russia, foreign economic activity is primarily based on the legislative regulation by internal (Russian) legal acts, as well as international agreements. The main federal documents regulating foreign trade include:

1. The Constitution of the Russian Federation.
   Article 15, Paragraph 4, of the Constitution of the Russian Federation states that international treaties are part of the Russian legislation. If an international treaty that is in force (ratified or recognized as valid) in Russia has adopted other terms or rules than those provided by domestic legislation, the rules of the international treaty will be applied [2].
2. The Civil Code of the Russian Federation.
   The Civil Code establishes a rule stated in the Constitution on international treaties (article 7 of the Civil Code [1]), the same rule is repeated in article 7 of the Tax Code [12]. Article 127 states that the liability of legal entities and individuals who conduct activities with the participation of foreign persons is determined by the law on the immunity of the state and its property. Article 317 regulates the use of the currency, monetary obligations in the Russian Federation, currency transactions are more broadly described in the federal law No. 173-FZ "On currency regulation and currency control" of 10.12.2003 [4].
3. The Tax Code of the Russian Federation (part one) and the Tax Code of the Russian Federation (part two).
   The Tax Code regulates issues related to the elimination of double taxation in relation to individuals and organizations; determines the taxation procedure for controlled foreign companies; tax rates and specifics of taxation of foreign persons' income, including organizations and individuals from sources in Russia; determines the procedure for paying VAT from activities of foreign organizations at the sale place of goods, works and services; the procedure for reimbursement of export

VAT, the specifics of paying excise taxes; exemption from taxes when applying certain customs regimes; defines the taxation procedure for income of foreign companies that pay tax on profits from sources in the Russian Federation through tax agents when carrying out activities that do not lead to the formation of permanent establishments; the specifics of taxation of permanent establishments of the main and dependent types; the specifics of calculating and paying personal income tax and insurance premiums for foreign individuals [12].

4. Federal law No. 164-FZ "On the basis of the state regulation of foreign trade activities" of 08.12.2003.

This law contains the main provisions on the foreign economic activity regulation; reveals definitions of the most important concepts in the contax of foreign trade. International treaties are an important part of the Russian legal framework. A contract can be concluded between two countries or between a large number of countries. Treaties reflect decisions of top officials of countries and their governments who agree on a specific issue related to geopolitics or economy. Of particular interest for tax purposes are international agreements for the avoidance of double taxation (DTAs), which take into account norms and differentiation of rights for taxation of income of organizations and individuals for each of the countries. This approach allows not to pay tax in full in two different states on the same income, but to either set off the tax, or pay the difference or calculate the tax at the rate specified in the agreement. Accordingly, in the Russian legislation, DTAs address tax issues that relate to personal income tax, corporate income tax, and property taxes of individuals and legal entities [3].

To apply the DTAs rules, a foreign person should provide the tax agent who is the source of income payment in a free form with a document confirming the permanent location of the foreign person in a foreign country. This certificate is usually issued either by foreign tax authorities or by departments of the Ministry of Finance. The tax agent takes this document into account when calculating the tax and applies the provisions of DTAs. If such a document was not provided, or the tax in a foreign country was not paid, the income tax is calculated by the tax agent in accordance with the legislation on taxes and fees.

It should be noted that the regulation of foreign economic activity is provided with an integrated approach to its management. Through tax reports and customs declarations, statistical data is collected on operations related to the conduct of foreign trade, control in this case is assigned to the tax and customs authorities; the analysis is conducted, recommendations for improving the legislation are directed by various ministries, especially the Ministry of Economic Development of Russia, some functions for the foreign economic activity regulation are highlighted for the President and the Government of the Russian Federation.

3   Results

According to the Federal Tax Service, in 2017, dividend payments to foreign organizations amounted to 1.5 trillion rubles, or 17% of all dividends paid to shareholders. This figure was 32% in the structure of tax revenues from income on dividends paid in Russia for 2018, or 2.1 trillion rubles [13]. The growth rate of tax revenues of foreign organizations from a source in the Russian Federation in the form of dividends was 43% in 2018, and 40% in 2017. Among the countries whose resident companies have the most significant shares of investment in the Russian economy and business, there are organizations-residents of such countries as the United States, the Republic of Cyprus and the Kingdom of the Netherlands, which in total own more than half of the shares of Russian companies among foreign shareholders. According to this data, the Russian economy consistently attracts foreign capital, the share of which in Russian companies is slightly less than 20%, and budget revenues in the form of taxes on dividends received by foreign companies are increasing every year and make up a large part of the structure of tax revenues from the profits of foreign organizations.

Much attention is paid in Russia to monitoring the activities of permanent establishments of foreign organizations. According to the Federal Tax Service (FTS) in 2018, the amount of revenue from the profit tax of foreign organizations from their permanent establishments amounted to 29.6 billion rubles (4.9 billion rubles to the federal budget and 24.7 billion rubles to regional budgets), the annual growth rate of tax revenues was 6% in 2018. In 2017, the increase in income tax receipts from the activities of permanent establishments was 15% [13]. However, based on the statistical data of income tax reporting, which reflects the income of permanent establishments of foreign organizations, there is a decrease in the total income of permanent establishments, for example, in 2017, this indicator decreased by 11% (1.1 trillion rubles) compared to 2016 data (1.3 trillion rubles). In 2018, this indicator increased by 20% and amounted to 1.4 trillion rubles [13]. Over the past three years, there has been a general decline in the number of permanent establishments of foreign organizations, with 2,290 companies registered in 2018, and there were 2,500 of them in 2016. It indicates a reduction of the number of companies by 8% for two years. This form of activity in the Russian Federation is not so popular by foreign organizations, since these companies prefer to pay taxes on income from sources in the Russian Federation through tax agents. A permanent establishment is subject to the state registration by the tax authorities as a taxpayer. This procedure leads to obligations to maintain tax and accounting records within the framework established by the legislation of the Russian Federation, i.e. to calculate and pay taxes and submit tax reports. If you pay tax through a tax agent, he takes all the obligations on calculation and payment of taxes.

The participation of Russian individuals in controlled foreign companies (CFC) remains a difficult issue. The Base Erosion and Profit Shifting plan (BEPS) calls for the state regulation of CFC. The application of CFC legislation in Russia involves the introduction of a procedure for the voluntary declaration of foreign accounts and other assets, and the state registration of CFC through the procedure of redomiciling companies. The concept of redomicilation means changing the official address of registration of a legal entity and changing the country of actual residence, according to

which the organization will be subject to the tax law of the country where it moved to. In 2018, the amount of tax payable on CFC profits was 2.9 billion rubles (3362 CFC were registered in 2018 according to the Federal Tax Service [13]); in 2017, it was 1 billion rubles (4820 registered CFC in 2017); in 2016, this figure was 2.7 billion rubles (3596 CFC registered in 2016). The decrease in the indicator by almost 3 times in 2016 was because of an increase in the amount of loss accounted for CFC tax purposes in 2017. For three years, the largest amount of corporate income tax payable from CFC activities was in 2018, which generally indicates the fruitful results of the program for deoffshorization of foreign capital in Russia.

4   Discussion

In 2017, the Russian Federation signed a multilateral convention on the implementation of measures related to tax agreements to counteract the erosion of the tax base and to eliminate the withdrawal of profits from taxation (in international practice: "Multilateral Instrument" or «MLI»). Russia has chosen a path of implementing a full package of requirements for limiting benefits applied in the DTAs. We are talking about introducing restrictions on benefits for certain types of passive income, which include dividends, income from the sale of shares and shares in companies; on the development of provisions for organizations to avoid the status of "permanent establishment". Since 2019 Russia has been actively cooperating with the International Convention MLI concerning the implementation of measures on the DTAs, it is planned to make changes in 70 bilateral DTAs, for example, in the DTAs with the United States, France, Italy, Cyprus and others.

International information exchange is a basic condition for improving international taxation, which is the topic of Action 1 of the BEPS plan "Addressing the Tax Challenges of the Digital Economy" [8]. On the official BEPS website, the exchange of data on beneficiaries and tax information is a key criterion for cooperation within the OECD. The main goal of the OECD is to establish an automatic exchange of information between member countries, which will ensure a rapid and targeted information exchange at the request of government agencies that control the taxation and tax evasion. For this purpose, the OECD hosts a global forum on transparency and information exchange of tax issues, whose main objective is to ensure high standards of transparency in tax accounting and information exchange. According to the OECD, since 2014, the transfer of data on income (including dividends, royalties, interest paid from participation in activities, wages, gross income, pensions, etc.) has already taken place between more than 90 countries, thanks to which more than 95 billion Euros have been returned to budgets [9]. Through the exchange of information, facts on 47 million accounts in offshore jurisdictions, whose total value was about 4.9 trillion Euros, were disclosed to the regulatory authorities.

The issue of digitalization is very relevant today. In particular, the role of digitalization of economic processes and its impact on international taxation are considered in the work of Turina [14]. The assessment of the OECD measures aimed at reducing the erosion of the tax base for foreign and international companies is considered in the work of Ismer and Jescheck [6].

Another important issue on the taxation of foreign companies, which is considered in the BEPS plan, is the choice of countries and jurisdictions with lower tax rates made by foreign organizations. This problem is covered in the article by Garner-Beuerle, Mucciarelli, Schuster, & Siems [5]. The authors found that the UK is of the greatest interest for taxation purposes of large corporations in the European Union. The prerequisites and reasons for moving activities of multinational companies in the United States for tax purposes to offshore zones – territories with a low tax burden, are disclosed in the article by Richardson & Taylor [11].

In the framework of Action 7, the OECD clarified requirements for dependent agents of foreign organizations and raised a question of recognizing commission structures whose activities in the Russian tax legislation do not lead to the formation of permanent establishments as dependent agents of foreign companies. The OECD, in Action n 7 of the BEPS plan, states that the use of commission agreements attracts a lot of attention from tax authorities in many countries, and this is also confirmed by the significant number of court proceedings related to such structures in the OECD member countries [7]. In most of these cases, the tax authorities' claims were rejected by the courts. According to the OECD, an independent agent should not be considered as a person who conducts activities for several organizations that are interdependent with the agent. The OECD encourages other countries to be guided in determining the dependent or independent status of an agent of a foreign company not only by the criteria formally established by law, but also by the economic essence of such an agent's activity. Research on this topic was conducted in the work of Petruzzi & Holzinger [10].

5 Conclusion

A significant problem with the taxation of foreign organizations is primarily the imperfection of the Russian legislation in the field of foreign trade taxation. Active cooperation within the framework of indirect participation in OECD programs allows us to expand boundaries of international standards on taxation and build the Russian tax policy in such a way as to increase the trust of foreign partners and arouse interest in cooperation. Active development and application of "digital economy" technology in the scope of taxation is already bringing results: taxpayers use FTS e-services. These services are also convenient for foreign traders, allowing them to address issues on taxation remotely and accelerated. The problem of deoffshorization of Russian capital remains urgent, but for this purpose active preparations are being made ensuring the information exchange which is already used with some countries and helps to control the outflow of foreign and domestic capital from Russia to countries with preferential tax rates, especially in offshore jurisdictions. The introduction of the concept of taxation of controlled foreign companies and the development of an effective mechanism for taxing their income made it possible to obtain additional tax revenues through the "amnesty of foreign capital" procedure and to keep records of transactions of Russian beneficiaries abroad.

Another important area of the Russian tax policy development is to support the OECD principles in modernizing the concepts of dependent and independent agents.

The possibility of excluding the concept of "commission agent" from the list of persons who do not form a permanent establishment of a foreign organization should be considered. This will allow expanding the influence area of the tax legislation, avoiding legal disputes and proceedings on this issue (at the moment there is already such judicial practice in Russia), as well as implementing the principle of fair taxation.

References

1. Civil code of the Russian Federation (1994). http://www.consultant.ru/document/cons_doc_LAW_5142/. Accessed: 20 Feb 2020
2. Constitution of the Russian Federation (1993). http://www.constitution.ru/. Accessed 27 Mar 2020
3. Federal law No. 164-FZ "On the basis of the state regulation of foreign trade activities" of 08.12.2003 (2003). http://www.consultant.ru/document/cons_doc_LAW_45397/. Accessed 13 Mar 2020
4. Federal law No. 173-FZ "On currency regulation and currency control" of 10.12.2003 (2003). http://www.consultant.ru/document/cons_doc_LAW_45458/. Accessed 12 Mar 2020
5. Gerner-Beuerle, C., Mucciarelli, F.M., Schuster, E., Siems, M.: Why do businesses incorporate in other EU member states? An empirical analysis of the role of conflict of laws rules. Int. Rev. Law Econ. **56**, 14–27 (2018). https://doi.org/10.1016/j.irle.2018.05.002
6. Ismer, R., Jescheck, C.: The substantive scope of tax treaties in a post-BEPS world: article 2 OECD MC (Taxes Covered) and the rise of new taxes. Intertax **45**(5), 382–390 (2017)
7. OECD: preventing the artificial avoidance of permanent establishment status, Action 7 - 2015 final report. (2015). https://doi.org/10.1787/9789264241220-enhttps://read.oecd-ilibrary.org/taxation/preventing-the-artificial-avoidance-of-permanent-establishment-status-action-7-2015-final-report_9789264241220-en#page5. Accessed 11 Feb 2020
8. OECD: BEPS actions (2019). http://www.oecd.org/tax/beps/beps-actions/. Accessed 25 Mar 2020
9. OECD: What is BEPS? (2019). http://www.oecd.org/tax/beps/about/. Accessed 25 Mar 2020
10. Petruzzi, R., Holzinger, R.: Profit attribution to dependent agent permanent establishments in a post-BEPS era. World Tax J. **9**(2), 263–298 (2017)
11. Richardson, G., Taylor, G.: Income shifting incentives and tax haven utilization: evidence from multinational U.S. firms. Int. J. Account. **50**(4), 458–485 (2015). https://doi.org/10.1016/j.intacc.2015.10.001
12. Tax code of the Russian Federation from 31.07.1998 (1998). http://www.consultant.ru/document/cons_doc_LAW_19671/. Accessed 22 Feb 2020
13. The federal tax service: statistics and analytics (2020). https://www.nalog.ru/rn77/related_activities/statistics_and_analytics/. Accessed 22 Feb 2020
14. Turina, A.: The progressive policy shift in the debate on the international tax challenges of the digital economy: a "Pretext" for overhaul of the international tax regime? Comput. Law Secur. Rev. **36**, 105382 (2019). https://doi.org/10.1016/j.clsr.2019.105382

Optimization of Production and Sales Program of an Oil Company

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Abstract. The results of a study carried out within the scope of an oil company management digitalization program are given. Influence of the seasonal fluctuation of demand on production volume and stock of petroleum products has been analyzed. A complex task of determining the optimal levels of stock and coordinating production and sales plans with regard to this stock is discussed. The problem is aimed at establishing the yearly production and sales cycle at which the maximal profit of the company is achieved. The problem is solved using a systemic approach. A two-level optimization algorithm monotonically converging for a finite number of iterations is suggested. Respective software has been developed. Experimental calculations have been completed. Recommendations concerning the intra-year dynamics of production and stock by the main groups of commercial petroleum products are given.

Keywords: Management digitalization · Oil refinery · Systemic approach · Production and sales strategy · Stock optimization

1 Introduction

The demand for petroleum products has a prominent seasonal nature and, as a rule, does not match the current production volume. For example, in winter, the demand for gasoline and diesel fells, but, on the contrary, grows for black oil. During this period, companies have to produce excessive volumes of gasoline and diesel to meet the seasonal demand for black oil.

The discrepancy continuously arising between the current volumes of production and sales is attenuated by stock. Availability of stock makes production and sales relatively independent on each other, rises the degree of operational management freedom. On the other hand, stock means conservation of current assets and direct expenses. A complex problem arises that consists in managing the stock and coordinating production and sales plans in order to achieve the highest general result.

2 Methodology

Let us assume that an oil company manages n businesses producing *m* products. Let us consider the problem of optimizing the company's production and sales operation within a timespan consisting of *T* periods, for example, within a year broken down by months.

Let us introduce three groups of variables: x_{jt} is the load of j-th business during the t-th period (it is measured in the volume of oil being refined); y_{it} is the sales of the i-th product during the t-th period; z_{it} is the stock of the i-th product as of the beginning of the t-th period. All variables are nonnegative.

The problem is to maximize the marginal income of the company (the revenue less the expenses on product production and storage):

$$-\sum_{j=1}^{n} p_{jt}x_{jt} - \sum_{i=1}^{m} r_{it}z_{it} - \sum_{i=1}^{m} c_{it}y_{it} \rightarrow \max, \tag{1}$$

where p_{jt} is the variable fraction of production expenses falling on one ton of refined oil; r_{it} is specific losses due to stock; c_{it} is the commodity products' prices.

Material balance conditions must be met:

$$z_{it} - z_{i(t-1)} + y_{it} \sum_{j=1}^{n} a_{itj}x_{jt} = 0, \; i = 1, 2, \ldots, m, \; t = 1, 2, \ldots, T, \tag{2}$$

where a_{itj} is the output factor of the commercial product in the current period; z_{i0} is the opening stock of product.

The business load constraints are:

$$U_{jt}^{-} \leq x_{jt} \leq U_{jt}^{+}, \; i = 1, 2, \ldots, m, \; t = 1, 2, \ldots, T, \tag{3}$$

where U_{jt}^{-}, U_{jt}^{+} are the limits of business load in the current period.

The constraints of sales due to the seasonal demand are:

$$D_{it}^{-} \leq y_{it} \leq D_{it}^{+}, \; i = 1, 2, \ldots, m, \; t = 1, 2, \ldots, T, \tag{4}$$

where D_{it}^{-}, D_{it}^{+} are the limits of product sales in the current period.

The stock constraints (for all products in aggregate) are:

$$\Omega_{t}^{-} \leq \sum_{i=1}^{m} z_{it} \leq \Omega_{t}^{+}, \; t = 1, 2, \ldots, T, \tag{5}$$

where $\Omega_{t}^{-}, \Omega_{t}^{+}$ are the stock limits in the current period.

Since the problem implies investigation of production and sales cycles repeated within a year, it is necessary to take into account that the end of the current year is the beginning of the next year; hence, the opening and closing stock must coincide for all products:

$$z_{i0} - z_{iT} = 0, \; i = 1, 2, \ldots, m. \tag{6}$$

The obtained problem of linear programming would have presented no theoretic interest should columns $\bar{a}_{tj} = (p_{tj}, a_{1tj}, a_{2tj}, \ldots, a_{mtj})^{T}, j = 1, 2, \ldots, n, t = 1, 2, \ldots, T,$ have been constant. In fact, they are variable. Every such column represents the

structure of a commodity plan of a business. Production programs of businesses vary depending on the season and in line with external and internal technical and economic conditions. In order to find a really optimal solution, it is necessary, in addition to variables x, y, z, to determine columns $\bar{a}$, i.e. to optimize seasonal production programs of businesses in the context of a general problem. But optimization of a production program of a refinery, even on itself, out of the situation in the system, is a rather intricate problem. That is why it is needless to speak about entering models of businesses into problem (1)–(6) directly.

Let us apply a systemic approach. In our case, it implies application of a two-level model of the company [2, 5]. The first (upper) level is the center represented with model (1)–(6). The second level are models of businesses. The center performs its coordinating function by calculating simplex multipliers π, which are interpreted in this instance as dual evaluations of petroleum products. In this context, we are interested in evaluations corresponding to material balance equations (2).

Taking into account these evaluations, each business represented with a second-level model optimizes its own technology and forms column 'commercial output structure', by which it is represented in the upper-level model. The mechanism of coordinating plans of businesses in order to achieve the optimal general solution follows from representation of model (1)–(6) as a generalized Wolfe problem.

The algorithm is as follows. Problem (1)–(6) is formed using some initial production plans represented by columns $\bar{a}$, and the necessary number of cycles comprising the following actions are realized.

1. We solve the problem using the simplex method with an inverse matrix. We obtain a conditionally optimal solution $x(\bar{a})$, $y(\bar{a})$, $z(\bar{a})$ and respective simplex multipliers $\pi = \pi(\bar{a})$.

2. Each business is trying to increase its own 'profit' in the circumstances offered by the center. To this end, it looks for a respective 'technology' and commodity output structure. In terms of mathematics, this is reduced to determination of vectors $\bar{a}_{tj}$, $j = 1, 2, \ldots, n$, $t = 1, 2, \ldots, T$, which give minimal evaluations of substitution for columns of the current basis of problem (1)–(6). This is completed through solving local problems

$$\Delta_{tj} = \min_{a,p}\big\{(\pi, \bar{a}_{tj}) - p_{tj}\big|\bar{a}_{tj} \in M_{tj}\big\}, \ i = 1, 2, \ldots, m, \ t = 1, 2, \ldots, T, \tag{7}$$

where M_{tj} is the set of structural commodity plans of a business in period t.

3. We check condition $\Delta^* = \min\{\Delta_{tj}\} \geq 0$. If it is fulfilled, then the current basis is optimal and the solution has been obtained. Otherwise, we proceed to the next item.

4. We introduce column $\bar{a}$, for which evaluation Δ^* has been obtained, into the basis of problem (1)–(6). We form a new inverse matrix. We delete the column, which has been removed from the basis, from the problem. We go to item 1.

The algorithm has proven monotonous convergence and, if sets M are polyhedral, provides the optimal solution of the problem for a finite number of steps. Local problems represented by formula (7) are explicitly described in [3].

3   Results

Calculations were made using copyrighted software product – SMONPP [4], or, more correctly, one of its components designed to determine a summarized balance depending on production and process parameters of a business and commodity product evaluations. Parameters of Rosneft refineries were used.

Data on the consumption of gasoline, diesel, and black oil in the Samara Region are given in Table 1. Production of petroleum products in the region does not correspond to their consumption either in volumes or structure. The factory yearly output is equal on average to, thousand tons: gasoline – 1200, diesel – 2200, commercial black oil – 1900. The consumption is: gasoline – 640, diesel – 410, black oil – 240. The rest is sold outside the region. We had to assume that consumption of the main commodity groups matches their production on the whole and that seasonal fluctuations of consumption correspond to the presented data in relative rather than absolute units.

Table 1. Intra-Year Dynamics of Petroleum Products Consumption in the Samara Region according to Year 2018 Data, thousand tons

#	Gasoline	Diesel	Black oil	#	Gasoline	Diesel	Black oil
1	52.3	24.2	28.6	7	59.2	36.3	13.3
2	40.2	27.4	25.3	8	63.1	46.3	11.1
3	53.6	23.1	25.2	9	57.0	40.2	8.0
4	47.4	38.8	26.5	10	54.6	29.7	12.7
5	56.8	48.4	29.1	11	57.4	33.5	23.4
6	53.4	40.2	14.7	12	56.9	28.9	26.9

Source: author.

The expenses on petroleum products' storage are equal approximately to 3% of their value [3]. The return on current assets can be assumed equal to 22%. Then it turns out that the expenses (direct and indirect), caused by stock maintenance, amount approximately to 25% of stock value. That was the figure which was input into the model. No constraints on stock levels were imposed. The calculation results (intra-year dynamics of stock, production and sales by groups of products) are shown on Fig. 1.
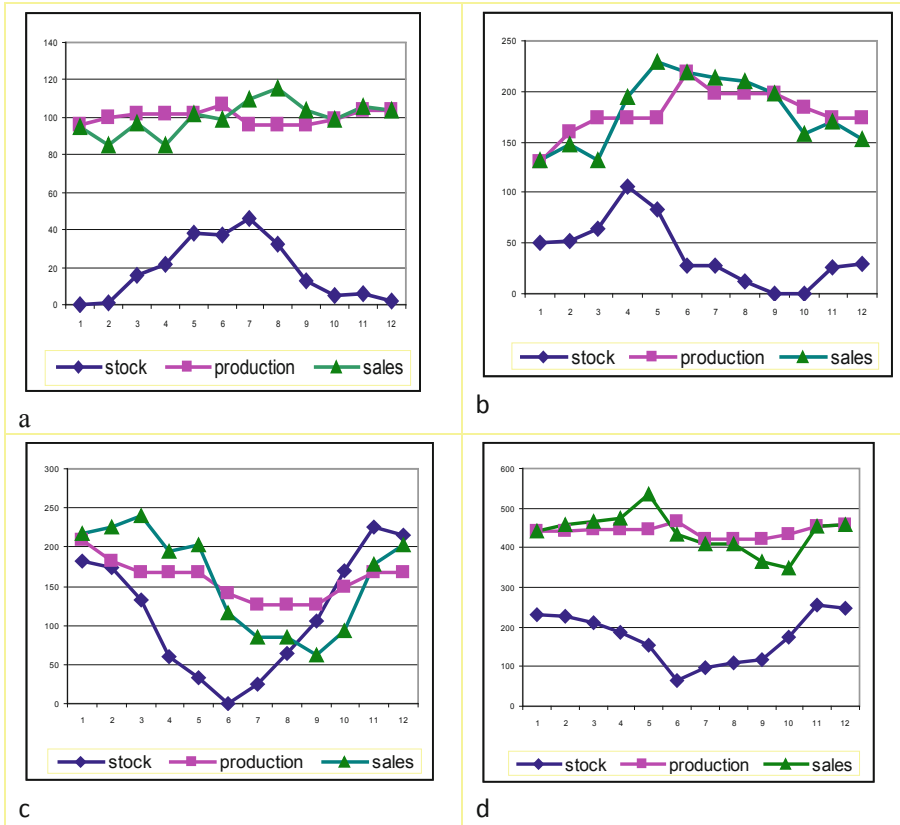
Fig. 1. Calculation results: a) gasoline, b) diesel, c) black oil, d) all three commodity groups (Source: author).

4   Discussion

The results show that in the optimal scenario, production of gasoline during a year does not require any significant changes. Thanks to some decrease of winter demand during the first half-year, gasoline stock is created that compensates the increased summer demand. The result for diesel differs. Here the optimal level of production during a year changes quite significantly. By the middle of a year it increases almost twice relative to the winter minimum, but still is somewhat behind the demand and the difference is made up from stock. The stock is depleted by autumn, then it grows and reaches maximum by spring.

The demand for black oil experiences the highest seasonal fluctuations. The coefficient of variation is equal approximately to 0.6. The dynamics of production is close to the dynamics of demand but is characterized by a substantially lesser variation. Hence, the attenuating role of stock is particularly great in this instance. In summer,

black oil production exceeds the demand and the stock grows till November. Later, during the first half-year, it is used to make up the output shortage.

So, the seasonal fluctuation of demand forces the company to maintain a considerable stock. In the example under discussion, the yearly output for the three commodity groups amounts to 5260 thousand tons while the optimal stock level is 2080 thousand tons, i.e. 39%, or 32% in terms of money. This approximately corresponds to findings of other similar investigations [1]. The direct and indirect expenses related to maintenance of such stock amount to 8% of the commodity product value. However, these expenses are compensated through reduction of costs in connection with seasonal restructuring of production.

5 Conclusion

A methodology for optimizing intra-year production and sales cycle of an oil company with regard to the attenuating role of commodity stock has been suggested. A mathematical model and problem solution algorithm have been developed. For algorithm realization, copyrighted software was used. Calculations were made based on Samara Region data. Calculation results allow concluding that in case of optimal stock management it is possible to reduce significantly the production costs related directly or indirectly to seasonal demand fluctuations.

References

1. Chen, H., He, X., Qiu, T., Chen, B.: Refinery inventory management. J. Chem. Ind. Eng. (China) **54**(8), 1118–1121 (2003)
2. Kadambur, R., Kotecha, P.: Optimal production planning in a petrochemical industry using multiple levels. Comput. Ind. Eng. **100**, 133–143 (2016). https://doi.org/10.1016/j.cie.2016.08.008
3. Livshits, M.Yu., Sizikov, A.P.: Multi-criteria optimization of refinery. In: Kuznetsov, G.V., Strizhak, P.A., Zhdanova, A.O., Bulba, E.E. (eds.) Thermophysical Basis of Energy Technologies 2015. Web of Conferences, Les Ulis (2016). EPJ Web of Conferences, vol. 110, no. 01035
4. Sizikov, A.P.: Software product SMONNP. Management of large systems. Collect. Papers **24**, 298–326 (2009)
5. Zhang, L., Jiang, Y., Gao, X., Huang, D., Wang, L.: Efficient two-level hybrid algorithm for the refinery production scheduling problem involving operational transitions. Ind. Eng. Chem. Res. **55**(28), 7768–7781 (2016)

Criteria for Analytical Evaluation and Selection of Investment Programs and Projects

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Abstract. The article investigates problems of evaluating the economic efficiency of investment projects for reconstruction of existing facilities and ways to justify investments in the process of reproduction of fixed assets. Special attention is paid to the selection and justification of criteria that ensure selective selection of an array of investment projects for inclusion in the investment program in the conditions of the economy digitalization. The classification of criteria is analyzed depending on the requirements of various participants in the investment and construction process by the implementation of reconstruction and technical re-equipment projects. The authors focus on the in-depth examination of investment projects for the reconstruction of existing enterprises.

Keywords: Criteria · Investment · Investment efficiency · Investment and construction process · Reconstruction

1 Introduction

When forming an investment program for reconstruction and technical re-equipment, as a rule, there is a situation when several investment projects are proposed that have various innovative solutions for inclusion in the investment program [8], and the total amount of investment is limited, so it is obvious that it is impossible to accept all the proposed investment projects. Therefore, there is a need to develop an algorithm that allows evaluating these projects and then ranking them according to certain criteria [4]. We can offer several approaches to solving this kind of problem in the context of developing digital technologies. Reconstruction is considered effective if the expected return rate exceeds any other investment. However, this should not be sufficient to include the i-th object in the investment program of reconstruction and technical re-equipment. In practice, there is a number of restrictions that do not allow carrying out reconstruction in the shortest possible time at all those enterprises where it is effective. In addition, there is a problem of establishing a rational sequence of objects included in the investment program, and the most optimal distribution of reconstructed objects by the implementation periods of the investment program.

2   Methodology

Criteria for analytical evaluation of investment proposals in the framework of the formation of investment programs are proposed to be determined depending on the direction of a reconstruction project on a competitive basis. Competitive selection of investment proposals is usually carried out on the basis of expert assessments within the framework of the competition. The selection of offers should not be based on a single criterion, even if it is a complex one. It should relate to all projects, regardless of their complexity or importance. Therefore, it is necessary to conduct a multi-aspect examination [4]. The final decision is formulated taking into account many different, often contradictory characteristics and factors that cover quantitative and qualitative parameters of a project [2]. Some of these factors affect economic, environmental or social consequences of implementing such projects in a country's economy, region, or industry. The other part describes various risks associated with the offer implementation process. Criteria for selecting investment proposals in the framework of the competition can be divided into the following groups:

- target criteria,
- criteria that determine the influence of the external environment,
- criteria that determine the economic efficiency of an investment project for a potential investor,
- criteria that determine environmental aspects,
- criteria of the investor submitting an investment offer,
- criteria that determine scientific and technical prospects,
- criteria that determine commercial prospects,
- criteria that determine the production potential,
- criteria that determine market prospects,
- social performance criteria,
- criteria that take into account various risk factors.

The first group of criteria determines investment directions that require support from the state, i.e. joint projects are formed, so-called public-private partnership, and therefore investment proposals are joint in their nature and have a high certainty degree. The second group forms a specific investment proposal taking into account their innovative component [8]. The criteria for each group are evaluated as mandatory and indicative. Failure to meet the mandatory criteria leads to a deviation of the project from inclusion in the investment program, indicative (recommended) criteria require additional evaluation, depending on the project direction. During in-depth examination of an investment offer, the criteria of each group are evaluated both for the entire offer and for individual participants.

The formation of criteria is based on a socio-economic situation in the country or specific industry in which the investment project is being implemented. Some of the specific criteria may relate to criteria of other groups. This is due to the fact that this type of criteria is taken into account only at the stage of selecting priority investment areas. It is obvious that this is the degree of linking the investment proposal with the goals of an investment program, and then it is clear that the discrepancy of the

investment proposal to a certain criterion causes a reasonable management decision of expert commissions to reject a project from inclusion in the investment program [9].

Criteria that determine the impact of the external environment include:

– legal security of the offer, its consistency with the current legislation;
– possible impact of the prospective legislation on the investment offer and results of the investment program implementation;
– a possible reaction of the public opinion to the implementation of a proposal;
– how will parameters in the industry and related industries change as a result of the implementation of the investment proposal,
– impact on the presence of harmful products and production processes in the region (positive, negative, neutral),
– the impact of supply on the employment level in the region.

Criteria that determine the economic efficiency of an investment project for a potential investor should be used as traditional, generally accepted, and related directly to the investment project under consideration, taking into account its features and specific features of its implementation. The composition of these criteria should be subject to in-depth examination, since the optimal indicators of these criteria significantly reduce investors' risks.

The criteria for an investor submitting an investment offer are:

– investor's position in the market;
– competence, experience and management skills of the management team;
– experience and activity of operations in the foreign market, marketing research strategy;
– financial stability and financial sustainability;
– trends in the achieved results of the economic activity,
– data on indicators of change (growth, decline);
– data on changes resulting from diversification and restructuring.

The criteria that determine the scientific and technical prospects affect:

– innovativeness and prospects of innovation implementation;
– patent purity of products and patentability of the used technical solutions;
– the possibility of applying the results obtained in future developments,
– the extent and nature of the impact on other projects of public interest.

These criteria are calculated for an investor who participates in the implementation of an investment offer with their assets.

Criteria for determining commercial prospects contain data on the value of investments, and the implementation of the proposal, the expected annual income, the expected net discounted profit, the value of the index of the internal rate of return that is satisfactory to the investor, the compliance of proposed criteria with indicators of the economic efficiency of capital investments, the payback period and balances of real cash flows, stability of revenues from the proposal implementation, the possibility of using tax incentives, financial investment risks, identified during the evaluation of the proposal.

Criteria that determine the production capacity include:

– opportunity to use available raw materials, materials and necessary additional equipment;
– need to implement technological innovations;
– availability of production personnel;
– possibility of processing and using production waste;
– need for additional production capacity.

These criteria are calculated for an investor who participates in the implementation of an investment offer with their assets.

The criteria that determine the market prospects imply the compliance of the investment offer with market demands, an assessment of the total market capacity in relation to the volume of the products output offered in the investment project, and a probabilistic assessment of the commercial success of the project proposal.

Criteria of social effectiveness:

– possibility of employment growth;
– increase in income of the population;
– improvement of working conditions of employees;
– growth of infrastructure facilities;
– improvement of housing conditions in the region;
– improving the supply of water, gas and electricity to the population of the region.

Criteria that take into account various risk factors:

– likelihood of increasing the cost of construction, reconstruction or technical re-equipment;
– likelihood of increased construction time;
– possibility of reduction of terms of reconstruction and technical re-equipment;
– stable relations between contractors, subcontractors by new construction;
– consistency of primary production and contractors conducting reconstruction works by reconstruction and technical re-equipment;
– political risks;
– environmental risks;
– other risks.

All indicators are accepted taking into account the impact of the investment offer on existing enterprises in the industry. The assessment of each component is taken as a sum of results achieved by the investment proposal under consideration, and changes in the situation at existing enterprises and in the industry or region as a whole [5].

3   Results

After selecting the composition of criteria, the task of selecting investment proposals can be determined: from a set of n objects, the reconstruction of which is effective for a given period of time based on the calculation method given above, it is necessary to include m objects ($m < n$) in the investment program for reconstruction and distribute them according to this investment program.

As a target function, the total economic effect of the reconstruction of objects can be used, calculated according to the described method.

$$y = \sum_{\tau=1}^{t} \sum_{i=1}^{n} x_{i\tau} E_{i\tau} \to \max$$

where $x_{i\tau} = 1$, if the i-th object is included in the investment program (0, otherwise).

$E_{i\tau}$ – economic effect of reconstruction;

The economic effect of the reconstruction of the i-th object in the τ-th year is determined by bringing the economic effect of the reconstruction to the first year of the investment program. Since the reconstruction duration of some objects may exceed a year, $x_{i\tau} = I$ is accepted only for the year of the beginning of reconstruction of the i-th object. The duration of reconstruction is assumed in accordance with standards or calculations. Breaks in the reconstruction of an object are not allowed.

It should be noted that some objects may be included in the investment program of reconstruction for non-economic reasons (for example, the emergency state of an industrial enterprise). Such objects are considered as extraordinary, and the task is solved taking into account the corresponding adjustments of capital investments and restrictions on the total capacity [5].

A limited number of capital investments in reconstruction by industry or region $K\tau$ may be a restriction. Restrictions on capital investments should be taken as a cumulative total, since funds not used in the year τ can be realized in the year $\tau + 1$. Thus, restrictions on capital investment can be presented as follows:

$$\sum_{\tau=1}^{t} \sum_{i=1}^{n} x_{i\tau} K_{i(t+1-\tau)} \leq \sum_{\tau=1}^{t} K_{\tau}$$

where t is a number of the implementation year of the investment program;

$K_{i\,(t+1-\tau)}$ – capital investment in the reconstruction of the i-th object in the $(t + 1 - \tau)$ year after the beginning of the reconstruction with a cumulative total.

If $(t + 1 - \tau)$ exceeds the standard duration of reconstruction, $Ki(t = 1 - \tau)$ is assumed to be equal to the total amount of capital investment in the reconstruction of the i-th object;

$K\tau$ – allocated investments for the τ-th implementation year of the investment program.

It should also be taken into account that the reconstruction of existing enterprises is often accompanied by their partial shutdown or partial reduction in production. Therefore it is necessary to take into account the restrictions on the total capacity of industrial enterprises:

$$\sum_{\tau=1}^{t}\sum_{i=1}^{n}x_{i\tau}M_{i(t+1-\tau)} \geq \sum_{\tau=1}^{t}M_{\tau}$$

where Mi is the need for the industry or region to increase capacity in the year τ due to the reconstruction;

$Mi(t + 1 - \tau)$ – increase (decrease) in the capacity of the i-th object in the $(t + 1 - \tau)$ year after the start of the reconstruction. If $t + 1 - \tau$ exceeds the reconstruction duration on the i-th object, $Mi(t + 1 - \tau)$ is assumed to be equal to the increase in the capacity of the i-th object due to the reconstruction.

Another approach is based on the assumption that if the implementation of all projects is postponed for one year, then based on the resulting index of expected losses of net present value, which acts as one of the main criteria for evaluating any investment project, we can compare and identify projects with minimal losses, the implementation of which can be postponed to the next year of the investment program.

The calculation logic is based on the following: from the business plans of a set of projects, the values of net present value (NPV_0) and the amount of investment ($\sum I$) required for each reconstruction project are selected; the discount coefficients or return on invested capital are determined when the project implementation is conditionally postponed for one year; the corresponding value of net present value (NPV_1) is determined by multiplying (NPV_0) by the discount coefficient; the absolute value of NPV losses ($NPV_0 - NPV_1$) for each of the projects is determined; then the index of possible losses of the net present value is calculated by dividing the absolute value of losses by the amount of investment in the corresponding reconstruction project. In this way, the priority range of projects is determined by the value of the loss index from a higher value to a lower one. The higher the value of the loss index is, the more feasible it is to implement the project in the first year of the investment program, if there is enough investment.

The same priority series should be built on the basis of a criterion that reflects the efficiency level of the return on investment – the profitability index. This indicator is also calculated when evaluating investment projects. By ranking its values in descending order, you can determine the implementation order of investment projects included in the program. Moreover, practice has shown that the use of these indicators gives, as a rule, the same result.

When forming an investment program for reconstruction and technical re-equipment, it is usually necessary to compare projects with different periods of validity [5]. In this case, the indicators of net present value taken from the business plans of projects are not quite correct. Here you can use the method for calculating the net present value of the reduced flows. The smallest total multiple of the validity periods of the analyzed reconstruction investment projects (γ) is determined, and considering each analyzed project as repeating a certain number of times (n) in the period (γ), the total net present value for each of the pairwise compared projects is determined by the formula:

$$NPV_{(ij)} = NPV_{(i)} \times (1 + \frac{1}{(1+r)^i} + \frac{1}{(1+r)^{2i}} + \frac{1}{(1+r)^{3i}} + \ldots n)$$

where: $NPV_{(i)}$ – net present value (reduced effect) of the original project from the business plan;

i – duration of the reconstruction project;

r – interest rate or profitability of the reconstruction project;

$\frac{1}{(1+r)^i}$ – a discount coefficient;

n – number of repetitions of the project during the period (γ).

From two projects compared in pairs, the one with the lowest value of the NPV is preferred.

4   Discussion

In the analysis of alternative reconstruction projects, each of which is effective, you can use the incremental indices: here we determined the difference of indicators with the additivity property; in renovation projects, it is the amount of investment, annual income, NPV, etc.; by calculation we determine the internal rate of return and the total return index for a conditional draft from each compared pair of projects with incremental indicators; and the obtained value of the internal rate of return for the conditional project and the analyzed project is compared with the interest rate. If the internal rate of return (IRR) of a conditional draft is more than the profitability of the project, then the project with large capital investments is accepted as the most effective one, and conversely, if the IRR is less than the profitability of the project, the project with less investment is accepted [1, 3]. This is not always legal and appropriate.

In this regard, when faced with certain difficulties in calculating the discount rate, especially in unstable conditions of the economic development, it is necessary to additionally use the option approach to the formation of investment programs. Distinctive features of the real options method are characterized by the complexity and direction of the evaluation process, which enables constant interaction of economists, lawyers, technologists, human resources specialists, financiers, etc. As a result, based on the use of digital technologies, the reasonableness, validity, comprehensiveness and depth of the evaluation results are increased [6, 7, 10]. Evaluation of real investment projects of reconstruction by the optional method consists of several stages. First, the compliance of various factors that affect the implementation of the project in the current conditions is assessed. In parallel, possible measures aimed at minimizing damage and maximizing the use of favorable factors are identified.

As a result of a comprehensive discussion, a general line is worked out with the main development parameters necessary for making future management decisions. In addition, serious attention should be paid to the environmental expertise, so the authors distinguish it as one of the criteria for the analysis of investment proposals. Environmental expertise should always be independent and of high quality. Therefore, it should be carried out by a

specialized organization. The investment program itself is pre-evaluated. Compliance with the legislation of the Russian Federation and regional legislation is the most important condition for the implementation of any state program, so if this condition is not met, it is necessary to review and eliminate all the provisions that prevent the implementation of the investment proposal. This is also a qualitative indicator. Further, if necessary, you can conduct an in-depth examination.

The objectives of the in-depth examination are to verify the validity of the economic calculations and forecasts contained in the investment proposal, the correctness of calculations, as well as to verify the estimates of the preliminary examination. In-depth examination is performed by one or more experts from the expert group appointed by the members of the expert council. If necessary, a special examination is carried out with the involvement of external specialists. In the conditions of digitalization, it is possible to build a sufficiently reasonable decision-making algorithm for optimizing the inclusion of the project in the investment program. If the evaluation of individual criteria was adjusted during the in-depth examination, a new offer rating is calculated. Proposals that have passed an in-depth examination are considered at a meeting of the expert council.

5 Conclusion

Based on the available information, it is possible to build an economic and mathematical simulation (or situational) model that will allow you to form an adaptive management plan for the reconstruction investment program. In our opinion, the optional method for evaluating real reconstruction projects is a method of the XX1 century, the use of which in the digital economy may provide specific advantages to industrial enterprises in the future.

The competition for investment proposals can be organized by public or private investment organizations that formulate the main goals of the competition. The competition can be held by an existing expert council or a specially formed competition council. The competition council develops terms of the competition that determine first of all directions of investment proposals and restrictions on their indicators. In accordance with the developed terms of the competition, the system of criteria for evaluating proposals and the procedure for selecting proposals is being clarified. The use of innovative digital technologies allows us to consider and take into account a wide range of criteria, specifics of various reconstruction projects and investment opportunities of customers of such projects. Both existing and newly created expert groups can be used for conducting the examination. To monitor the implementation of the proposal accepted for funding by the expert or competition council, a curator is appointed from the council, who submits a report on the compliance of the actual progress of work compared to the planned ones in the project and makes suggestions for changing the work plan. Funding organizations make a decision on whether to maintain or change the terms of funding based on these reports. Proposals that raise doubts, as well as those related to significant capital investments, can be submitted for in-depth examination.

References

1. García, M.V.R., Krzemień, A., Bárcena, L.C.S., Álvarez, I.D., Fernández, C.C.: Scoping studies of rare earth mining investments: deciding on further project developments. Resour. Policy **64**, 101525 (2019)
2. Karibskii, A.V., Shishorin, Yu.R., Yurchenko, S.S.: Financial and economic analysis and efficiency evaluation of investment projects and programs. Autom. Remote Control **64**, 1205–1224 (2003)
3. Karner, A., Golub, A.: Assessing the equity impacts of a transportation investment program. In: Lucas, K., Martens, K., Di Ciommo, F., Dupont-Kieffer, A. (eds.) Measuring Transport Equity, pp. 277–290. Elsevier, Amsterdam (2019)
4. Makarkin, N.P.: The Effectiveness of Real Investment. INFRA-M, Moscow (2011)
5. Moiseenko, N.A., Kotov, I.A.: Features of managing investment programs for the reconstruction of existing enterprises. Constr. Econ. Manag. **1**(5), 13–27 (2012)
6. Momeni, M.A., Yaghoubi, S., Mohammad Aliha, M.R.: An optimal control model for analyzing quality investment in the project management. Comput. Ind. Eng. **129**, 529–544 (2019)
7. Paquin, J.-P., Gauthier, C., Morin, P.-P.: The downside risk of project portfolios: the impact of capital investment projects and the value of project efficiency and project risk management programmes. Int. J. Project Manag. **34**(8), 1460–1470 (2016)
8. Samosudova, N.V., Cherkas, A.D.: Innovative solutions in modern construction. Modern Innov. **2**(2), 30–32 (2015)
9. Serov, V.M.: On the evaluation of the effectiveness of the functioning and updating of fixed assets. Constr. Econ. Manag. **4**, 7 (2011)
10. Yu, S., Gao, S., Sun, H.: A dynamic programming model for environmental investment decision-making in coal mining. Appl. Energy **166**, 273–281 (2016)

A Modern Tool for Students' Self-organization in the Digital Economy

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Abstract. The article presents the results of an empirical study of the level of self-organization of students of the Samara State University of Economics (SSEU). The purpose of the study is to determine the level of self-organization of students in the digital economy. It was supposed to diagnose parameters that reflect the degree of self-organization of modern students. The survey was used as a research method. A sample of 120 students. The results of the study demonstrate the degree of application of self-organization tools for students aimed at developing the key competencies of future specialists and the fundamental competencies of future employees.

Keywords: Digital economy · Self-organization · Time-management

1   Introduction

In the new realities of economic and social development, special attention is paid in modern organizations to the sphere of human resources management. The digital age is significantly transforming the labour market, which changes the key competencies that a modern effective employee should have. According to the BCG study, the following skill groups of future employees will be relevant: cognitive, socio-behavioural and digital [12]. Among cognitive skills, experts primarily highlight organization as the degree of self-organization and ability to effectively use such irreparable resource as time.

In today's conditions of accelerating the dynamism of the rhythm of life, many people have a number of questions about the effective distribution of their time, and students are no exception. At present, students' timetable at the higher educational institution is quite dense. It is necessary to visit all lecture and practical classes, to prepare group and individual projects, to make a report, to write a summary, course and graduate qualification works. Many students seek to combine study and work to gain experience and practical skills. At the same time it is impossible to forget about family, friends, hobby, sports. In order to cope with such a rhythm of life, students need to learn to apply time management tools. The ability to select, structure and process information within a short time frame is already a competitive advantage in the labour market under conditions of universal digitalization. In this regard, the aim of the study is to determine the level of self-organization of students as future professionals who are already in global informatization and living in an environment of excessive information

flows. The subject of the study is time management as a tool of self-organization. The subject of the study are students of the SSEU. At various times, foreign and domestic scientists have attempted to study various aspects of self-organization and time management [1–4, 6, 11].

Currently, time management is a comprehensive system of managing your time, yourself and your activities. The application of time management principles can help achieve various goals: increasing personal efficiency, more rational use of time, increasing the level of life satisfaction, etc. One obstacle to that is time. Due to the high dynamics of modern life, it is almost impossible to carry out all cases at once. Therefore, when planning, it is necessary to prioritize immediately for purposes, to concentrate their attention on really important cases, and the rest to delegate or abandon them. Sometimes this can greatly improve the efficiency of using your time.

The use of various time management tools allows a modern person to manage more, work more efficiently, focus on the main aspects. But without the internal component of the personality, represented by self-organization, they will remain just tools. In general, self-organization is the ability to organize your activities and your own resources, the ability to organize yourself. Self-organization is a multi-component of the individual that requires the presence and development of the following abilities to:

- self-knowledge – implies the desire of a person to study his personality in order to determine his own strengths and weaknesses;
- self-determination – definition of own desires and formation from them is more whole also arrangement of priorities between them;
- self-monitoring – ability to form constraints for the expected activity with subsequent evaluation after obtaining the result;
- self-realization – use of knowledge of own merits and shortcomings in order to achieve the set goals in the course of their activities;
- self-improvement – ability to learn from the results of their activities and work on themselves, developing their personal qualities for more efficient work in the future [10].

2   Methodology

The methodological basis was the self-organization test questionnaire of Time Structure Questionnaire (TSQ), developed by Fisher and Bond (adaptation in Russian was performed by Madrikova) [8] and modified to meet the needs of the study. In order not to distort the interval of the questionnaire estimates, the scale boundaries were adjusted in proportion to the magnitude of the changes.

The above technique is aimed at systematic analysis of factors of self-organization of the person during the course of their daily activities, which are multi-component components of the person (internal characteristic of self-organization) and assessment of the level of use of auxiliary tools and technologies of time management (external factors of self-organization). All these factors describe the model under study by means of indicators: "regularity," determination, "perseverance," fixation, "self-organization,"

orientation to the present". The converted questionnaire was distributed to the students of the SSEU. The number of respondents was more than 120 people (1–4 courses).

3 Results

The results of the questionnaire are shown in Table 1.

Table 1. Results of questionnaire of self-organization students

Scale	Degree, number of students		
	Low	Average	High
Regularity	119	55	448
Commitment	22	103	117
Persistence	225	78	119
Fixing	77	111	44
Self-organization	55	72	445
Orientation to the present	66	110	66

Source: authors.

First of all, the involvement of respondents in planning (regularity) of their daily schedule was revealed by determining tasks for the day, as well as the presence of systemicity in building daily cases. It was found that 55 students (45% of the sample) are moderately inclined to develop day plans, a list of cases and try to comply with them. However, elements of spontaneity may be present in their lives.

The next group is slightly smaller than the previous group and is 48 (39%). This group included people who have more advanced tactical planning skills and prefer to move consistently towards their goals. A small group of 19 students (16% of the total sample) prefer to live a spontaneous life and not complicate it with current case planning. It is important to note that such people are evenly distributed in the amount of not more than 5% per course.

Next, a corrective question aimed at determining the degree of personality commitment was used and demonstrates the respondent's ability to concentrate on any goal to fulfill it. The largest group of 103 students, representing 84% of the sample, are able to characterize themselves as sufficiently committed, who are well aware of and understand their own goals and are able to achieve them. However, this is not always the case. Periods of time may appear in their lives when they perform tasks without the necessary clarity and need for them personally.

The next group of 17 respondents (14%) consider themselves purposeful people. They have decided on life goals that have set for themselves, know and go towards their realization. This group prevails among senior students, which may be due to a successful choice of profession and a possible place of future employment.

The smallest group of 2 students are not always inclined to see and set clear goals for themselves. They also describe themselves as people who do not make efforts to

achieve their goals. The next stage determined the degree of "Perseverance" of students in carrying out their daily tasks. The ability of respondents to apply will efforts, as well as internal reserves, to bring the cases started to completion was identified. Unlike the two previous scales, this shows a more normal distribution of respondents' responses. A group of 78 students, representing 64% of the total sample, are sufficiently organized and capable of making a will effort to achieve any goal. However, if circumstances so require, they may postpone the current tasks and switch another.

The next group by percentage is 25 people (20%). This group of students has difficulty bringing their cases to the completion stage, which is due to their tendency to be distracted by extraneous cases unrelated to the current one, and may not be meaningful. The smallest group, but not the most important, is the will and organized people. They are able not only to plan goals and objectives, but also to structure them to more effectively complete them. It is not common for them to be distracted by extraneous affairs during their activities.

This group also defined the presence of multitasking and the effectiveness of this form of organization. The results showed that for 20% of the sample it is not typical to take several cases at the same time and not bring them to a logical conclusion, or it happens with a low probability. What can't be said about the others. Half of the students live in multi-tasking conditions, and are often unable to bring all cases to the right time frame. The remainder of the 30% sample does not have internal reserves to bring its cases to a logical conclusion.

A question was then used to determine the degree of student fixation to the pre-planned event structure and the difficulty of adapting to its change. Most respondents consist of flexible people regarding the planning of their activities. This group included 111 people or 91% of the total sample. They can both concentrate on already planned cases and quietly switch to others.

The next largest group included 7 respondents (6%) with a low degree of fixation in a certain occupation. They are flexible and able to switch between cases with ease, as well as to new tasks. A slight group of respondents included 4 people, which is 3% of the total sample. They are characterized by high performance and an obligation to complete their tasks. They try in every way to complete the cases already in place before embarking on new ones. As a result, they lose flexibility when circumstances change.

The tendency of respondents to keep diaries, daily books and other auxiliary means for planning their time was also revealed. It has been determined that most students, namely 72 (59%) may use external sources of self-organization, which may include keeping diaries or diaries and their counterparts. And it is more typical for this group to use either a diary or a daily. At the same time, they can equally rely on their natural self-organization.

Another proportion of 45 respondents (37%) are active users of auxiliary time planning tools, recording their experiences and results in a diary, and using daily and other planning tools. An interesting fact is that this group of students is formed practically at the expense of the 1st year. Their share in the total sample in this group is 43%. The remaining 5 respondents (4%) consist exclusively of 2nd year students. They are not inclined to use external sources of self-organization and do not keep diaries and daily books that can help plan their time more effectively.

The final part of the questionnaire asked about the orientation of students in time, defined the priority of current affairs or the tendency to long-term planning. The largest group of respondents of 110 people (90%) balance well and appreciate what has happened to them, what is going through and happening at present, and what expects them in the future.

The remaining part of the sample was divided into two equal parts of 6 people (5% respectively). One group included students who are characteristic of fixing on their past or future, forgetting the present or ignoring these events. For the other group, it is more preferable to live on the principle of "Here and now" and the past or future cares little about them.

4 Discussion

In order to increase the level of self-organization of modern students, it is advisable to use some time management tools. The use of the Eisenhower matrix can provide substantial assistance to improve planning and scheduling. This time management tool is based on dividing all tasks into two axes – importance and urgency. Before distribution, all targets for the day must be written. In order to determine the degree of importance, it is necessary to assess the possible consequences in case of refusal to perform it. If the consequences are expected to be serious, the goal is important. The urgency criterion is relevance. If the target loses relevance, it is assessed as urgent. This easy-to-implement tool by prioritizing tasks will allow you to plan your day more rationally [5].

For more efficient targeting, it is possible to use the tool of time management "Wheel of life balance". This tool implies the identification of the most important spheres of life for man, in which he wishes to achieve success. Career, financial welfare, family and more, determine the balance [3]. It is necessary to define the main 8–10 directions, to define a key and measurable goal for the long term and to move towards it. The main obstacle to bringing the goal to a logical conclusion may be its incorrect formulation or assessment of significance. Using SMART technology can help solve this problem. It involves several requirements in setting the target:

1. Concreteness implies that the goal must demonstrate the end result in the realization of the goal.
2. Measurable requires that the goal be able to quantify and evaluate its achievement.
3. Reachability is a requirement for an objective that can be achieved while being ambitious. This condition involves evaluating your own resources to achieve your goal, or identifying missing conditions that will be an intermediate step between getting a result and the current state.
4. Consistency is the end result of achieving the goal must be consistent with the longer term and is in one of the directions of the Wheel of Life described above. This will, on the one hand, be a motivating factor, and on the other, make it possible to understand the real significance.
5. Time certainty involves setting time gaps for each target, a deadline for its implementation, after which its execution may lose relevance.

Paper daily is now a fairly traditional and popular tool for structuring and planning your own time, capable of showing an overall picture of your own employment. But the constant compilation of a list of cases and corrections can distort the picture. In the conditions of digitalization, the market of planning applications is actively developing [7]. Based on the fact that students always have a smartphone at hand, such applications can help plan their time more competently and concentrate on really important things.

The introduction of a time management system into its day-to-day operations should begin with the identification of a daily time reserve, which consists of downtime (duration of absence of active activities) and time sinks. Timing technology can help. In the conditions of digitalization, timing becomes possible to transfer from traditional paper media to specialized software products available for installation on a smartphone. This will allow to optimize the time for its maintenance, as well as to build a chart of the daily time balance for further graphoanalytic assessment and increase personal efficiency [9].

There are also alternative methods of timing using Internet services, one of which can be a multifunctional and universal Google form product with good adaptability. By simple transformation and adjustment of formulas in analytical cells within the results table, it is possible to easily determine the duration of activities during the day, which will serve as a basis for monitoring efficiency and further planning of their activities [2]. The main disadvantage of this method is the need to access the Internet for data synchronization and backup. At the moment there is quite a wide selection of applications, performing similar functions of traditional paper daily (external sources of self-organization), but supplemented with additional functionality. As a rule, many of them differ only in the design and variations of key functions (synchronization, backup, ability to project tasks, labels, priorities, etc.), which are available in the free version of the program.

5 Conclusion

In general, respondents who participated in the questionnaire can be described as flexible, able to adapt to changes in the digital economy, while being able to structure their time, having a sufficiently high level of self-organization. Most of them are familiar with the concept of time management and realize the importance of planning their activities in conditions of universal digitalization. However, based on the specifics of the direction of training of students, it is necessary to further inform about existing technologies and tools of tai-management, to develop those competencies that lay the basis for competitiveness in the labor market in the further employment of current students.

References

1. Archangel, G.: Time Management. Alpina, Moscow (2018)

2. Blandford, A.E., Green, T.R.G.: Group and individual time management tools: what you get is not what you need. Pers. Ubiquit. Comput. **4**, 213–230 (2001)
3. Boniwell, I., Osin, E.: Beaond time management: Time use, performance and well-being. Organ. Psychol. **3**, 85–104 (2015)
4. Drucker, P.: The Effective Executive. Eksmo, Moscow (2014)
5. Kochetkova, N.V., Khlebnikova, D.A.: Time management: the art of time management. Modern Socio-Econ. Process. Prob. Patterns, Prospects **3**, 104–106 (2017)
6. Kostricov, S.S., Kerzhentsev, P.M.: Fight in time. Vestnik Univ. **18**, 76–80 (2014)
7. Lekerova, G.Z., Kylyshbayeva, G.B., Karbozova, G.K., Zholdasbekova, K.A., Dlimbetova, B.S., Sikhimbayeva, Z.S., Aymenov, A.Z.: Research of the problem of forming student's motivation. Espacios **25**, 26 (2017)
8. Mandrikova, E.Yu.: Development of the questionnaire of self-organization of activity (OSD). Psychol. Diagn. **2**, 87–111 (2010)
9. Nevolina, V.V., Shcheglova, M.I.: Study of self-organization features as essential characteristic of student time management. Tavrichesky Sci. Obs. **9**(14), 47–49 (2016)
10. Reunova, M.A.: Axiological aspect of self-organization-time student of the university. Vestnik OGU **2**(138), 237–242 (2012)
11. Shmurygina, N., Nikolaeva, N., Bazhenova, N., Bazhenov, R., Tcytcarev, A.: Self-organization activities of college students: challenges and opportunities. Int. J. Environ. Sci. Educ. **11**(17), 9981–9989 (2016)
12. The Boston Consulting Group: Russia 2025: Resetting the talent balance. (2017). https://www.bcg.com/Images/russia-2015-eng_tcm27-187991.pdf. Accessed 15 Feb 2020

Some Basic Mathematical Tools' Principles for Modeling Economic Processes

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Abstract. The purpose of this work is to consider some basic mathematical modeling aspects of economic processes. Economic and mathematical modeling, which is an economic object or process mathematical description, is particularly relevant in management processes. Comprehensive assessment of all important conditions of economic facility operation, management parameters, consequences of decisions made significantly reduces risks and financial losses. The problem is that mathematics does not work with real objects, but with their mathematical models. The problem's mathematical formulation is only half of the success in solving it. The complexity consists in an exception of excess, unnecessary details. Important conditions should be preserved and the problem formulated as a standard model. This makes it possible to identify process patterns and to ensure effective application of this model in practice. By way of illustration, the author presents some economic problems solved by special mathematical techniques means.

Keywords: Economic processes · Mathematical modeling · Optimization

1 Introduction

Modern economics is impossible without the use of mathematical methods as a tool for solving problems of economic content and carrying out various types of financial analysis. Calculation of the goods cost, products and services, costs, profitability of production, arbitrary labor and other calculations is a mandatory function of any economist and accountant. Linear programming, optimization tasks, factor analysis are used to justify economic decisions, identify trends and choose enterprise development strategies.

Economic and mathematical models are very useful in management processes, which are an economic object or process mathematical description [6]. Comprehensive assessment of all important conditions of the economic facility operation, management parameters, decisions consequences made significantly reduces risks and financial losses. A large number of models are distinguished, the selection of which in the real situation depends on specific goals: extrapolation, optimization, balance sheet, expert, network, factor econometric, models of mass service systems and other [7]. In the works of the winner of Prize in Economic Sciences in Memory of Alfred Nobel academician Kantorovich, four groups of economic and mathematical models are distinguished: interaction models of economic subdivisions; macroeconomic models that include demand models and balance sheet methods; optimization models as well as linear models [4].

2 Methodology

Linear programming has a very substantial application in economic calculations. Following problem definition.

Function of the purpose:

$$L(\overline{x}) = \sum_{j=1}^{n} c_j x_j \rightarrow extr$$

at restrictions:

$$\sum_{j=1}^{n} a_{ij} x_j \leq b_i, i = \overline{1, k}$$

$$\sum_{j=1}^{n} a_{ij} x_j = b_i, i = \overline{k+1, m}$$

Most often practical tasks use economic-mathematical problems' models about resources optimal use, about diet, about material cutting. These models are so-called "simulators" for compiling and solving a very wide range of economic problems. The current promising direction is economic and mathematical modeling of economic situations taking into account the market participants expectations, as well as using complex variables [3]. This approach is based on statistical study mathematical methods.

Economic and mathematical modeling allows to obtain the most objective idea of the analyzed economic object, to identify the main factors affecting the final result, to determine the force of their impact and the existing relationships [8]. In the case of building mathematical analysis on economic methods and statistics talk about applied science – econometrics. It includes modeling production and financial processes with further calculations [10].

The econometric model is a means of analyzing and predicting the real economic phenomena and processes based on specific statistical information. Classical methods of mathematical analysis include integration, logarithmization and differentiation, which are used both independently and within the framework of mathematical statistics and programming.

The integral method of factor economic analysis, based on the incremented function summation defined as a private derivative multiplied by the increment of the argument at infinitely small intervals, finds use in determining the influence of individual factors using multiplicative, multiple and mixed (multiple-additive) models, regardless of the elements number that are included in the model, as well as regardless of the connection type between them. Using the integral method, the calculation of a certain integral according to a given sub-attribute function and a given integration interval is usually carried out by a program using computer technology.

The integral method solves two main types of problems: statistical and dynamic. In the first case, there is no information on changes in the analyzed factors during the analyzed period, as in the case of the business plans implementation or economic indicators dynamics analysis. Dynamic type of tasks is solved if there is data on analyzed factors dynamics, for example, when studying economic indicators time series [2]. Logarithm is also fairly common, particularly in factor analysis. The essence of the method is to determine logarithmically proportional distribution of factors joint action values in proportion to the share of each of them influence on the total indicator value. Note that in the integral method, this value is equally distributed among the factors. Therefore, the logarithm method makes factor influence calculations more reasonable than the integral method.

Logarithmization does not involve absolute values of economic indicators growth, as in the case of integral method application, but relative - these indicators change indices. In carrying out mathematical analysis, the differential calculation method often finds application, which, formalizing the economic values connections, allows to solve the main economic tasks most effectively: determination of income change directions at taxes increase, the enterprise revenues at the price increase for its products or goods, additional purchased equipment on production and financial indicators influence's calculation, maximum profit search, costs and other minimization.

Each measure is a function of one or more variables, and it is necessary to study their relationships using differential calculus methods. The total change in function, that is, the total key figure, is divided into individual values, the value of which is determined by the product of a certain partial derivative per increment of the variable by which that derivative is defined [2]. For example, if the goal is to maximize profit, as a function of Y from the certain product X sales volume, then at the maximum point, the ratio of the function Y increment to the argument X increment should tend to zero, when the increment X approaches zero.

The Lagrange multipliers method, based on the search for private derivatives of the Lagrange function, is an effective tool for solving economic problems:

$$L(\overline{x}) = f(\overline{x}) + \lambda_1 \phi_1(\overline{x}) + \ldots + \lambda_s \phi_s(\overline{x}).$$

The numbers $\lambda_1, \ldots, \lambda_s$ are called Lagrange multipliers.

The most famous model of the production sphere is the "input-output" method developed by the American economist of Russian origin, Nobel Prize winner V.V. Leontiev, the creator of the intersectoral analysis theory. The method involves the formation of matrix (balance) models built according to a chess scheme and clearly illustrate the relationship between the volumes of final demand for a product or commodity, the total volume and the product industry structure.

If, instead of "product," a more general concept of "resource" is introduced, the balance model is understood to mean a system of equations that satisfy the requirements of matching the resource and its use availability.

$$X_j = \sum_{i=1}^{n} x_{ij} + Z_j, j = \overline{1.n}$$

$$X_i = \sum_{j=1}^{n} x_{ij} + Y_i, i = \overline{1.n}$$

Here

X_i – is the value of total output of industries, i.e. gross product;
Y_i – the industries end products;
Z_j – conditional net production.

Mathematical programming methods are one of the main means of solving problems of the enterprise production and economic activity optimization [9]. They allow to estimate the planned tasks intensity, results deficit, to determine limiting resources, optimal plan of goods transportation and to solve many other optimization tasks. An example of such tasks are transport models, the essence of which is not only to determine the optimal goods transport, the exclusion of too long-distance, counter-transport and repeated transport. With the transport type model, you can solve a wide range of problems, such as optimizing the various parts production or the optimal distribution of company employees [5].

The closed transport task's mathematical model is:

$$L(\bar{x}) = \sum_{i=1}^{m} \sum_{j=1}^{n} c_{ij} x_{ij} \rightarrow \min$$

at restrictions

$$\sum_{j=1}^{n} x_{ij} = b_i, \ i = \overline{1, m}$$
$$\sum_{i=1}^{m} x_{ij} = a_j, \ j = \overline{1, n}$$
$$x_{ij} \geq 0$$

In solving economic problems, it is often necessary to examine situations in which the interests of several parties with different objectives compete. Such situations are called conflict situations. In real life and, in particular, in the economy, conflict situations occur very often and are of different nature. Mathematical modeling of conflict situations is carried out by game theory, which allows to properly apply scientific-based methods of conflict situations resolution.

3 Results

Mathematical modeling in economics is carried out in several stages:

- the economic problem presentation and its qualitative analysis. At this stage, the main characteristics of the research object and its structure are identified, as well as the problem and acceptable assumptions are formulated;
- building a mathematical model as a specific mathematical dependency;
- identification of the model and its solutions general properties. An important aspect here is the proof of the existence of solutions in the formulated model;
- preparation of initial information. In this case, methods of probability theory and mathematical statistics can be used to organize selective studies and evaluate reliable data;
- numerical solution of the economic-mathematical model;
- analysis of the results obtained and their application in practice.

Consider the task of determining the amount of capital from known net investments using classical methods of mathematical analysis.

Let us designate capital as a function of time $K(t)$, and net investments $-I(t)$. Then net investment can be determined by how:

$$I(t) = \frac{dK(t)}{dt},$$

that is a derivative of the capital for the time t.

It is often required to determine the capital increment over a period of time from t_1 to t_2, i.e. value $\Delta K = K(t_1) - K(t_2)$.

The function $K(t)$ is primitive for the function $I(t)$, therefore, we can write:

$$\Delta K = \int_{t_1}^{t_2} I(t)dt = K(t_2) - K(t_1)$$

Let, for example, net investments be given by the function $I(t) = 200t^2$ (cu), it is required to determine the capital increment for 3 years.

Following the primitive formula for net investment, we get

$$\Delta K = \int_0^3 200t^2 dt = \frac{200t^3}{3} = 1800 \text{ (cu)}$$

Given the function of net investment, you can also determine how many years it will take for the capital increment to be a certain amount. These tasks are very much in demand in the field of financial computing. In modern economic conditions, the organization and planning of production in small enterprises is a development promising direction. Lagrange multipliers method allows to find the optimal solution to the distribution and production planning problem.

Let a small enterprise specialize in the production and sale of certain products. The daily production volume is 5 thousand kg. It can sell its products through the store and wholesale through sales agents. When selling x_1 kg of products through the store, sales costs are x_1^2 currency units, and when selling x_2 kg of products through trading agents - x_2^2 currency units. It is necessary to determine how many products should be sold in each way, so that the costs of sales are minimal

In order to solve this problem, it is necessary to draw up a mathematical model.

The objective function is:

$Z(x) = x_1^2 + x_2^2 \rightarrow min$

At restrictions:

$x_1 + x_2 = 5000,$

$x_1 \geq 0, x_2 \geq 0$

Let's make Lagrange's function:

$$L(x_1, x_2, \lambda) = x_1^2 + x_2^2 + \lambda(x_1 + x_2 - 5000)$$

Find private derivatives of Lagrange functions and equate them to zero.

$$\frac{\partial L}{\partial x_1} = 2x_1 + \lambda = 0$$

$$\frac{\partial L}{\partial x_2} = 2x_2 + \lambda = 0$$

$$\frac{\partial L}{\partial \lambda} = x_1 + x_2 - 5000 = 0$$

By solving this equations system, we get

$x_1 = 2500, x_2 = 2500, Z(x) = 12500000$ currency units.

Thus, in order to obtain minimum costs for products sales it is advisable to sell 2500 kg of products per day through the store and sales agents, at the same time the costs for sales will amount to 12500000 currency units.

The main requirement for any economic-mathematical model is its adequacy, i.e. compliance with the investigated process. Economic and mathematical models are effective only if they reflect only significant characteristics of the studied process, without taking into account secondary parameters [11]. This makes it possible to identify process patterns and to ensure this model effective application in practice.

4   Discussion

The economic and mathematical modeling process can very efficiently select the most optimal solutions to the problem. Today's economic challenges and challenges have a very broad range of issues. The economic-mathematical model analysis can be carried out using various software provisions [5]. For example, using standard, freely available optimizers such as Mathcad and Excel.

In order for the problem to be described qualitatively and quantifiably, it is necessary to carry out an analysis of the situations and objects laid down in this study. Complex objects are broken down into elements, there are relationships, properties, natural relations between them, expressed in the form of mathematical expressions [2]. Step-by-step use of operations research methods and their implementation with various software provisions allow to realize many possibilities that allow to simplify the problem's modeling process and analysis of the obtained result.

System analysis using mathematical methods of economic objects operation conditions, management parameters, decisions consequences significantly reduces risks and financial losses. Mathematics does not work with real objects, but with their mathematical models. The problem's mathematical formulation is only half of the success in solving it. The complexity consists in an exception of excess, unnecessary details. Important conditions should be preserved and the problem formulated as a standard model. To make full use of optimization theory and operation research techniques, one must be convinced of the system mathematical approach usefulness in managing.

5   Conclusion

Mathematical methods and economic and management processes modeling always simplify in one way or another, make more ground-breaking questions to be found. Sometimes nonlinear processes are reflected by linear models, dynamic processes are reflected by static models, and so on. In any case, the researcher should not feel that the mathematical methods application in economic research consists only in the suitable formulas selection, substitution of any numbers in them and obtaining adequate answers to the questions asked. The recommendations of the famous American scientist specialized in the development and application of computational mathematics methods Hemming are known: "The purpose of calculations is understanding, not number" [1, p. 32]. And also: "Before you solve the problem, think about what to do with its solution" [1, p. 68]. It is necessary to possess knowledge and skills in the use of generally accepted and individual techniques, which will allow to achieve the goal faster and easier.

References

1. Hemming, R.: Numerical Method. Nauka, Moscow (1972)
2. Intriligator, M.: Mathematical Optimization Methods and Economic Theory. Airis-Press, Moscow (2002)
3. Kostuchenko, V., Zdanov, A., Rodionov, A.: Mathematical methods of managing economic sustainability of the construction company. IOP Conf. Ser. Earth Environ. Sci. **90**(1) (2017). https://iopscience.iop.org/article/10.1088/1755-1315/90/1/012076. Accessed 09 Mar 2020
4. Kutateladze, S.S., Makarov, V.L., Romanovsky, I.V.: Scientific heritage of L. V. Kantorovich (1912–1986). Siberian J. Ind. Math. **4**(2), 3–17 (2001)

5. Levitin, I.E., Mayboroda, V.P.: Digital economy in management and evaluation of transport and logistics projects and life cycle processes. In: Sofin, A. (ed.) Proceedings of the 2017 International Conference Quality Management, Transport and Information Security, Information Technologies, IT and QM and IS 2017, pp. 240–242. IEEE, Piscataway (2017). https://doi.org/10.1109/itmqis.2017.8085803

6. Okrepilov, V., Chetyrkina, N., Krylov, M.: The role of elements of the economics of quality in mathematical modelling of socio-economic processes. In: Mottaeva, A. (ed.) Proceedings of the International Scientific Conference Construction and Architecture: Theory and Practice for the Innovation Development. EDP Sciences, Paris (2019). https://doi.org/10.1051/e3sconf/201913802008. E3S Web of Conferences, vol. 138 (02008)

7. Podvalny, S.L., Minakova, N.V., Vasiljev, E.M.: Modelling and analysing the dynamic interaction between competing branches of the regional economy as a multiagent control system. In: Korol, E. (ed.) Proceedings of the 1st International Conference on Control Systems, Mathematical Modelling, Automation and Energy Efficiency, pp. 169–174. IEEE, Piscataway (2019). https://doi.org/10.1109/summa48161.2019.8947567

8. Pourjavad, E., Mayorga, R.V.: Optimization of a sustainable closed loop supply chain network design under uncertainty using multi-objective evolutionary algorithms. Adv. Prod. Eng. Manag. **13**(2), 216–228 (2018). https://doi.org/10.14743/apem2018.2.286

9. Voronkova, O.Y., Kundius, V.A.: Economic and mathematical modeling of the process of production of quality agricultural products. Qual. Access Success **20**(173), 116–120 (2019)

10. Wang, Y.: Medium- and long-term predictions for coastal economies based on support vector regression. J. Coast. Res. **98**(sp1), 71–74 (2019). https://doi.org/10.2112/SI98-018.1

11. Zhang, S., Wang, X., Wang, S.: Modeling and computation of energy efficiency management with emission permits trading. J. Ind. Manag. Optim. **14**(4), 1349–1365 (2018). https://doi.org/10.3934/jimo.2018010

Digitalization and Project Management Method in Improving Efficiency of Drilling Wells Construction

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Abstract. The authors consider the feasibility of using an innovative approach to solving strategic and current tasks of oil and gas enterprises, which implies optimizing existing processes and integrating modern technologies based on digitalization and project management in these processes. The development of a project implementation schedule can be carried out using software to image the process and create a flowchart of all working phases and decision points, as well as create a Gantt chart using standard programs. An important factor is to determine when to implement technologies that meet the project goals, align with the company's risks, and reduce the cost of the drilling process.

Keywords: Construction of drilling wells · Gantt chart · Project management · Project schedule · Well models

1 Introduction

The oil industry is one of the most important structural components of the Russian economy and one of the key factors in ensuring the country's life. It produces more than a quarter of the Russian industrial output and has a significant influence on the country's budget. Export revenues of the oil industry provide a consistently high trade surplus. Thus, the physical volume of oil exports for 2018 is 236.6 million tons (1.722 billion barrels). The increase, compared to 2017, was only 0.5%, and in value terms, the increase is 38% – 118.42 billion U.S. dollars. In January 2020, Russia's revenues from oil exports increased by 0.6% compared to January 2019 and amounted to $ 9.015 billion [15].

Currently, the labor intensity of oil reserves extraction in Russia is increasing. If innovative technologies and modern equipment are not used, oil production will begin to decline since 2020. The future success requires an innovative approach to solving strategic and current tasks, which implies optimizing existing processes and integrating modern technologies into them [4].

Industry 4.0 technologies such as Big Data analysis, the Internet of Things, and Artificial Intelligence (AI) help to improve the drilling efficiency [8]. However, the lack of serious competition leads to the fact that market participants are not in a hurry to

invest significant resources in their development and take on additional risks associated with this. Therefore, the application of new technologies is often an initiative of oil companies themselves [7].

Improving the efficiency of solving current problems at all stages of the life cycle of oil and gas facilities is possible with the complex interaction of all production processes based on the project management method [1].

Project management is a set of measures to coordinate human, financial, information and material resources throughout the project cycle, aimed at achieving the project goals. The entire set of project implementation operations is interconnected in time and space [5].

Oil production from old fields is becoming more and more difficult, its growth is slowing, but the demand on the international market is not decreasing, in particular, China's dependence on oil imports will increase. It is expected that by 2020–2030 it will reach 64–66% of the oil used. In the future, it will be possible to fully automate drilling operations and use solutions based on artificial intelligence, which will make it possible to remotely control the drilling rig.

The urgency of the problem increases in connection with the development of new oil and gas fields lying at great depths with complex mining and geological conditions. One of the most important components of the issue of increasing the drilling operations efficiency is to improve the process of well deepening. A significant amount of scientific and practical work has been devoted to this problem for more than a century in the history of rotary drilling. Currently, these problems need to be solved using a process approach based on the project management method [13], in which the structure and the functioning mechanism of an object or process can be more accurately investigated.

2 Methodology

The use of simulation models and digital technologies in project management is needed not only to optimize processes, to verify the economic efficiency of projects, but also to provide realistic scenarios for the development of the oil industry [6]. According to Russian authors [2], the application of innovations in project management in the oil and petrochemical industry is not only a way to increase the production of raw materials and reduce losses in the search and development of new unconventional fields, but also a tool to increase competitive advantages of companies.

The application of the project management method in the digitization of drilling well construction is a further research of a team of authors [3] related to the management of production processes in the changing internal environment of an oil production enterprise and the use of cloud platforms [9]. The main practical goal of the well construction is to optimize the well design and construction process. At the same time, it should be noted that the well model is a base for analytical and research work of designers, technologists and other specialists.

The well construction model is created from various information modules (geological, ground-based, technical-technological, and economic ones, etc.) that allow calculating, describing, analyzing and predicting technological processes and

operations, and changing parameters over time in a certain range of conditions planned during the project implementation.

There is a following classification of well models: conceptual; static; dynamic.

1. A conceptual model of a well is constructed in the process of creating an integrated project for the field development, based on information from a permanent geological-technological model of the field. Based on the conceptual model of the well, the technical specification for the design of its construction (reconstruction) is developed. This well model consists of the following main modules: geological, technical and technological, and economic ones.

2. A static well model describes the initial (original) state of a studied technogenic system – the well before the start of the drilling process. Static modeling is performed to find high-quality and effective engineering and technological solutions used in the project documentation. A static well model is built on the basis of simulation results obtained from engineering and technological solutions formalized in the project documentation and work programs. Engineering (mathematical) calculations are performed with specialized software. Design solutions are a theoretical basis for the construction of wells, the work of professionals (drillers, geologists, geophysicists) in the process of engineering and technological support for the well construction. Design solutions based on modeling of well construction should ensure the variation principle realization, as well as the efficiency and safety of drilling operations. Monitoring of construction (drilling) operations is provided based on the set threshold values (extremes) of the model. A static model consists of a number of modules: ground-based, geological, technical-technological, and so on.

3. A dynamic model of a well describes the state of a technological system – a well in the drilling process. Dynamic well modeling is performed to optimize the well drilling process. Optimization is performed through the operational adjustment of work programs based on a specialized methodology. Primary sources of information on the drilling rig for building a dynamic model are a geological and technological station, a telemetry station, a supervisor's summary, results of a laboratory research. The dynamic well model is based on the processed information during monitoring, namely, technical, technological, geological and geophysical parameters received from the drilling rig in real time. The dynamic model state is time dependent and varies during the drilling process.

Conceptual, static and dynamic models are built in the corporate information system. The results of well modeling are presented in the form of simple forms: time graphs, tables, diagrams, 2D and ZD modules, visualized in the information system [11]. Each of the presented types of wells can be used to optimize the permanent geological and technological model of the field.

According to the presented characteristics of the well models, the most attractive is the dynamic one. On the one hand, it is suitable not only for optimal programming, but also for the operational solution of optimization problems [12]. The latter are especially important when faced with unforeseen constraints, when in the current situation it is necessary to find an optimal solution, i.e. the closest in consequences to the programmed one. If necessary, it can be adjusted in previously accepted program parameters with some deviation from the programmed indicators [10]. On the other

hand, dynamic programming allows us to solve problems that are discrete in nature, that is, not transformed from the corresponding continuous problems [14]. Also, this model allows you to predict and prevent sticking of drilling tools based on the selection of optimal technological parameters of the drilling process.

3   Results

The research is determined by the fact that the process of well deepening has not been optimized yet, and the existing reserves are not used for improving the drill bit designs, mechanical drive, technical and technological characteristics of hydraulic downhole motors and drilling modes. The cost of drilling wells can reach up to 75% of all costs for exploration and extraction. For a well to work effectively, the company has to provide $6–10 in revenue in order to spend $1 on drilling. The experience shows that innovative technologies, without using people's technical skills and business processes that ensure their application, will not lead to the desired goals.

Project management can be divided into phases according to the project lifecycle (for example: definition, development, implementation, analysis) [2]. These processes can be at different levels of project detail and implemented in different ways.

The development of a project implementation schedule can be carried out using the following methods:

– using software to image the process and create a flowchart of all working phases and decision points,
– creating a Gantt chart using standard programs.

However, the main thing is to define the project goals, assess technical and commercial risks and opportunities, and initiate technical research. An important factor is also to determine the implementation moment for technologies that meet the project goals and are consistent with the company's risks.

Significant improvements can be made by increasing the efficiency of basic operations: for example, by optimizing equipment maintenance and repair schedules. With the ability to forecast and reallocate work, you can reduce downtime, optimize preventive maintenance, and increase the volume of drilling operations.

Digital projects can be launched in the exploration and production block. The process of well design and construction is now largely digitized. The location of wells, their trajectory, design, and individual operations (lowering casing strings, cementing the trunk, etc.) are calculated in special computer simulators. The software allows you to evaluate the expected return from a reservoir and find the best ways to achieve it. The method application will allow increasing the speed of drilling of the horizontal part of wells in the future, reducing the cost of eliminating errors and improving the quality of sinking, and therefore the efficiency of the future operation.

4   Discussion

The efficiency of drilling wells construction is based on the application of the project management method. The Gantt chart is used when drawing up the work plan. The graphical control system is a result of the construction and operation of drilling wells. Gantt charts provide concise, accurate and visual information about the position of the actual result and help you to make optimal management decisions.

In project management of the construction of complex, communication-rich and equipment-rich technological facilities, a number of problems arise. Most of them are related to errors made at the design stage, which can be eliminated by applying the Gantt method. Its main principles are: the management of future problems is based on past results; the relation of phenomena in time; the relation between work and time. The value of Gantt charts in the well construction is to identify such inconsistencies, as the intersection of structures, the discrepancy between the size of the facility and the installed equipment, overlay of communications, a lack of space to move lifting equipment, barriers for personnel's access and their timely removal while designing.

5   Conclusion

The creation of high-tech drilling rigs is a prospect today for the Russian market, as the situation of falling resource prices on the world market encourages the use of digital technologies to reduce costs. Increasing the efficiency of drilling wells is provided by the optimization process during their design and construction. At the same time, it should be noted that the well model is the main one for analytical and research work of designers, technologists and various specialists. All this will allow switching to full automation of drilling operations and applying solutions based on artificial intelligence, remotely managing the drilling rig based on the flowchart of all working phases and decision points marked in the Gantt chart. The presented research is important in the sphere of drilling directional and horizontal wells in the fields and for the design of well construction in general in the context of project management in solving strategic and tactical tasks in the oil and gas industry.

References

1. Alexandrova, T.V., Prudsky, V.G.: On the conceptual model of oil and gas business transformation in the transitional conditions to the Industry 4.0 (2019). https://hdl.handle.net/10195/74254. Accessed 12 Mar 2020
2. Babordina, O.A., Garanina, M.P., Ilyina, L.A, Garanin, P.A.: Formation of the business model of oil producing enterprises. In: Mantulenko, V. (ed.) Proceedings of the International Scientific Conference "Global Challenges and Prospects of the Modern Economic Development". Future Academy, London (2019). The European Proceedings of Social and Behavioural Sciences, vol. 57, pp. 230–238

3. Bagaeva, I.V., Larionova, G.N., Bagaeva, Y.R.: Comparative analysis of innovative activity of large business in Russia and the United States in terms of digitalization of the petrochemical industry. In: Ilin, I.V. (ed.) Proceedings of the International Conference on Digital Technologies in Logistics and Infrastructure (ICDTLI 2019). Atlantis Press, Paris (2019). Atlantis Highlights in Computer Sciences, vol. 1, pp. 316–321

4. Barney, S., Petersen, K., Svahnberg, M., Aurum, A., Barney, H.: Software quality trade-offs: a systematic map. Inf. Softw. Technol. **54**(7), 651–662 (2012). https://doi.org/10.1016/j.infsof.2012.01.008

5. Barth, C., Koch, S.: Critical success factors in ERP upgrade projects. Ind. Manag. Data Syst. **119**(3), 656–675 (2019). https://doi.org/10.1108/IMDS-01-2018-0016

6. Garvey, M.A., McLeroy, P.G., Weijermars, R.: Reservoir-model-based scenarios for assessing the viability of greenhouse gas mitigation strategies through CO2 enhanced oil recovery. Energy Strat. Rev. **16**, 54–67 (2017)

7. Janocko, J., Ryzhkova, M., Mamzina, T., Bereznev, S.: Digitalization of economic evaluation of mineral deposits. In: Tyulenev, M., Zhironkin, S., Khoreshok, A., Vöth, S., Cehlár, M., Nuray, D., Janocko, J., Anyona, S., Tan, Y., Abay, A., Marasová, D., Stefanek, P. (eds.) Proceedings of the IVth International Innovative Mining Symposium. EDP Science, Les Ulis (2019). E3S Web of Conferences, vol. 105 (04030)

8. Jonak, Ł., Rudnicka, A., Włoch, R.: Digitalization of supply chain transparency: the case of ChainReact. In: Grzybowska, K., Awasthi, A., Sawhney, R. (eds.) Sustainable Logistics and Production in Industry 4.0. EcoProduction, pp. 89–102. Springer, Cham (2020)

9. Meghana, H., Asish, O., Lewlyn, L.: Prioritizing the factors affecting cloud ERP adoption – an analytic hierarchy process approach. Int. J. Emerg. Mark. **13**(6), 1559–1577 (2018). https://doi.org/10.1108/IJoEM-10-2017-0404

10. Nagurney, A., Shukla, S., Nagurney, L., Saberi, S.: A game theory model for freight service provision security investments for high-value cargo. Econ. Transp. **16**, 21–28 (2018). https://doi.org/10.1016/j.ecotra.2018.09.002

11. Somu, N., Kirthivasan, K., Sriram, V.: A computational model for ranking cloud service providers using hypergraph based techniques. Future Gener. Comput. Syst. Int. J. Escience, **68**, 14–30 (2017). https://doi.org/10.1016/j.future.2016.08.014

12. Symons, C.: Exploring software project effort versus duration trade-offs. IEEE Softw. **29**(4), 67–74 (2012). https://doi.org/10.1109/MS.2011.126

13. Syntetos, A.A., Kholidasari, I., Naim, M.M.: The effects of integrating management judgement into OUT levels: in or out of context? Eur. J. Oper. Res. **249**(3), 853–863 (2016). https://doi.org/10.1016/j.ejor.2015.07.021

14. Yakhneeva, I.V., Agafonova, A.N., Fedorenko, R.V., Shvetsova, E.V., Filatova, D.V.: On collaborations between software producer and customer: A kind of two-player strategic game. In: Ashmarina, S., Mesquita, A., Vochozka, M. (eds.) Digital Transformation of the Economy: Challenges, Trends and New Opportunities. Springer, Cham (2020). https://doi.org/10.1007/978-3-030-11367-4_56. Advances in Intelligent Systems and Computing, vol. 908, pp. 570–580

15. RCC: Russia's oil export revenues increased by 0.6% in January (2020). http://rcc.ru/article/dohody-rossii-ot-eksporta-nefti-v-yanvare-vyrosli-na-0-6-72835. Accessed 12 Mar 2020

Regional Market Adaptation to the Demands of Digital Economy

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Abstract. Digitalization of the economy might create conditions for the formation of new disproportion in the national and regional labor markets, the most likely consequences of which will be a further stratification of the population by income level, an increase in structural unemployment, a decrease in both the level of income and the quality of life for citizens with "obsolete" professions. The state has to take measures which will lead to the transformation of the labor market, matching with digital changes and which will contribute not only to economic growth, but to social progress as well. Research is aimed at to identify the socio-economic laws of functioning and transformation in the digitalization of the regional labor market, development of proposals for its adaptation to the demands of the digitalization. The main research methods used were systematic analysis and situational analysis. The article systematizes prominent patterns and tendencies that are common to the labor market as a result of the development of the adaptation to digitalization. Recommendations on the adaptation of the labor market of the Samara region to the demands of the digital economy are proposed.

Keywords: Adaptation · Digitalization · Labor market · Region · Samara region · Transformation

1 Introduction

Digitalization of the economy is a powerful tool for increasing labor productivity and as such, provides developing countries with a unique chance for a non-linear breakthrough to improve in economic growth. For Russia, which suffers technological underdevelopment and demographic constraints, the development of the digital economy can lead to economic growth and state sovereignty. Digitalization is followed by multiple positive economic and social effects, however, it also carries a number of threats and risks to the currently established socio-economic mechanisms, including the labor market. According to experts, in the near future, most traditional companies will be replaced by digital platforms, with 80% of the world trade being conducted through online sales; as such the new labor market will be represented by online employment, with 50% of the workers having a flexible work schedule [4]. The negative effects of digitalization will be the stratification of the population by income level, the growth of unemployment, the decline in income and the quality of life of people who have old professions, and therefore the deterioration of the social well-being of Russian society.

The urgent need to minimize the negative effects of digitalization on the pre-existing labor market and provide the digital economy with a workforce that possess appropriate skills, determines the relevance of the chosen research topic. The author aims to identify the socio-economic laws of functioning and transformation in the digitalization of the regional labor market, development of proposals for its adaptation to the demands of the digital economy.

Plan for achieving this aim was to:

1. Study the socio-economic effects of developing the digital economy, as well as employment trends caused by digitalization.
2. Analyze structural, territorial and qualitative characteristics of Samara region labor market.
3. Develop proposals for adaptation of the Samara region labor market to the demands of the economy in a new format – «Industry 4.0».

The object of study is the labor market of the Samara region. The subject of the study is the compilation of socio-economic relations which arise in the regional labor market as a result of the developing digital economy. The significance of the study underlined in the further development of already existing approaches to understanding the specifics, tendencies and issues of the development of the Russian labor market, which manifest and strengthen due to digitalization. The author offers practical ways of adapting regional labor markets to the development factors of the digital economy. The following terminology is utilized in the article. Regional labor market - socio-economic mechanism that operates within a specific economic and geographical space and is influenced by the state and institutional factors, which itself regulates aggregated amount of wage labor implemented in the economy and the employee wage rate. The digital economy implies the transition of all processes and value chains in all spheres of economic production and consumption to digital technologies which allow organizations to work with maximum efficiency. Modern digital technologies consist of: cloud technologies, artificial intelligence, Big Data, the Internet of Things (IoT), the industrial Internet of Things (IIoT), additive technologies, smart services [17].

2 Methodology

The following methods were implemented during the research process: theoretical (analysis and synthesis, comparison, etc.); empirical (measurement and systematization of research results, induction, deduction, grouping, and sampling). The main research methods were system analysis (when determining causal relationship between digitalization and the regional labor market) and situational analysis (when establishing a link between the influence of digitalization factors and trends in regional development of the employment sector). The main experimental base of the study consisted of statistical indicators of the Samara region labor market for the period between 2005 and 2018.

The study of this subject was conducted in four stages:

Stage 1 – collection and processing of data on the state and development of the labor market in the Samara region, VFD and the Russian Federation.

Stage 2 – classification of the main approaches in determining the influence of factors of the digital economy on the formation of an efficient labor market in the region.

Stage 3 – analysis of the main statistical indicators of the Samara region labor market, structural, territorial and qualitative characteristics of the regional labor market.

Stage 4 – diagnostics of vital problems and establishment of possible ways to adapt the labor market under the influence of digitalization factors with the aim of creating an efficient labor market in the region.

3   Results

Labor market in Russia and its regions, operates with the following characteristics and trends:

- satisfactory level of maturity, sustainable long-term relationships between the main market indicators;
- comparatively low level of labor productivity compared with a simultaneous increase in real wages;
- adaptability of real wages to the unemployment rate, which is largely determined by institutional factors: state support for large employers, low minimum wages, and comparatively weak trade unions;
- mechanism of labor market crisis adaptation leads, firstly, to a decrease in real income for the population, an increase in poverty rates and the emergence of the Russian phenomenon of "working poor", and secondly to a decrease in labor productivity as a result of a fall in real GDP and the preservation of employment;
- low territorial and labor mobility of the population;
- high share of employees in the public sector;
- existence of a massive number of unofficial jobs with their own specific mechanisms for determining wages;
- a growing share of highly qualified profession groups in the total number of employees;
- a noticeable differentiation of labor markets in the regions and within regions of the country with a growing conjunction between regional labor; markets and their integration into the general labor market [6].

Samara region with a population of 3.2 million people is a highly urbanized region with Samara-Togliatti agglomeration (STA) established in its territory and has the third largest population in the Russian Federation after Moscow and St. Petersburg. 2.7 million people live in urban districts and municipal districts of STA (over 86% of the region's population). The economy of the region is formed primarily by large and medium-sized businesses. Samara region produces approximately 2% of the gross

regional product (GRP) of the constituent entities of the RF. About 29% of industrial production is accounted for by industries traditional for the economy of this particular region: aerospace, metallurgical, and electrical equipment manufacturing. More than 70% of the region's industrial production accounts for motor vehicles, chemicals, foodstuffs, rubber and plastic products, as well as pharmaceutical products (Fig. 1).
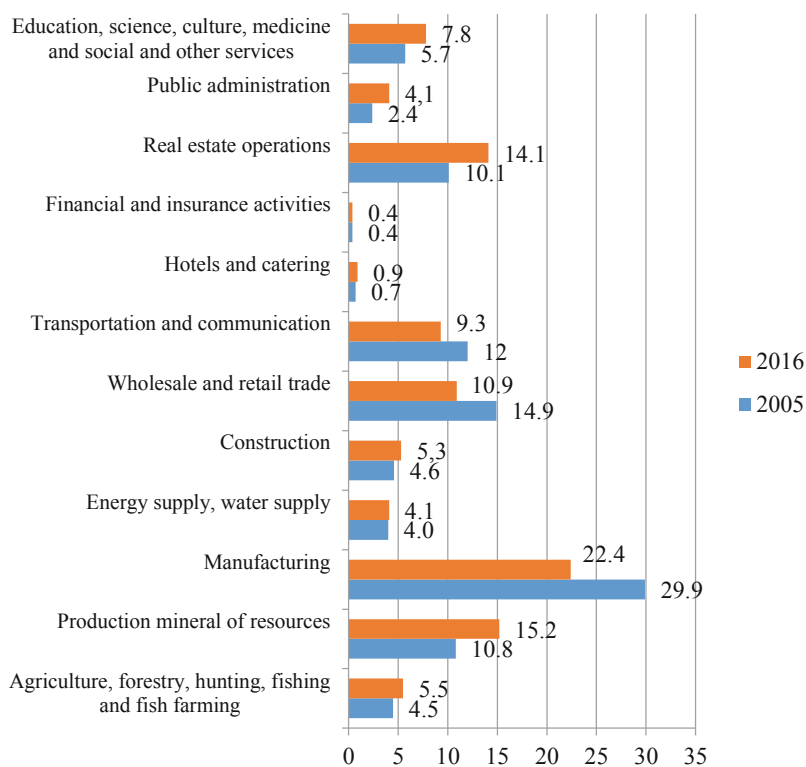
Fig. 1. Sectoral structure of the gross regional product (Source: author).

At present, Russia in the field of digitalization is the leader in the field of telecommunications and communications, IT and software development, the banking sector and financial services. «Catching up» are trade, insurance, education, the auto business, and transport. The «lagging behind» are the sectors of industrial production, oil and gas production, tourism and restaurant services, as well as consulting, publishing and the media. «Beginners» – the construction industry, medicine and the entertainment industry.

Leading industries act as digitalization drivers in related industries. Informatization of the banking sector creates the conditions for the complete computerization of financial processes among its customers, and the development of telecommunications and communications, IT and software development, defined as the IT market, ensures the growth of computerization and informatization in organizations of other industries.

The size of the region's workforce is 2.3%–2.2% (2005–2018) of the country's labor pool (Table 1), and takes the 4th place in the VFD, 3rd place when it comes to the employment rate.

Table 1. Workforce and real wages in the Russian Federation, VFD and Samara region, 2005–2018

Region	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018
Workforce, million people										
Russian Federation	73,8	75,5	75,8	75,7	75,5	75,4	76,6	75,8	76,1	76,2
VFD	15,7	15,9	15,8	15,7	15,6	15,5	15,5	15,5	15,2	15,1
Samara Region	1,7	1,8	1,8	1,7	1,7	1,8	1,8	1,7	1,7	1,7
Participation in workforce of workers aged between 15–72 years, %										
Russian Federation	66,0	67,7	68,3	68,7	68,5	68,9	69,1	69,5	69,1	68,9
VFD	65,8	67,8	68,4	68,6	68,1	68,4	68,9	69,2	68,3	68,0
Samara Region	68,1	68,5	68,8	69,3	69,3	70,4	71,0	71,6	70,5	71,0
The average monthly nominal wage, rubles										
Russian Federation	8555	20952	23369	26629	29792	32495	34030	36709	39167	43724
VFD	6473	15614	17544	20020	22481	24601	25632	27265	29189	31990
Samara Region	7765	16479	18600	20800	23470	25884	26849	28295	30492	33754
Real wages of employees of organizations, compared in % to previous year										
Russian Federation	112,6	105,2	102,8	108,4	104,8	101,2	91,0	100,8	102,9	108,5
VFD	112,0	104,5	103,2	108,8	105,2	101,7	91,0	100,5	103,9	106,8
Samara Region	109,9	104,3	104,4	107,5	106,3	102,4	89,9	98,8	104,6	107,7
Unemployment, in %										
Russian Federation	7,1	7,3	6,5	5,5	5,5	5,2	5,6	5,5	5,2	4,8
VFD	7,4	7,6	6,5	5,3	4,9	4,5	4,8	4,8	4,7	4,4
Samara Region	5,4	5,8	5,1	3,4	3,2	3,0	3,4	4,1	4,2	3,7

Source: author based on [14].

The Samara region is characterized by above the average population workforce participation in both the country and the Volga Federal District, where it securely occupies no lower than 3rd place in that regard. However, from 2010 to 2018, the potential workforce of the region decreased from 20 thousand people down to 14.3 thousand people. The organization's need for workers increased by more than 48% and amounted to 19,066 vacancies. The dominant majority of the able-bodied population of the region are men.

By average monthly nominal wage Samara region ranked 1st in the Volga Federal District in 2005, and the 3rd in 2018 (33,754 rubles). The growth dynamics of real

wages for the study period was unstable in the region, as well as in the country and in the VFD. Its growth rate over the general period was lower than both Russian and VFD average. The region is also defined by low labor productivity, which is one of the main constraints for economic growth in the Samara region. The level of registered unemployment in municipalities is characterized by significant unevenness. The following patterns are traced:

1. A higher level of registered unemployment is observed in rural municipal areas; the indicator increases as the municipal district moves away from the STA.
2. The unemployment rate is lower in large cities and higher in small cities.

The dynamics of the Samara region workforce size were negatively affected by the demographic situation. Regional population decreased by 0.67% in the period from 2005–2018, there has been a natural decline in the population since 1991 (−2.9% in 2018). Moreover, since 2015, migration outflow to the region has begun to outpace migration inflow.

The number of foreign citizens entitled to work in the Samara region is growing, but does not have a significant role in the formation of supply in the labor market. Among foreign citizens with a valid work permit, the share of specialists in the field of physical and engineering sciences was 25.8% in 2018 (15.7% in 2016). In the ranking in terms of employment and unemployment in 2018, the Samara region was among the first twenty regions with the highest level of employment and the lowest unemployment. By the share of highly skilled workers in total amount of workers and by the share of the employed population with professional education, Samara takes 5th, 6th and 8th places among the subjects of the Russian Federation. 24% of workers are employed in processing and refinement industry branches, with 5.4% employed in the agricultural sector. Share of people employed in manufacturing sectors is on a slow decline, with construction trade and service being on the rise. In 2018, the number of vacancies in low skill jobs exceeded the supply of labor by 2.1 times, for high skill jobs – 1.7 times.

The Samara region has necessary prerequisites for the creation of high-performance jobs and the development of a digital economy in the region:

1. Over the years, the region has been amongst the leaders of innovative development. According to the Association of Innovative Regions of Russia, in 2018 the region ranks 10th (in 2017 – 9th) in the Rating of Innovative Regions, leading a strong group of mid-tier innovators [3].
2. The Samara region participated in the program of the National Technological Initiative on a competitive basis, and carries out scientific research in the field of EnergyNet (distributed energy), HealthNet (personal medicine), AeroNet (distributed unmanned aerial vehicle systems), AutoNet (distributed network of unmanned vehicles), NeuroNet (distributed artificial components of consciousness and psyche) [11].
3. The innovative development of the region is supported by significant scientific and production potential, the basis of which is university and academic science divisions, as well as scientific departments of industrial enterprises.
4. Innovative developments are then implemented in innovative business. In 2017, Samara region, amongst constituent entities of the Russian federation, took 11th

place in the share of Russian high-tech business and 8th in the concentration of newly created high-tech companies [1].

5. Innovative and high-tech business is developing in a favorable investment climate.

According to the Skolkovo, in 2018 Samara Region reinforced its status of a region with high investment attractiveness. However, according to the results of the "Digital Russia" index for the constituent entities of the Russian Federation in 2018, the Samara region took 17th place (in 2017 – 21st place) [15].

At the same time, the Samara region is ahead of competitors in terms of "Specialized personnel and training programs" sub-index, as well as having high relative indicators in "The existence and development of research competency, technological groundwork and works", but falls short in terms of investment, i.e. the creation of digital jobs, and development of the digital infrastructure.

Digitalization of the Samara region is carried out in partnership between the state and large business and is characterized by the following trends:

– more than 60% of households are connected to broadband Internet,
– about 80% of the region's residents have access to electronic public services,
– all schools in the region have Internet access, and 63% of schools are connected to fiber-optic communication lines,
– actively developing the system of «smart education» and «smart city»,
– as a result of the implementation of the Smart-agro project in the Samara region, up to 100% of arable land was digitized and space monitoring was carried out up to 80% of their area.

The strategic and program documents of the Samara region trace the understanding of the importance of digitalization for the development of a competitive economy, the role of human capital and highly qualified personnel in the creation, development and implementation of digital technologies. Priority is given to education and training, the maintenance and development of research competencies and ICT.

4   Discussion

In modern Russia, interest in the problems of employment and unemployment, the formation and transformation of market relations in the labor sphere, and the specifics of function in regional labor markets has been formed due to development of a market economy. In the works of Aslanova [2], Mokronosov, Matafonov, Chuchkalova, Prudnikov [9], Vaysburd [16], Nedohlebova [10] unique approaches were developed to the definition of the labor market.

Russian scientists have entered the science of modern market problems and are currently working on a study of the staff demands of the digital economy and its impact on employment [2, 12]. Some researchers are united in opinion that digital economy is an entirely new step in development of economic relations, based on digital information trade, which is system-forming, and strongly impacts all aspects of human life [5, 8, 13]. Due to the double-sided effect of digital economy on the labor market such as both a multitude of economic or social benefits and negative effects, scientists are

attempting to analyze and predict possible outcomes [4, 7]. However, the regional aspects of the labor market transformation in the context of digitalization have hardly been studied.

5 Conclusion

For the effective formation of the labor market, it is necessary to preserve human capital, support innovation and investment in the digital sphere. Samara region serves as an example that such factors contribute to creation of:

– high-tech jobs that demand new requirements on the qualitative characteristics of workers, generating labor demand for the digital economy;
– conditions and institutions related to the demographic improvement, personal development and development of human capital, the formation of a labor supply that has the characteristics necessary for an economy based on knowledge and digital processes;

The following situation has developed with these factors in the Samara region:

– priority development of education and training, maintenance and development of research competencies and backlogs in the field of ICT;
– infrastructure and investment lag in the digitalization process in the region;
– the lack of a holistic strategic approach to the development of the regional labor market, aimed at increasing its effectiveness, preventing possible imbalances caused by the widespread introduction of high-tech and digital technologies.

Factors in the formation of an effective labor market:

1. Conditions for the development and preservation of human capital.
2. Conditions for maintaining innovation and investment.
3. The role of regional authorities and government agencies in the development of the digital economy.

Taking the specifics of digital economy development in Samara region and the state of the regional labor market into account, its adaptation to the demands of digital economy requires the solution of following imperative issues:

1. Region falls behind in terms of implementation of information and communication technologies whilst having a high scientific and manufacturing potential, scientific developments and groundwork.
2. Lack of IT staff and specialists in various relevant spheres with digital competency.
3. «Maturity» of staff.

Labor market adaptation to the needs of the digital economy should be carried out at the national and regional levels. National level involves the modernization of the education system and the volume of training of IT specialists within the framework of the state program, regulation of migration processes, improving social protection for workers engaged in non-standard forms of labor, improvement to employment promoting policies and increase in efficiency of the public employment service.

On the regional level, measures to adapt the regional labor market to digital transformations must provide am influx of high-tech and digital jobs, jobs in the humanitarian field and areas in which computers and robots cannot replace people (demand generation) and training/retraining of personnel with relevant competencies (labor supply). Specifics of regional labor, its demands and problems, methods of solving such problems must be reflected in a strategy for the development of the labor market and employment of the Samara region, he development of which should be carried out as part of the joint project activity of all involved ministries of the regional government, representatives of unions of workers and employers. Measures to adapt the regional labor market to digital transformations should ensure the creation of high-tech jobs, jobs in the humanitarian field and in areas in which computers and robots cannot replace a person and training (retraining) personnel with relevant competencies.

References

1. Adamaitis, S.A., Barinova, V.A., Zemtsov, S.P., Kidyaeva, V.M., Kotsyubinsky, V.A., Tsareva, Yu.V.: High-tech business in the regions of Russia National report (2019). http://i-regions.org/images/files/ranepa18.pdf. Accessed 28 Feb 2020
2. Aslanova, L.O.: Analysis of the situation on the Russian labor market and forecasting its development in the post-crisis period. Int. Mag. EPOS **4**, 17–23 (2009)
3. Association of Innovative Regions of Russia: Rating of innovative regions (2018). http://www.i-regions.org/reiting/rejtjrng-innovatsionnogo-razvitiya. Accessed 28 Feb 2020
4. Balsmeier, B., Woerter, M.: Is this time different? How digitalization influences job creation and destruction. Res. Policy **48**(8), 103765 (2019). https://doi.org/10.1016/j.respol.2019.03.010
5. Colombo, E., Mercorio, F., Mezzanzanica, M.: AI meets labor market: exploring the link between automation and skills. Inf. Econ. Policy **47**, 27–37 (2019). https://doi.org/10.1016/j.infoecopol.2019.05.003
6. Gurvich, E., Vakulenko, E.: Macroeconomic and structural properties of the Russian labor market: a cross-country comparison Russian. J. Econ. **3**, 411–424 (2017). https://doi.org/10.1016/j.ruje.2017.12.006
7. Hammershøj, L.G.: The new division of labor between human and machine and its educational implications. Technol. Soc. **59**, 101142 (2019). https://doi.org/10.1016/j.techsoc.2019.05.006
8. Kurt, R.: Industry 4.0 in terms of industrial relations and its impacts on labour life. Procedia Comput. Sci. **158**, 590–601 (2019). https://doi.org/10.1016/j.procs.2019.09.093
9. Mokronosov, A.G., Matafonov, M.E., Chuchkalova, Y.I., Prudnikov, D.M.: Forecasting the demands of the regional economy in the training of qualified personnel. Ekaterinburg: RSVPU (2010)
10. Nedohlebova, E.B.: Labor Market. RIC KSERU, Khabarovsk (2018)
11. Program of the National Technological Initiative (2014). https://nti2035.ru/nti/. Accessed 28 Feb 2020
12. Putilov, A.V., Bugaenko, M.V., Timokhin, D.V.: Development of Russian labor market in the context of informatization and computerization of the economy. Procedia Comput. Sci. **145**, 169–176 (2018). https://doi.org/10.1016/j.procs.2018.11.035
13. Richardson, L., Bissell, D.: Geographies of digital skill. Geoforum **99**, 278–286 (2019). https://doi.org/10.1016/j.geoforum.2017.09.014

14. Russian Federal State Statistics Service: Labour market, employment and wages (2020). https://www.gks.ru/labor_market_employment_salaries. Accessed 28 Feb 2020
15. Skolkovo: The digital Russia index (2019). https://finance.skolkovo.ru/downloads/documents/FinChair/Research_Reports/SKOLKOVO_Digital_Russia_Report_Full_2019-04_ru.pdf. Accessed 28 Feb 2020
16. Vaysburd, V.A.: Labor Economy. OMEGA-L, Moscow (2011)
17. Watanabe, C., Tou, Y., Neittaanmäki, P.: A new paradox of the digital economy - structural sources of the limitation of GDP statistics. Technol. Soc. **55**, 9–23 (2018). https://doi.org/10.1016/j.techsoc.2018.05.004

Complexity Theory for Project Management in the Digital Economy

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Abstract. The analysis of the digital economy as a global phenomenon involves the use of new methodological approaches that contribute to modern understanding of theoretical and practical aspects of one of the most popular areas in economic science. The use of complexity theory made it possible to justify that the digital economy has all the features of a complex system. The spatial approach revealed heterogeneity of the industry space, the existence of the institutional vacuum in its institutional space, and digital divide, which allow finding new ways to develop both the individual enterprise and the economy. The study of the digital economy in the aspect of the spatial approach revealed a number of problems such as heterogeneity of the industry space, the existence of the institutional vacuum, and digital divide.

Keywords: Complexity theory · Digital divide · Digital economy · Institutional vacuum · Spatial approach

1 Introduction

The adherence to traditional methodological approaches, proven by theory and practice in scientific research, is a natural and legitimate phenomenon. It is a tribute to traditions and a recognized achievement in the methodology of scientific research. However, the desire to go beyond what is usual in the scientific space is insurmountable, although it is risky from the standpoint of adopting new methodological approaches in scientific community. The authors consider that it is necessary and possible to apply complexity theory and methodological approaches, which are relatively new to the interdisciplinary nature of spatial economics, in the study of the digital economy, which is little-known in Russian scientific circles.

Complexity theory came to social sciences, to economics from mathematical theory of complex systems. Complexity theory, in its modern sense, summarizes a whole set of new methodological approaches of a postdisciplinary nature, including interdisciplinary and transdisciplinary approaches aimed at collaboration and integration of various types of scientific thinking (humanitarian and natural science), aggregation of which in the new system paradigm allows us to identify such peculiar complex quality systems like the presence of self-organizing structures: dynamism, emergence, fractality, nonlinear. In the 90s complexity theory took shape institutionally in the

framework of the established Santa Fe Institute - known as a center for the study of chaos and complexity. A collaboration of scientists from various fields of knowledge took place at this institute. Complexity theory is multidisciplinary and covers knowledge in areas such as meteorology, biology and chemistry, psychology, sociology and economics. Along with the characteristics noted above, complexity theory operates with such basic concepts as:

– sensitivity to initial conditions,
– strange attractors,
– self-identity,
– self-organization,
– edge of chaos,
– hilly landscape.

2   Methodology

The methodology of the digital economy is presented as a system of principles and methods of organizing and constructing theoretical and practical activities, as well as a doctrine on the progress in changing technological structures, the basis of which is the formation of the network space. This approach necessitates the use of the network management method, including network planning, network organization, network control and accounting. Also in the theory of complexity, analysis is widely used as a way to identify the main problems associated with the development of the digital space, to identify the characteristic features of the digital divide and the existing institutional environment that does not allow the full use of the existing digital opportunities.

3   Results

The digital economy has all the signs of a complex system, namely, dynamism, disequilibrium, self-regulation and self-identity, dissipativity, openness, emergence, attractiveness, fractality. We will reveal all of them.

1. The digital economy is a nonequilibrium system, which means constant dynamic fluctuations in various sectors and levels of management, pendulum oscillations, which each time come into equilibrium in different coordinates. Disequilibrium of the digital economy is closely related to the uneven development, i.e. different speed and direction of changes. The sector of digital technologies - the digital economy is developing rapidly, and the non-digital sector is developing much more slowly. Signs of disequilibrium of the digital economy are a lack of personnel for the digital economy, a lack of knowledge among specialists of various fields, a lack of intellectual resources - inventors, developers, etc., in the field of digitalization, a brain drain and intelligence, a vacuum in modern specialties and profiles in universities. For example, Russian universities still do not train managers for knowledge management, crowdsourcing, and additive technologies.

2. The digital economy has a border of chaos. It can be considered as the boundary between the regulated space and the unregulated space of the digital economy (chaos). Today, there is a rapid decline of traditional institutions, despite the fact that their replacement has not taken shape yet, so the system has signs of randomness, uncertainty between the old and the new. Under conditions of the digital economy, different processes are layered and cogered (from the word coherence), various processes are combined - new institutions are generated that are adequate to a higher level of technical and technological development, old institutions and structures are abolished. The necessary existing institutions are being transformed. All this happens asynchronously, asymmetrically, and does not coincide in time and space. The necessary new institutions and structures are being created slowly. They require significant resources, and, above all, financial, appropriate organizational transformations, which are barriers in the processes of their generation and cause their deficit. The old institutions are no longer functioning and therefore are being eliminated. Objectively unfilled space appears, an unregulated zone - an institutional vacuum, appears, i.e. there is a lack of necessary new institutions, relations between them and the players personifying them.

3. Dissipativity of the digital economy as a nonequilibrium system means a qualitatively different course of various processes at different levels of management. These processes include: the emergence of new spontaneous institutions and institutional structures on a self-regulatory basis, the forms of interconnections between them, the new forms of activity of existing institutions and structures, the implementation of constant dynamic transitions from order to chaos, from chaos to the orderly system with the corresponding order parameters (control parameters). Dissipativity determines "scattering" processes in the formation of single-order structures arising from the conversion of energy scooped from chaos. The consequences of dissipativity of the digital economy are:

   – ability to describe startups based on information theory. A failed startup is a typical dissipative system. A successful startup is an example of generating new information, the value of which significantly exceeds the initial investment in the project,
   – possibility, based on information theory, to describe the process of competition and the filling of market niches in the economy,
   – disappearing postulate of the inevitable maximization of profit of any market actor (company, enterprise). Instead, new concepts are introduced - the development of market niches and the struggle to preserve their conditional information.

   In relation to Russian conditions, dissipativity is associated with the simultaneous existence of more than two technological modes. In reality, there are simultaneously elements of the third, fourth and fifth technological modes in the Russian economy.

4. Strange attractors. From the standpoint of the passing "inheritance" from the industrial economy, one can consider large enterprises, firms, small and medium-sized business structures, within which the able-bodied and economically active population realize their professional competencies. In the digital economy, new strange attractors are also being generated, one of which can be called the Digital

Man. The digital man is one of the new attractors of the digital economy. A digital person must be created even with the highest potential of his inherent self-regulation. Attractors of the digital economy can be called digital enterprises that use the latest, including additive technologies, digital banks, and digital government.

5. Emergence of the digital economy. One of fundamental approaches in complexity theory is Emergence, i.e., emergence of a new quality, quantity, process, relationship in the interaction and interrelationship of various elements, for example, many simple particles or actors, agents that act according to simple rules. In complexity theory as applied to systems, emergence is the presence of a system with special properties that are not inherent in its elements, either individually or in total. A new, more complex substance is formed from this interaction, while the behavior of this new substance is not equivalent to the totality, the sum of the behaviors of its components. Moreover, the behavior of the new substance is logically inexplicable from the standpoint of the behavior of its components. Complexity theory claims that open complex systems, such as the digital economy and the labor market that is inherent in its level of development generate unpredictable patterns of agent behavior due to their inherent emergence and they really resist the effects of direct control measures.

In the digital world, there are several examples of self-organization. For example, there are different types of modern technologies - information, nanotechnology, bio and cognitive technologies, the convergence of which determines technological singularity. Their interaction in the digital economy forms its technical and technological basis and gives new emergence properties - instead of traditional duality - the polarity of being, multidimensionality and autopoiesis come.

The speed of information movement increases, and actors move faster after it. More and more individuals go online (only in 2016–2017 there are more than 2.3 billion of them), and the result is a fundamental and spontaneous restructuring of collective behavior. The upper layer of the developing digital system of planetary scale has absorbed the eternal factors of change - human needs, politics, geography and culture and created new schemes and patterns on their basis. Each of the entities, especially those who manage companies, needs a new coordinate system. This is a basic principle underlying the complex collective behavior of natural systems, which partially explains how computers achieve their useful complexity, despite the fact that their work is based on several simple processes.

In systems theory, emergence is called the presence of a system with special properties that are not inherent in its elements (both individually and in total). If this period is successfully passed, then one can find himself in the historical equivalent of such a moment in the creative process when chaos is replaced by order, and a new model, solution or structure becomes obvious.

The analysis of the digital economy in the aspect of the spatial approach allows us to identify a number of problems that must be solved in the framework of the national project of the same name.

1. Heterogeneity of the industry space of the digital economy in Russia.

In terms of digitalization, Russia occupies a leading position in such areas as education, information and communication technologies, and finance, even at the level of world leaders. However, extractive and manufacturing industries, the transport sector, and agriculture are lagging behind. In metallurgy, the oil and gas industry, mechanical engineering and the electric power industry, there are opportunities for transformation based on digital technologies: robotics, the Internet of Things and augmented reality, efficient capacity utilization. An integrated planning system has been created for Severstal, which includes process management from orders according to customer needs to equipment capabilities and terms of production of goods. An intelligent system for predictive maintenance of equipment has been developed and implemented in industry. Special tags (RFID tags) are superimposed on the units and equipment, which in real time provide data on the state of machines. These indicators are displayed on portable devices, including tablets, smartphones of workers in the workshop, and enter the data warehouse. Then, with the help of big data technologies, an analysis is carried out and a real-time forecast of equipment wear is calculated. Thus, for example, the costs of equipment repair at Novolipetsk Metallurgical Combine are optimized. In the field of transport, logistics services – there is the principle of sharing economy. Yandex taxi is a service for finding a taxi in the Russian market. Another transport project of the sharing economy is a car sharing service. For example, in Moscow these are "Car5", "Anytime", "Delimobil" and "YouDrive". Another example in the field of transport in the Russian market is carpooling, that is, the simultaneous sharing of a car for a trip in one direction - the international carpooling service BlaBlaCar in Russia. There is the use of machine vision technology (smart cameras) to record the movement of motor vehicles in freight yards, taking into account the goods imported or exported, finding vehicles in the parking lot, as well as controlling the access of cars to the parking lot, and registering customers through integration into enterprise systems.

Digitalization of banks in Russia is actively implemented. They store databases in clouds, work using remote desktop technology, reserve information systems on diverse platforms, use hybrid solutions that allow connecting the service provider's infrastructure with the customer's private virtual infrastructure, online banking. The system of electronic payments through mobile devices with biometric user identification is being increasingly developed in the banking sector. At the end of 2016 Sberbank announced the launch of a robot lawyer, launched the Iron Lady artificial intelligence system, which calls debtors [2]. Blockchain technology is still being mastered by Russian banks.

2. The presence of the institutional vacuum in the institutional space of the digital economy of Russia.

Existing state legal institutions are lagging behind the challenges of new digital opportunities, both in matters of Internet regulation and in the application, for example, 3D printers, unmanned vehicles, bioengineering technologies, ensuring cyber security, etc. Cybercrime institutions do not match the number of cybercrimes, which have grown by 75% over the past three years. Russia needs to create a modern information security system for all sectors of the economy. In the Russian Federation, there are no

standards for evaluating data processing and storage centers, unlike many other countries, which excludes the objective possibility of assessing the level of services provided to consumers, for example, the possible amount of data for storage. The Institute of Public Control, which is implementing the digital economy program, has not been formed yet. Regarding the Institute of Business, there are a number of proposals in the field of digitalization of management systems and resource planning (ERP-systems) of individual large enterprises. The private sector is experiencing a shortage of relevant knowledge and managerial experience among enterprise managers and employees. There is no competitive pressure due to the high market consolidation in leading sectors, and high barriers for new players to enter the market. In the private sector, the introduction of innovation is in stagnation. This is a consequence of the residual R&D financing of enterprises and existing tax rules that do not stimulate investment in scientific research. Relations with scientific community remain weak, both at the local and international levels. Industry standards for analysis and data integration have not been developed. In Russia there is a shortage of programmers, their training requires financial resources and years of training. As for foreign specialists, they have uncompetitive salaries. According to the data of the Ministry of Digital Development, Telecommunications and Mass Media of the Russian Federation, about 25,000 IT specialists graduate from the country's universities [7]. Only about 400 thousand programmers work in the Russian market, while in the USA – 4 million, in India – 3 million and in China – 2 million. In Germany, about 10% of the population is employed in high-tech industries - in Russia – 2 times less [10].

3. Network space.

In accordance with the Federal Law "On Communication" dated 07.07.2003 N 126-FZ, the creation of a telecommunication network space in the country should be based on a single network [5]. In practice, private capital is building networks spontaneously. An example is fiber-optic temporary huts stretched through the air between buildings, the randomness of architecture and the location of transit nodes of network traffic, the inability to control it even in cases of force majeure. High growth rates of communication networks in the country are due to the absence of administrative barriers and competition in the market. So, over the past 15 years in Russia, more than 50% of households began to have fixed access to the digital environment, which is many times more than the number of phones installed over 120 years. The total coverage of broadband Internet access exceeded 80% of users, and their number is more than 100 million people. However, there is a serious problem: to form a modern infocommunication infrastructure in Russia, it is necessary to develop network-wide regulations and mechanisms; you cannot control the quality and traffic of a single network without it. There is a conglomerate of private fragments of the Internet, which cannot be used as the infrastructure for special networks because of high systemic risks, a low degree of reliability and stability, and security of information exchange.

4. Digital divide in Russia.

This is a direct lack of access to modern information and communication technologies and/or the presence of unequal, selective provision of them in various regions and cities of the country. There are such forms of digital divide in access, in use and in impact of

the Internet on the behavior and attitudes of the population. Digital divide bridges the socio-economic gap between entities with and without access to information resources. Regions of the Russian Federation differ in access to the Internet by type of terrain, the availability of infrastructure, the level of education and the mastery of digital skills of the population. The leaders of the ICT rating among the regions in 2018: Moscow, St. Petersburg, Moscow Region, the Republic of Tatarstan, the Republic of Sakha (Yakutia). For 2015–2018 the percentage of the population in Russia using the Internet to order goods and services increased from 19.6 to 29.1% of the total population. Russian users account for 16.6% of Internet users in Europe. At the same time, the number of Facebook users is 12 million people, which is significantly lower than the indicators of developed European countries [6]. At present, the federal project "Eliminating Digital Divide" is being implemented in the Russian Federation, which provides for the creation of access points in settlements with the population of 250 to 500 people and for providing the population access to the Internet at a speed of at least 10 Mbit/s. Russia needs to create its own key niches of digital innovation, which at the lowest cost will allow achieving independence both in the domestic market and the level of recognized world leaders.

4   Discussion

Recently, the economic digitalization has received great attention worldwide. The digital economy is any activity that uses digital data [3]. Economists in their studies consider the transition to digital as a source of new production opportunities for those organizations that can adapt to changing conditions [1], as one way to reduce the costs of firms and consumers in finding and transporting goods and services, as a way to limit price fluctuations for homogeneous goods [12]. Russian researchers study the digital economy as a new reality, which leads to changes in the cultural, social, economic environment [8], to changes in the institutional sphere [4]. Complexity theory allows us to study how individual firms and the country's economy grow, adapt and develop [9]. A number of economists recommend using this theory to model specific results in the strategic management of a firm [11].

5   Conclusion

The digital economy leads to constant fluctuations in economic activity, causes rapid changes in the institutional environment, leads to the emergence of new forms of interaction among economic entities. Digitalization of the economic space of Russia is not uniform, existing institutions lag behind new digital opportunities, leading to the emergence of digital divide both among individual economic entities and among regions of the Russian Federation. The construction of network space is extremely uneven, there are no clearly developed network-wide regulations and mechanisms. The institutional structure also does not correspond to modern digital realities. There is no way to give an objective assessment of the quality of the delivered digital services; the institution of public control has not been formed.

References

1. Anderson, L., Wladawsky-Berger, I.: The 4 things it takes to succeed in the digital economy. Harvard Bus. Rev. (2016). https://hbr.org/2016/03/the-4-things-it-takes-to-succeed-in-the-digital-economy. Accessed 20 Mar 2020
2. Business Online: Sberbank has introduced a robot lawyer that will replace 3 thousand employees (2017). https://www.business-gazeta.ru/news/334226. Accessed 20 Mar 2020
3. Ducharme, L.: Measuring the digital economy international monetary fond (2018). https://www.imf.org/en/Publications/Policy-Papers/Issues/2018/04/03/022818-measuring-the-digital-economy. Accessed 20 Mar 2020
4. Ermolaev, K., Matveev, Y., Trubetskaya, O., Gromova, T.: Institutional changes and digital economy. In: Mantulenko, V. (ed.) Global Challenges and Prospects of the Modern Economic Development. European Proceedings of Social and Behavioural Sciences, vol. 57, pp. 580–589. Future Academy, London (2018)
5. Federal Law "On Communication" dated 07.07.2003 N 126-FZ. http://www.consultant.ru/document/cons_doc_LAW_43224. Accessed 22 Mar 2020
6. Internet World Stats: Internet, facebook and population stats for Europe (2019). http://www.internetworldstats.com/stats4.htm. Accessed 22 Mar 2020
7. Open Innovations 2018: National Program Digital Economy, 16 October 2019. https://digital.ac.gov.ru/upload/iblock/f4b/. Accessed 21 Mar 2020
8. Parker, C., Ramdas, K., Savva, N.: Is it enough? Evidence from a natural experiment in Indias agriculture markets. Manag. Sci. **62**(9), 2481–2503 (2016)
9. Sammut-Bonnici, T.: Complexity theory. Strat. Manag. **12** (2015). https://doi.org/10.1002/9781118785317.weom120210. Accessed 20 Mar 2020
10. TAdviser: The labor market in Russia (2020). http://www.tadviser.ru/index.php/%D0%A1%D1%82%D0%B0%D1%82%D1%8C%D1%8F:%D0%A0%D1%8B%D0%BD%D0%BE%D0%BA_%D1%82%D1%80%D1%83%D0%B4%D0%B0_%D0%B2_%D0%A0%D0%BE%D1%81%D1%81%D0%B8%D0%B8. Accessed 20 Apr 2020
11. Woodsidea, A., Nagyb, G., Megehee, C.: Applying complexity theory: a primer for identifying and modeling firm anomalies. J. Innov. Knowl. **3**(1), 9–25 (2018)
12. Yudina, T.N., Tushkanov, I.M.: Digital economy as a result of the industrial-technological revolution (theoretical and practical aspects) (2017). https://reosh.ru/t-n-yudina-i-m-tushkanov-cifrovaya-ekonomika-kak-rezultat-promyshlenno-texnologicheskoj-revolyucii-teoreticheskie-i-prakticheskie-aspekty.html. Accessed 22 Mar 2020

Methodological Aspects of Credit Portfolio Management in Financing Innovative Projects

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Abstract. There is a high degree of uncertainty and high risks in the financing of innovative projects, which prevents the banking sector from increasing its share in project type lending. Current credit risk assessment methods are unable to assess the change in the borrower's business cycle with exogenous factors in mind. Authors of the research are finalizing and proposing portfolio quality management principles that are applicable for lending to the innovative sector of economy. In particular, a credit risk management system, described in the article below, is modelled using proactive diagnostics based on a free cash flow model calculated using a covariance matrix of factors that determine the dynamics of borrowers revenue. Key indicators used to calculate the probabilistic model, such as estimating the probability of default and evaluating debt exposed to credit risk, are analyzed using Monte Carlo simulations. The borrower's credit risk assessment is modeled using the real options method and using the risk adjusted net present value approach. Authors succeeded in developing a parametric migration matrix according to the multicollinear rNPV model. Article provides an example of a diagnostic card of a loan portfolio for IT borrowers.

Keywords: Credit risk · Default · Innovative economy · Loan portfolio quality · Proactive diagnostics

1 Introduction

Working with the quality of a loan portfolio in a commercial bank is not an easy task. Commercial banks are actively introducing credit risk assessment and management tools. However, according to Banki.ru, the growth in total overdue debt for 2019 amounted to 11.8%, and its share in the total loan portfolio as of January 1, 2020 increased to 5.9% (a year earlier – 5.5%). The share of overdue loans in the corporate portfolio increased from 5.7% to 6.7% [1].

Stagnation of the economy and increased competition in the banking sector may subsequently lead to a decrease in the profitability of interest-bearing lending operations, even in such segments, that provide high investment yields, like innovative economy. In this case to remain profitable, banks need to develop and implement a set of measures aimed to reduce operating and non-operational costs, optimize risk assessment methods, as they directly affect reserves and capital adequacy ratios.

One way to increase the marginality of your business is to lend to more marginal, such as innovative projects. For lending efficiency not to be offset by high loan loss provisions, a different approach to working with the loan portfolio is required. In this article, we focused on methods for assessing and managing credit risk, as the most significant form of risk.

Modern approaches to credit risk management (although they are based in large banks on advanced models for assessing the probability of default) do not allow building the management process quite effectively. The reasons for this situation are as follows:

1. Discreteness of factors that are used in the model of assessing the probability of default (financial and non-financial indicators, default indicators), which are identified once a quarter.
2. The model does not take into account the whole variety of exogenous external factors that affect the performance of borrowers.
3. Not transparency of the significance of factors that affect the borrower rating to a greater extent. On the one hand, this helps ensure the independence of the risk management vertical; on the other hand, the business unit does not have the ability to manage portfolio quality.
4. The lack of universal portfolio quality meters, which does not allow them to be managed. The rating of the borrower is static, the fact of delay is a late indicator.
5. The complexity of the management system, expressed in the dichotomy of the goals of internal departments.

Currently existing methods for assessing the credit risk of debt portfolios are not fully able to assess how, when changing the business cycles of one borrowing company, whose loan obligations payments are included in the structure of the loan portfolio, the total loan risk of the portfolio changes. A multivariate analysis of the loan portfolio in the presence of a multicollinearity factor is complicated by the fact that it is not always possible to accurately assess how the selected factors actually affect the dynamics of the total loan risk of the portfolio.

The task is to develop an approach to managing the quality of the loan portfolio of a commercial bank, taking into account the industry specifics of borrowers. The effect is expected from the timely detection of negative signals that may precede the occurrence of overdue debts of 5+ clients of the segment of large and medium-sized businesses in the time horizon of 1–2 months. Solving the problem will improve the quality of the loan portfolio and prevent the occurrence of arrears in the early stages, due to the timely development of a strategy for working with the client, and optimize the reserves for possible losses on loans, to increase the margins of credit operations.

The solution to this problem is to optimize the current process of assessing credit risk and should act as additional tools for assessing and managing the credit risk of a commercial bank on a monthly basis (as opposed to PD models that are calculated once every three months). The information collected as a result of working with this tool should help refine the PD model, make it more elastic due to new factors, and prepare for validation with the regulator.

2 Methodology

The study uses methods of comparison, financial and economic, systemic, statistical, correlation and regression analysis, the Monte Carlo method, the method of principal components, the method of real options. The loan portfolio is a structured system of data on loans and other requirements of the bank in relation to the bank's clients. The loan portfolio is a reflection of the results of the bank's work in credit work, which consists of various types of loans. The quality of the loan portfolio on credit risk is the subject of considerable attention by many authors: Gadzo, Kportorgbi, Gatsi [6]; Samorodov, Azarenkova, Golovko, Miroshnik, Babenko [14]; Ferretti, Gabbi, Ganugi, Sist, Vozzella [5], Qayyum, Riaz [12]. According to GOST ISO 9001-2008 "Quality management systems" [7] quality is a degree of conformity of set of inherent characteristics to requirements.

The quality of the loan portfolio is understood as a property of its structure that has the ability to provide the maximum level of profitability at an acceptable level of credit risk and balance sheet liquidity [9]. The goal of managing a bank's loan portfolio is to ensure maximum profitability at an acceptable level of risk. The main criteria for the quality of the loan portfolio are profitability, degree of credit risk and security. The ratio of these indicators characterizes the effectiveness of credit and total activities of the bank. In the system for evaluating the effectiveness of a credit institution, there is an indicator RAROC Risk-adjusted return on capital. This indicator is characterized by increased sensitivity to borrower risks due to the use of expected losses (EL) and economic capital (EC) in the calculations. The indicator allows you to allocate to any level of customer segmentation in the bank, including the level of the client and the individual transaction. However, in the public reporting of our domestic banking system there is no such indicator. Standard indicators are the value of the prudential reserve, NPL (Non-performing loan).

The NPL indicator is not objective, with an increase in the absolute values of the portfolio, the relative value of the indicator will be adjusted downward, which will not reflect the whole situation. An essential element of the calculation of EL and the subsequent determination of RAROC is the degree of credit risk of the borrower, which is expressed in the rating of the borrower and is determined through PD.

PD is an internal model for calculating the probability of a default of a counterparty and assigning it an internal rating based on selected quantitative and qualitative factors (loan to equity ratio, current liquidity ratio, net debt load, current liquidity ratios, business activity, market position, credit history, ownership share, operational control, state support, fraud of reports etc.).

A practical control problem based on the PD model is the imperfection of the modeling approach itself. For example, in the work of Shatalova and Shatalov [16] noted that often used by a commercial bank methods of calculating credit rating are isolated, not integrated into the sequential process of credit risk management, working independently from this process.

Proactive diagnostics of the loan portfolio of borrowers is based on a fundamental analysis of the external and internal parameters of the borrower, depending on its industry sector. As a rule, financial statements are amenable to substantial adjustments

by the client's financial services and are provided with a significant delay. It is not possible to draw up a detailed CF for each borrower due to the different line of loan products.

3 Results

The proposed model is based on the assumption of a high level of direct correlation between the dynamics of the company's free cash flows and the credit risk of the bank's portfolio. The modeling of free cash flows in our model is based on the use of a multi-factor model, among which the key factors are:

- volume of sales,
- customer reliability,
- non-parametric model of stochastic dynamics of interest rates.

The dynamics of these indicators is modeled using a number of stochastic differential equations. Cash flow, which is critical in terms of default risk, is calculated using key variables with a feedback effect. Sales uncertainty is associated with variable product demand. During the growth phase of the global economy, the model can set a high level of sales. Low demand indicates a poor state of the economy, which will be reflected in the reduced creditworthiness of borrowers and the total credit risk of the portfolio. From the above arguments, two key conclusions must be drawn:

- random factors in equations should be positively correlated,
- in order to increase the predictive accuracy of the model, it is necessary to take into account the cyclical nature of the global lending phases (also known as credit cycles).

When modeling free cash flows and calculating a probabilistic model for the phased implementation of the project, it is necessary to take into account that illiquidity problems arise if the debtor company's low income is combined with a significant delay in paying bills (in this case, the company has to sell part of its assets to make a payment, which puts threat to its future prospects). In this sense, when modeling future periods rNPV, it is necessary to carry out additional discounting of the probability coefficient by a correction factor calculated by changing the credit risk of the company.

Key indicators used to calculate the probabilistic model, such as estimating the probability of default and estimating debt exposed to credit risk, are analyzed using Monte Carlo simulations, as well as the likelihood of a forecast cash flow. For the purposes of forecasting discount rates, we use the non-parametric model of stochastic dynamics of Hall-White interest rates (one-factor extended Wasecek model) [2]. To calculate free cash flow, our model refers to the average value of the Ornstein-Uhlenbeck process [4], and the parameters of the free cash flow itself are adjusted by the economic environment model.

Modeling Algorithm (Proactive Portfolio Diagnostics)

a. **Identify a phased structure for the implementation of the project (business operation) for the construction of the rNPV model [17]**

In theory (and in 90% of cases in practice), any project can be divided into specific stages of its implementation. But for companies and projects implemented in a number of sectors (for example, for those, which are operating in the innovative economy framework), the described approach of separating the individual stages of projects implementation has very specific consequences.

b. **Expansion of the correlation matrix using the principal component method**

In the context of increased uncertainty in global capital markets, it is especially important to assess how external systemic risk factors can negatively affect the dynamics of borrowers' quarterly revenue [15]. Since systematic risk is not diversifiable and we consider the entire underlying market for the selected borrowing company as a combination of assets, the systematic risk of an individual borrowing company is the degree to which its risk is associated with market risk. That is why systematic risk of any industry consists of the systematic risks of individual companies, which, by definition, cannot be excluded regardless of how many companies are in the industry.

Among the external factors most often used for constructing covariance matrices, we selected the following by multiple regression analysis: the total financial leverage of the industry companies, the liquidity ratio, the consolidated indicator of the operational efficiency, the reduced profitability ratio of the companies, the variable of the financial crisis. The summary conclusion based on the analysis of data for five sectors (construction companies, banking and insurance companies, food retail companies and airline carriers) is as follows:

- the systematic risk of companies in these sectors is negatively correlated with the combined profitability ratio and this relationship persists for long-term periods of time,
- positive level of correlation between systematic risk and the size of companies in these segments also persists for long-term periods of time,
- financial leverage positively affects the airline's systemic risk, but the correlation coefficient calculated by this argument is not so significant and varies for companies from different industries in the range (0.12–0.17),
- high correlation coefficient also exists between the systematic risk of companies in these segments and the combined liquidity ratio,
- it was not possible to find any significant relationship between the combined indicator of the operational efficiency of companies within sector and systemic risk. The correlation coefficient calculated by this argument varies for companies of different industries in the range (0.23–0.25),
- equally, it was not possible to establish a stable relationship between the systemic risk of a company and the variable of financial crisis. The correlation coefficient calculated by this argument varies for companies of different industries in the range (0.18–0.24).

Below we present the correlation matrices for the given factors for a number of industries (Table 1):

Table 1. Correlation model

	Ratio of profitability	Company size	Financial leverage	Current ratio	Operating efficiency	Variable Fin. crisis
Construction	(0.34)	0.45	0.12	0.76	0.24	0.21
Airlines	(0.12)	0.51	0.16	0.59	0.23	0.19
Banks	(0.29)	0.34	0.15	0.68	0.25	0.24
Insurance	(0.49)	0.29	0.15	0.83	0.24	0.18
Retail	(0.53)	0.68	0.17	0.91	0.23	0.19

Source: authors.

After constructing the correlation matrix, it is required to increase the efficiency of the model to decompose the resulting matrix using the principal component method. But first of all, we need to establish which of the determinants of the correlation matrix have signs of multicollinearity (low level of correlation of indicators with a relatively high coefficient of determination; relatively high level of sensitivity of correlation coefficients to the addition and exclusion of additional determinants from the sample).

In our opinion, the most suitable method to solve the multicollinearity problem is the principal component method (hereinafter: PCA) presented above. PCA is a mathematical procedure that uses orthogonal decomposition and transformation to project a set of observations of possible correlated determinants (i.e., large data) onto a set of values of linearly uncorrelated determinants (i.e. low data), which are global components. The number of major components is less than the number of original determinants. The projection is performed using the least squares method, where large (i.e., main) data variability is recorded, and small variability is ignored. As a result, the first global component will be in the direction of maximum dispersion in the input space. The second global component is orthogonal to the first and coincides with the direction of the second maximum dispersion. Subsequent global components are consistent with the remaining maximum variance up to the last major component, which is the smallest variance of the data.

In the article by Kendryukhov and Tolkachev [8] it is proposed, to conduct a general analysis of components (GCA) and spectral analysis of large empirical covariance matrices based on PCA. So, the first step for conducting PCA analysis is to determine two types of components (global and local) by calculating the coefficients of inverse participation. The second step is to analyze the information embedded in the listed global components. The third stage is the creation of a portfolio of local components and the use of an integrated network approach to identify its correlation structure.

Local components contain information about the correlation of certain assets, and not the entire market as a whole. The most effective method of researching cluster information in the system is a comprehensive network analysis. In addition, portfolios of local components can also be used to establish noise correlations. We use the threshold method to filter noise correlations. We select the 95th percentile of mixed correlations as the threshold in each period. Thus, we filter out most of the noise information contained in local components. Using network analysis, you can discover cluster information contained in portfolios of local components.

As a result, the found noise effects in the correlation matrix we constructed can be removed from the model, thereby increasing its efficiency in the framework of the multifactor analysis.

c. **Modelling probabilities**

The next step in the process of introducing proactive approach to assessing portfolio credit risks is modeling the probabilities of a positive effect on each previous phase of the project (the onset of which is itself a trigger for starting the next phase of the project).

To implement the described stage it is necessary:

– to usereal options method in modelling procedure,
– to build an rNPV model for the purpose of estimations

The methodology of real options is aimed to eliminate the influence of economic uncertainty on the cost of the project by applying the theory of financial options to the project implementation process. This approach considers the process as containing a number of options in the face of unpredictable economic changes. For each phase of the project, an assumption is made that there is a real option for the investor (creditor). If the option holder decides to invest, he will acquire the option to invest in the next phase along with the option for future commercialization of the project. It may also happen that success in the previous phase is accompanied by unfavorable market conditions.

The holder of the option in such circumstances may refuse the project, which limits the negative impact of the strike price of the option. In comparison, conventional NPV-based methods suggest that all investments will occur after making a decision on investing. Projects can include other options, such as extension options, deferrals, and licenses. It is assumed that rational investors value these options, and therefore, the project cost is associated not only with its cash flows, but also with the availability of such options.

After performing the simulation using the real options method, we can begin to build the rNPV, which will serve as the basis for the subsequent construction of the migration matrix and the calculation of the credit risk of the portfolio. Determining the risk-adjusted net present value (rNPV), like NPV, also includes forecasting income (cash inflows), costs (cash outflows), but additionally requires calculating the probability of obtaining forecasted cash flow for each phase of the project. To account for risk, the expected net cash flow for a given period of time is multiplied by the probability of its occurrence [13].

Modeling as part of the process of structuring cash flows by rNPV is carried out taking into account the described conventions:

– cash outflows under Phase 1 represent the outstanding value,
– the described cash outflow occurs regardless of whether the first stage is successful after completion. The cash outflow associated with the costs of Phase 2 is weighted to reflect the likelihood of success of phase 1, because phase 2 can occur only if phase 1 is successful,
– in the same way, the outflow of funds in phase 3 is determined by the cumulative probability of its achievement, which is equal to the success rate of Phase 1 multiplied by the success rate of phase 2, etc.,
– after the net cash flow of each time period has been correctly adjusted for risk, these cash flows are discounted using the appropriate discount rate and the discounted cash flow method.

Moreover, when modelling cash flow using the rNPV method, it makes sense to apply different discount rates at each individual project phase. Discount rates may vary, but typically (for different industries) range from 1.0 to 1.5 standard deviations at different phases of the project.

4   Discussion

For a given basis, operators are represented as square matrices. These estimates are used afterwards to prepare migration matrices estimated by the described methods: cohort for periods T (PI), duration (parametric (D) and nonparametric (AN)), marginal model GLM (M GLM) and transition model GLM (T) GLM). For Russian companies, the average value of the migration matrix for one year (AR) was also calculated. Standard errors were calculated for the matrix elements by the boot method (matrices with the letter B at the end), and the generators for each matrix were determined with the correction calculated for the model described in the described article. Note that transition matrices for duration methods are already continuous time matrices. Then, the transition matrices obtained using the generators (denoted by G) were calculated to make probability estimates possible at any time. A total of 10 matrices were considered.

We separate all the matrices obtained by the factor of the presence/absence of correction for the parametric model of default given in the article. As you know, often large default probabilities are due to the fact that models are extrapolated for a long period of time (in practice, portfolios from the "banking book" are tracked on the horizon up to 10 years). Application of the methodology proposed above for the parametric assessment of the credit risk of portfolios allows us to circumvent this problem. Below we compare the migration matrices obtained without and using the parametric method described above (Table 2, Table 3).

Table 2. Parametric matrix of migration by model Moodys

	Aaa	Aa	A	Baa	Ba	B	Caa_C	D
Aaa	0.8933	0.1018	0.0036		0.0012			
Aa	0.0086	0.8781	0.1065	0.0029	0.0019			0.0019
A		0.0153	0.9027	0.0658	0.0126	0.0027		0.0009
Baa		0.0052	0.0628	0.8356	0.0817	0.0126		0.0021
Ba	0.00		0.0029	0.0391	0.8418	0.1035	0.0039	0.0078
B		0.00	0.0019	0.0038	0.0596	0.8221	0.0298	0.0817
Caa_C				0.0138	0.0276	0.0741	0.6034	0.2800
D								1

Source: authors based on [18]

Table 3. The parametric migration matrix according to the multicollinear rNPV model

	Aaa	Aa	A	Baa	Ba	B	Caa_C	D
Aaa	0.8974	0.1042	0.0071		0.0090			
Aa	0.0093	0.8921	0.1100	0.0109	0.0134			0.0291
A		0.0201	0.9132	0.0801	0.0190	0.0100		0.0081
Baa		0.0112	0.0798	0.8890	0.0922	0.0201		0.0192
Ba	0.0012		0.0189	0.0451	0.8890	0.1101	0.0112	0.0291
B		0.0027	0.0090	0.0111	0.0789	0.8768	0.0671	0.1202
Caa_C				0.0201	0.0450	0.1201	0.8279	0.6728
D								1

Source: authors.

For practical use, the most important are the probabilities of a transition to default. Tables 2 and 3 show the probabilities of transition to default from Ba and Caa_C depending on time. In addition to the average value, confidence intervals were estimated using the boot method.

Models, provided above give different results. Particularly large differences exist for portfolios with lower ratings, such as Caa_C. Migration probabilities provided above are used as opening data for estimating economic capital and, as the result, are directly transposed into financial results. Diversities provided in the process of modeling can lead to significant changes (up to 15%) in portfolio maintenance costs. Based on both methodologies and using retrospective analysis, we were able to conclude that the rNPV parametric model described in this article can significantly reduce the average sampling error, thereby increasing the accuracy of the model.

The major step is to create a diagnostic card for the loan portfolio, taking into account the criticality of the boundaries of financial and other indicators, which allows a static assessment of the level of risk in the portfolio. All indicators are developed individually for each industry. Option scorecard for IT sphere, is given in Table 4, taking into account their features, which are considered in detail in one of the author's articles [11].

Table 4. An example of a diagnostic card of a loan portfolio

Indicator title	Level of risk
Stdevr NPV (1.5)	High
Decrease in contract base by more than 25%	
DSCR in range less than 1	
Failure to comply with LTV indicator (Decrease in estimated value based on annual revaluation results that resulted in loan failure by more than 20%)	
Stdevr NPV (1.2)	Medium
DSCR in the range from 1 to 1, 1	
Failure to comply with LTV indicator (Decrease in estimated value based on annual revaluation results that resulted in loan failure to reach 20%)	
Net assets less than share capital	
Decrease in contract base to 25%	

Source: authors.

The significance of the indicators is determined based on the results of heuristic assessment of experts in the sectors. The construction of the composite index is carried out by a double convolution method [10] or other mathematical weighing methods. The interpretation of the composite index is proposed according to the modified empirical scale of probability of the risk event occurrence (Table 5).

Table 5. Risk level interpretation

Gradation of risk level	Interpretation	Working strategy
High	All deviations are critically exceeded. Probability of default is extremely high	Reduce
Medium	Permissible deviations in the values of indicators are exceeded. Probability of default on obligations average	Hold
Low	There are no deviations in the value of indicators. There is no probability that the liabilities will not be settled	Increase

Source: authors.

For cash flow modelling purposes we use a modified model of adjusted net present value. The theoretical structure of risk-adjusted rNPV calculation consists of a probability tree, which details all likely scenarios and subsequent cash flows, as well as the probability that each forecast scenario will occur. It is also possible to add other qualitative factors, which are significant from the point of view of protection of bank interests.

5   Conclusion

The presented approach to the quality management of the loan portfolio, based on the principles and two-level proactive diagnostics, will help maintain the quality of the bank's corporate loan portfolio and participate in financing innovative projects. The methodology were tested on the loan portfolio of the largest bank in Russia (in Moscow and the Moscow region). The area for further research is the formation of measures to develop and implement a risk management plan, hedging methods, requirements for IT systems, organizational structure and personnel to increase the efficiency of the business process. A special area is the study of the theory of behavioral finance and its impact on borrower behavior [3].

References

1. Banki.ru: Banking sector in 2019 (2020). https://www.banki.ru/news/research/?id=10919284. Accessed 15 Apr 2020
2. Belsner, O.A., Zhabin, D.N.: Analytical expression of the value of a swap contract in the hall-white model. News Tomsk Polytech. Univ. Eng. Geo-Resour. **309**(3), 15–17 (2006)
3. Bogatyrev, S.Y.: Testing the value function of the prospect theory on Russian M&A market. J. Rev. Glob. Econ. **7**, 731–739 (2018)
4. Dmitriev, D.I.: Analytical expression of swap contract cost in the Hall-White model. Diploma work. Saint Petersburg State University, Saint Petersburg (2016)
5. Ferretti, C., Gabbi, G., Ganugi, P., Sist, F., Vozzella, P.: Credit risk migration and economic cycles. Risks **7**(4), 109 (2019). https://doi.org/10.3390/risks7040109
6. Gadzo, S.G., Kportorgbi, H.K., Gatsi, J.G.: Credit risk and operational risk on financial performance of universal banks in Ghana: a partial least squared structural equation model (PLS SEM) approach. Cogent Econ. Finance **7**(1), 1589406 (2019). https://doi.org/10.1080/23322039.2019.1589406
7. GOST R ISO 9001-2008 "Quality management systems". Requirements (2008). http://docs.cntd.ru/document/1200068732. Accessed 15 Apr 2020
8. Kendryukhov, A.V., Tolkachev, D.O.: The use of the main components method to assess the competitiveness of machine-building enterprises. Mark. Innov. Manag. **4**, 219–227 (2013)
9. Lavrushina, O.I.: Banking risks. KNORUS, Moscow (2007)
10. Nedosekin, A.O., Maksimov, O.B.: A new comprehensive indicator for assessing the financial condition of an enterprise. Quest. Risk Anal. **2–3** (1999). http://masters.donntu.org/2005/kita/sroka/library/art3.htm. Accessed 15 Apr 2020
11. Pomulev, A.A. Selugina, O.N.: Approaches to risk assessment in financing borrowers of the digital economy sphere. In: Ashmarina, S.I., Mantulenko, V.V. (eds.) Proceedings of the II International Scientific Conference Global Challenges and Prospects of the Modern Economic Development. European Publishing, London (2020). The European Proceedings of Social and Behavioural Sciences, vol. 79, pp. 555–562
12. Qayyum, A., Riaz, K.: Incorporating credit quality in bank efficiency measurements: a directional distance function approach. J. Risk Financ. Manag. **11**(4), 78 (2018). https://doi.org/10.3390/jrfm11040078

13. Rambachan, A.: Harvard Economics Math Camp 2018: Econometrics, Probability Review. Harvard University Press, Cambrige (2018)
14. Samorodov, B.V., Azarenkova, G.M., Golovko, O.G., Miroshnik, O.Y., Babenko, M.V.: Credit risk management in the banks financial stability system. Financ. Credit Activity Prob. Theory Pract. **4**(31), 301–310 (2019)
15. Sharpe, W.F.: Capital asset prices: a theory of market equilibrium under conditions of risk. J. Finance **19**(3), 425–442 (1964)
16. Shatalova, E.P., Shatalov, A.N.: Assessment of the Borrowers' Credit Capacity in the Bank Risk Management. KNORUS, Moscow (2020)
17. Svennebring, A., Wikberg, J.E.: Net present value approaches for drug discovery. SpringerPlus **2**, 140 (2013)
18. Yavin, T., Zhang, H., Wang, E., Clayton, M.A.: Transition probability matrix methodology for incremental risk charge (2010). https://arxiv.org/pdf/1102.3857.pdf. Accessed 15 Apr 2020

Implementing Lean Manufacturing and Solving Motivation Problems in Russian Companies

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Abstract. The introduction of lean manufacturing principles in Russian companies often causes dissatisfaction among employees. This is due to the fact that the staff is poorly involved in the process of changes that are imposed on them by the management. The authors suggest paying serious attention to motivation problems when applying principles of lean production by actively teaching employees the basics of the 5S system, which helps to reduce losses in the workplace, as well as involving employees in the process of continuous improvement. A solution to this problem, the authors see in the creation of training classes in companies that model production situations that require managerial influence using the lean production principles.

Keywords: 5S system · Labor productivity · Labor efficiency · Lean manufacturing · Losses · Process factory

1 Introduction

Recently, lean production (Lean system) has become one of the innovative management concepts implemented at Russian enterprises. This concept is based primarily on the production management system developed by the Japanese automobile giant Toyota in the 1950s. It is based on internationally recognized principles of the Toyota Corporation, which is known for its innovative approach to the production organization and strives to continuously improve all processes in the company.

Here it is important to emphasize that the true pioneer in improving the production efficiency is not a Japanese company, but the ideologist of the scientific labor organization Gastev, who in the 20s of the XX century after an active correspondence with Henry Ford implemented his method in the Soviet production, becoming the founder of the Central Institute of Labor (CIL), whose task was the development of productivity and production methods of workers [9].

The Lean system has been widely and successfully implemented in many foreign companies, at enterprises of various activity fields. Although the lean production methods have been most fully implemented at automotive and mechanical engineering enterprises, the successful implementation results are demonstrated by construction

companies [10, 15], horticulture [13], furniture industry [1], food industry [3], mining [14], etc.

This concept is based on enterprise management, which allows you to improve the quality of work by reducing losses. Losses are defined as anything that reduces the work efficiency and does not increase the value of a product or service to the consumer. In practice, such losses are extra movement of equipment and employees, which leads to an increase in production time; overproduction which leads to excess inventory and storage costs, etc. In general, losses lead to an increase in the cost of production.

For many Russian enterprises, the issues of high cost price, along with insufficient quality of products are quite acute. At the same time, problems of outdated equipment, high energy consumption, excessive inventory and inconsistent production processes remain also relevant [6]. However, despite the fact that the concept of lean production is generally recognized in the world and its main principles are aimed at solving these problems, its implementation at domestic enterprises is usually painful and it comes not always to the desired result [16].

2   Methodology

The authors used general scientific methods of systematic and integrated approaches, as well as traditional methods of economic analysis (observation, comparison) and non-traditional (heuristic techniques), analysis, synthesis, description, and comparison. Their application is determined by the theoretical nature of this research, which includes the following stages: problem statement, analysis of information on the research topic, comparison and description of various scientific views on the issues under study, synthesis of different approaches to the problem. The results of the study are based on the implementation of lean production and training of personnel according to lean production principles at industrial enterprises of the Samara region over the past three years.

3   Results

The main reason for these problems is the reluctance of employees to accept new ideas and work in accordance with them, as well as the inability of management to motivate staff in the new environment. This is already evident at the very first stages, when implementing one of the lean manufacturing tools of the 5S system (workspace management system). The 5S system implies the implementation of 5 steps (Fig. 1). The effectiveness of the 5S method is very important and has a correlation with the overall performance of production [18], but the resistance of the personnel begins at the stage of "removing unnecessary". However, this state of affairs is typical for all spheres (production, services, education, health, etc.).

As a clear example, let's consider a machine-building enterprise. On the assembly, maintenance, and other grounds of domestic enterprises, there is often a picture when a large number of unnecessary tools are located in the workplaces (locksmiths, turners, assemblers, etc.), which are practically not used or are used in emergency situations.
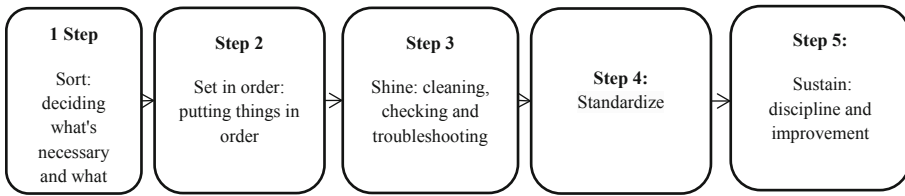
Fig. 1. Basic steps of the 5S concept (Source: authors).

The presence of an extra tool hinders the performance of current work and contributes to temporary losses in the search for a necessary tool.

At the enterprise level, an extra tool at each site leads to higher costs. At the same time, companies solve this problem by purchasing cheaper and, as a rule, low-quality tools. However, this tool wears out faster and a whole chain of unnecessary actions (ordering, delivery) is performed again to replace it, which increases the company's expenses. In addition, poor-quality and constantly changing tools (and sometimes their absence) affect the psychological condition of workers and, as a result, the quality and efficiency of production. So instead of time, effort, and money being spent on developing and improving the quality, it is spent on performing actions that do not add value to the product for the consumer.

The same applies to excess inventory. Many enterprises have a problem of over-production, resulting in increased stocks of finished products in warehouses, or have the practice of purchasing excessive raw materials, without calculating the optimal volume of these materials for normal functioning of production. As a result, stocks and the size of warehouse space increase, that leads to an increase in the cost of their maintenance and the deadening of working capital, which could also be used for the production development. However, as a rule, enterprises solve the problem of working capital shortage not by using a lean production mechanism, but with additional credit resources, which further aggravates the negative financial situation. At the same time the most difficult part is trying to convince the staff, who are used to working according to the usual way, to change this state of things. Moreover, this applies to the entire hierarchical structure of the enterprise, from the simple worker to the general director.

It is quite difficult, for example, to persuade workers to organize their workplace with the 5S requirements: to remove all unnecessary things from the point of view of technological process, to place working tools rationally, to clean garbage and to wash the equipment to a condition when the smallest damage on it is visible, etc. For most of the staff who tried to implement lean production principles, the first reaction was to reject the proposed measures. People who have been used for years or even decades to work with a certain, familiar way for them, are wary of such innovations and do not see any sense in them. It should take enough time for the employee to feel the effect from the rational organization of the workplace. However, in general, no matter how much management tries to implement lean production system in the workplace of its employees, it will never be realized if the manager himself does not adhere to the "philosophy" of the lean production.

Most managers of domestic enterprises see the success of building a business in the growth of financial indicators and give them priority, which is fundamentally wrong. Only if business managers pay sufficient attention to the staff development, motivational and social activities, the impact of the lean production on the productivity growth will be sustainable. For successful implementation of lean production, first of all, the management itself should firstly be morally ready for changes (for example, it starts implementing the 5S principles in its workplace, and not only requires cleanliness from subordinates), constantly participate in the process of monitoring and improving the lean production processes. Otherwise, the removal and non-participation of management leads to demotivation of employees and no measures (especially of an administrative nature) can affect this. Secondly, the management of enterprises should pay special attention to measures for developing the corporate culture and social support for employees.

It should also be noted that, in general, methods of motivation in the lean production system are mainly non-material. It can be a moral incentive (by providing employees with flexible scheduling and special privileges), regular communication with subordinate managers, maintaining the corporate culture, etc. For unstable conditions of the Russian economy, such measures are essential. In addition, they are consistent with the domestic mentality, based on a propensity to cooperative work.

The success of implementing lean production principles depends more on how the company's management communicates this philosophy to its team. There are many ways for managers and subordinates to interact, which is the essence of management. Administrative and command methods, democratic and liberal – none of them will be successful if the lean philosophy is not accepted by every employee of the company.

At Toyota, the lean production philosophy is based on the principle of continuous training of employees in the framework of these principles in specialized training classes. This experience is considered as advanced and is now used all over the world, including Russia.

In our country, the creation of training classes to teach the principles of lean production at enterprises is a relatively new phenomenon. Its origins date back to the approval of the national project "Labor Productivity and Employment Support" in 2017, during which it is planned to ensure that by 2024 the growth rate of the labor productivity at medium and large enterprises of the basic non-resource sectors of the economy is not less than 5% per year [4, 17]. To implement this project, an operator was created – the "Federal Center of Competence" (FCC), its mission is to improve the quality of goods and services and increase the competitiveness of the Russian economy by creating a culture of high productivity and efficiency among employees of organizations in each region of Russia.

The state is interested in improving the efficiency of enterprises, so the FCC is entrusted with the main task of creating a methodology for training the staff of companies that have applied for participation in this project. Currently, 1513 enterprises from 62 subjects of the Russian Federation have become participants of this national project. It is important to emphasize that in addition to valuable knowledge and experience in implementing the principles of lean production, enterprises receive tangible financial benefits from participating in the national project: up to 300 million rubles for a period of up to 5 years at 1% per annum, under a number of conditions.

A mandatory condition for obtaining a loan under this program is to get a conclusion (certificate) of the FCC on the availability of key elements of the production system and a sufficient level of internal resources use to increase the productivity [7].

In the Samara region, one of the first participants in the national project is the company JSC "Sredne-Volzhsky mechanical plant". More than two years have passed since the company entered the labor productivity program. During this time, impressive results were achieved: revenue increased by 44.6%, the number of employees increased by 10%, and the labor productivity – by 40.6%. This success would not have been possible without the company's employees who deeply understand and support all the management's initiatives.

One of these initiatives was to build the production system of the enterprise. The production system of this plant is a set of tools and methods used to convert all types of resources into finished products and based on improving the efficiency of processes and continuous improvement of the company's activities. At the first stage, the basic guidelines for building a production system were formulated.

JSC "Sredne-Volzhsky mechanical plant" is very sensitive to the best practices in the field of improving the labor productivity, which are used by both foreign and domestic companies. Among the key elements of the production system, the company's management has placed a bet on the following ones:

– search for 7 types of losses,
– applying lean production principles to eliminate losses, such as mapping, 5S, standardized work, and unit product flow,
– continuous improvement of all internal processes by mobilizing unused human potential, increasing the competence of employees and spreading the lean production culture. In order to achieve these goals, it was decided to create a training class "Process Factory" within the enterprise, which plays a serious role in training personnel for the implementation of plans outlined by the plant management to increase the labor productivity.

In the practice of global companies, such training centers solve three tasks at once. The first is to involve employees in the improvement process and motivate people by the preparation for changes. As a rule, the changes themselves have not yet begun at the enterprise, and the management needs to interest employees, teach them the basics of the lean production. Secondly, there is a need to provide employees with such a starting level of knowledge and skills that they could immediately use in their workplace without unnecessary theory, without large time expenditures, on the principle of "take and do". Third, you need to bring them to a certain level of understanding of the lean production system so that they can share their knowledge with their colleagues and involve them in changes. After all, the main idea of lean production is that it is formed, first of all, as a culture, and only then as a skill for using appropriate tools in the workplace [12].

The training class "Process Factory" was created with the support of the "Federal Center of Competence" (FCC), which is the operator of the national project "Labor Productivity and Employment Support" [17]. Among the company's employees, candidates were selected for the position of internal trainers who have received serious training in methods used by the FCC. As a result, they have a high level of competence

that helps them train other employees in the sphere of lean production culture. To date, the "Process Factory" of JSC "Sredne-Volzhsky mechanical plant" is a modern training class in which internal trainers train employees in key areas of lean production:

– search for losses by modeling production and office processes,
– process mapping,
– application of the 5S system in production and in the office,
– SMED-quick changeover,
– standardized work.

For each direction, methodological materials have been developed that have a close relation with the real processes taking place at the enterprise. Therefore, employees easily and with great interest are involved in training, learn to see losses, formulate and solve problems, and balance processes. This is a fully interactive learning format that doesn't have boring theory and long slides, but has a lot of practice. Internal trainers set a task for a group of participants: to optimize the production flow with specific, measurable performance indicators that should increase from shift to shift. And in the process of solving this problem, expert trainers teach how to do this using lean production tools. Due to the fact that participants work with real situations and see the effect of their actions in numbers, they come to understanding where they can and should put effort in their enterprise.

4   Discussion

Numerous studies show that innovative management concepts do not work at all or work poorly without building an appropriate organizational culture. So, researchers conducted a study among 295 British manufacturers [2]. Their findings show that the lean practice is positively associated with an organizational culture that is process-oriented, employee-oriented, structurally open, socially free, rule-based, and market-oriented. An even earlier study by a group of German scientists [11] shows that the lean philosophy can increase productivity and efficiency when it is applied in a complex way. According to them, the concept of Learning Factory is already actively used by some companies to train employees in lean production methods.

Some authors pay special attention to the need to revise the approach to the development of human resources that are important for the development of modern industrial systems [19]. They focus on improving, collaborating, communicating and transferring knowledge between industry and universities, facilitating curriculum development, and developing applied knowledge skills and methods. In their opinion, this ensures an effective and efficient transition from the academic to the industrial environment. At the very beginning of the professional career, a person should already have a certain set of knowledge about lean production in order to reduce the time for its adaptation in a company that applies these principles.

Some researchers of lean production consider quality and productivity as priority criteria for the business sustainability [8]. Others speak today about the concept of the Triple bottom line, according to which lean production should be multidimensional and pursue three goals: economic growth, environmental conservation, and social

responsibility [5]. But no one denies the importance of such a factor in the implementation of lean production as social responsibility.

5 Conclusion

Nowadays, the application of lean production is an urgent task for many Russian enterprises, since the issues of low labor productivity and product quality, high production cost are quite acute. However, the implementation of lean production in practice does not always bring the expected effect.

The authors use the example of a machine-building enterprise to investigate how losses are formed, what is their reason, and why the application of lean production (namely, one of its tools – the 5S system) does not bring the desired result. One of the main reasons, according to the authors, is the lack of motivation of employees to work in the new conditions (and this applies to the entire hierarchical structure of the enterprise). To solve this problem, it is proposed to use methods of non-material motivation of employees, which are organically consistent with the Russian mentality and are indispensable in unstable economic conditions.

In the article, a special place is given to the mechanism of state support for the introduction of lean production at Russian enterprises, which is implemented through the national project "Labor Productivity and Employment Support" [17]. The operator of this national project was the autonomous non-profit organization "Federal Center of Competence" (FCC), which was established in 2017. The mission of this center is to improve the quality of goods and services, increase the competitiveness of the Russian economy and the labor productivity at enterprises. One of the main tasks is to train the personnel of Russian enterprises in lean production methods.

In addition, the article investigates positive experience of one of the first participants in this national project, JSC "Sredne-Volzhsky mechanical plant". The introduction of lean production has significantly affected the growth of labor productivity and increased revenue of this enterprise. The moral and psychological climate in the team has significantly improved. This company not only uses advanced foreign and domestic methods to improve production processes, but also successfully implements personnel training activities.

In general, we can say that the introduction of lean production at Russian enterprises, although it is associated with a number of difficulties, is still being implemented, as it is evidenced by the positive experience of domestic enterprises.

References

1. Abu, F., Gholami, H., Saman, M.Z.M., Zakuan, N., Streimikiene, D.: The implementation of lean manufacturing in the furniture industry: a review and analysis on the motives, barriers, challenges, and the applications. J. Clean. Prod. **234**, 660–680 (2019)
2. Cadden, T., Millar, K., Treacy, R., Humphreys, P.: The mediating influence of organisational cultural practices in successful lean management implementation. Int. J. Prod. Econ. (2020, in press). https://doi.org/10.1016/j.ijpe.2020.107744. Accessed 20 Apr 2020

3. Costa, L.B.M., Filho, M.G., Fredendall, L.D., Paredes, F.J.G.: Lean, six sigma and lean six sigma in the food industry: a systematic literature review. Trends Food Sci. Technol. **82**, 122–133 (2018)
4. Decree of the President of the Russian Federation No. 204 of May 7, 2018 "On national goals and strategic objectives for the development of the Russian Federation for the period up to 2024" (2020). http://www.consultant.ru/document/cons_doc_LAW_297432/. Accessed 15 Apr 2020
5. Henao, R., Sarache, W., Gómez, I.: Lean manufacturing and sustainable performance: trends and future challenges. J. Clean. Prod. **208**, 99–116 (2019)
6. Ilina, T.A.: The 5S system as the initial stage of implementing lean manufacturing in industrial enterprises. Bull. Samara Municipal Inst. Manag. **4**, 70–77 (2017)
7. Ivanov, O.B., Buchwald, E.M.: National project on labor productivity: the key to "economic breakthrough" for Russia. ETAP Econ. Theory Anal. Pract. **2**, 28–44 (2019)
8. Jimenez, G., Santos, G., Sá, J.C., Ricardo, S., Pulido, J., Pizarro, A., Hernández, H.: Improvement of productivity and quality in the value chain through lean manufacturing – a case study. Procedia Manuf. **41**, 882–889 (2019)
9. Khokhlova, T P., Nazaretian, P.V.: The legacy of Russian Taylor in modern management (to the 135th anniversary of the birth of A. K. Gastev). Manag. Russ. Abroad, **4**, 102–111 (2017)
10. Li, S., Fang, Y., Wu, X.: A systematic review of lean construction in Mainland China. J. Clean. Prod. **257**, 120581 (2020)
11. Makumbe, S., Hattingh, T., Plint, N., Esterhuizen, D.: Effectiveness of using Learning Factories to impart lean principles in mining employees. Procedia Manuf. **23**, 69–74 (2018)
12. Markova, N.A., Markov, D.A.: Motivation, training, and leadership in lean manufacturing. Bull. PNRPU Soc. Econ. Sci. **4**, 329–341 (2016)
13. Pearce, D., Dora, M., Wesana, J., Gellynck, X.: Determining factors driving sustainable performance through the application of lean management practices in horticultural primary production. J. Clean. Prod. **203**, 400–417 (2018)
14. Seifullina, A., Er, A., Nadeem, S.P., Garza-Reyes, J.A., Kumar, V.: A lean implementation framework for the mining industry. Ifac-Papersonline **51**(11), 1149–1154 (2018)
15. Solaimani, S., Sedighi, M.: Toward a holistic view on lean sustainable construction: a literature review. J. Clean. Prod. **248**, 119213 (2020)
16. Suetina, T.A., Rakhimova, G.S.: Improving the company's competitiveness through a lean manufacturing system. Russ. Entrepr. **15**(18), 72–80 (2014)
17. The passport of the national project "Labor productivity and employment support" was approved by the decision of the Presidium of the Council under the President of the Russian Federation for strategic development and national projects on December 24, 2018 (2018). http://government.ru/rugovclassifier/865/events/. Accessed 20 Apr 2020
18. Veres, C., Marian, L., Moica, S., Al-Akel, K.: Case study concerning 5S method impact in an automotive company. Procedia Manuf. **22**, 900–905 (2018)
19. Vukadinovic, S., Macuzic, I., Djapan, M., Milosevic, M.: Early management of human factors in lean industrial systems. Saf. Sci. **119**, 392–398 (2019)

Digitalization of Higher Legal Education in Russia in the Age of Covid-19

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Abstract. The study covers topical issues of digitalization of higher legal education in Russia. Even though the process of digital transformation of higher education (including law schools) was launched before the Covid-19 pandemic, it was the coronavirus that acted as a catalyst for digitalization of almost all spheres of public life. Universities were faced with the need to create a comfortable and high-quality digital information and educational environment as soon as possible, and many enterprises (including their legal departments) decided to switch for remote work due to the self-isolation regime, which triggered further digitalization of the legal profession. In turn, digitalization of the legal profession can affect the labor market, and, therefore, higher education, as universities must consider the needs of future employers. The authors applied both general methods and methodological techniques (analysis, synthesis, deduction, induction, etc.) and special legal methods (formal legal and comparative legal). While analyzing, the authors conclude that the potential digitalization of legal education is widespread, since it is not only about the use of digital technologies in education, but changing the content of legal education due to digital transformation of the legal profession.

Keywords: Covid-19 · Higher education · Legal education · Digital transformation · Distance education · Legal tech

1 Introduction

Currently, we are actively struggling with the spread of the new coronavirus infection Covid-19 all around the world. Since neither a vaccine nor a specific treatment for the coronavirus has been invented, the most effective measure is social distancing, and even complete self-isolation. In this regard, the governments of many states, including Russia, are taking unprecedented measures, such as the suspension of thousands of enterprises alongside with the transition of millions of workers around the world to remote work. Aware of all the risks of the spread of the infection, both the Ministry of Education of the Russian Federation and the Ministry of Science and Higher Education of the Russian Federation decided almost simultaneously to transfer schools and universities to distance learning [12, 13]. E.g., by the Order of the Ministry of Science and

Higher Education for universities (including law schools and faculties) the training should be provided exclusively in the electronic format.

Thus, all Russian universities were urgently required to improve or even create a digital environment to ensure a continuous and high-quality educational process. Even though the course for digitalization of the social sphere (including education) was set long before the coronavirus pandemic [3, 14], the issue of digitalization of Russian education has never been so acute.

Now two trends in digitalization of higher legal education can be outlined: 1) a more obvious one covers the change in the form of education in the Covid-19 era (a greater emphasis is made on distance learning by the use of digital technologies and computer software) and 2) a less noticeable one, but getting more weight in the future – a change in content, since digitalization affects all spheres of public life, including the legal profession, since the needs of the labor market are gradually changing, and hence the requirements for graduates of law schools and faculties will inevitably undergo transformation.

In the age of digitalization accelerated by Covid-19 outbreak, law schools and faculties faced some problems, both of formal (like retaining the familiar form of oral exams) and of substantive nature (changing shape of the legal profession itself and the role of lawyers in particular, including the steps universities should undertake so that graduate lawyers could remain in demand on the labor market). It makes perfect sense that such questions arise as they have already touched the legal community around the world: for example, in the USA there were difficulties with the format of the traditional exam to obtain a lawyer's licence (Bar Exam) [1].

The team of authors attempts to consider the possible digitalization vectors of higher legal education in Russia, considering the general trends towards digitalization of the economy and all spheres of public life (including digitalization of the legal profession and the popularization of legal tech). The authors consider digitalization of legal education in the following key areas: digitalization of the educational process; digitalization of student-university/student-teacher relations; the impact of digitalization of the legal profession on the labor market and, therefore, on legal education. It is important to study both the ways and processes of digitalization and the consequences of digitalization for higher legal education in Russia.

2   Methodology

For the purposes of analysis, the authors have raised the following main questions (related to Russian law schools and faculties):

- What are the features of digitalization of the educational process and what are the significant differences between distance learning and the learning process offline?
- How will digitalization of the legal profession affect the labor market and digitalization of legal education?

The purpose of this study is a comprehensive review of the process and the possible consequences of digitalization of higher legal education in Russia, including digitalization of the legal profession; assessment of the prospects of distance legal education,

considering digitalization of all spheres of public life. The results of this study can potentially be used while further studying digitalization of higher legal education in Russia.

The study is based on extensive normative, scientific, analytical and statistical material regarding digitalization of higher legal education as well as all spheres of public life and their impact on the legal profession. Research methods include both general methods and methodological techniques (analysis, synthesis, deduction, induction, abstraction, etc.), as well as special legal methods (formal legal and comparative legal). In the process of preparing the study, a significant amount of material was obtained from different legal research services, such as ConsultantPlus, Garant, Westlaw Academics.

3   Results

Despite the existing trend towards digitalization of practically all spheres of society, including education, in Russia, the coronavirus pandemic acted as a catalyst for digitalization and exposed all the problems in this area. Regarding digitalization of higher legal education and considering the questions posed in the study, the following was established.

3.1   The Features of Digitalization of the Educational Process and the Differences Between Distance Learning and the Learning Process in the Offline

When using digital educational platforms and appropriate technical equipment and software, most academic disciplines can be taught just the same way as in the offline. For example, according to the results of monitoring classes in digital remote format at MGIMO-University, it turned out that more than 99% of the classes were held in accordance with the timetable [8]. In fact, digitalization in this case is carried out through the use of digital technologies in education: the form of presentation of the material changes, but not the content itself (or such changes are not significant). Currently, Russian universities can choose necessary tools and software on their own and most often they use one of the following software products: Webinar, ZOOM, Microsoft Teams, Google Hangouts, Skype, Discord etc. At the same time, the issue of personal data security and confidentiality is especially relevant: for example, a lawsuit has already been filed against the ZOOM developer company in the USA based on an alleged disclosure of users' personal data, including recordings of teleconferences with their participation [2]. Despite the experience of leading universities, the overall situation in Russia shows that the digital infrastructure for science and education is still only at the initial stage of its formation [15].

The features of digital education are also reflected within the relationship between a teacher and students. Firstly, in the context of the digital organization of the educational process, it is getting even more difficult to objectively control the involvement of students within the educational process in class, and therefore the importance of such general cultural competence as the ability to self-organization and self-education

inevitably increases [11]. Secondly, the student's perception of the teacher is formed not through personal communication, but through communication within the digital environment. For this reason, the role of the so-called "Personal brand" of the teacher is getting very important, which, in turn, requires a lot of effort from the teacher. A personal brand can be created by using a personal website/an account in a social network, or even by participation in major scientific events, etc. A "brand-teacher" is recognizable and popular. He is trusted by students, the target audience understands his/her "depth" as a specialist, expert [7].

3.2 The Impact of Digitalization of the Legal Profession on the Labor Market and on Digitalization of Legal Education

Nowadays (partially because of the Covid-19 pandemic and the respective need to switch to a remote mode of work), legal technologies (Legal Tech) are actively developing, and it significantly changes the qualitative approach of lawyers to work [6]. In this context, Legal Tech refers to platforms, IT services, and software that first made law firms and lawyers more efficient in performing their activities [22]. Lawyers tend to use more smart contracts instead of regular ones. Smart contracts, being in fact a computer program, are contracts that self-execute once the parties meet agreed-upon conditions [9]. The development of blockchain technology has also affected the legal profession, by both influencing smart contracts based on distributed ledger technology [23] and the development of cryptocurrencies. As of today, the legal status of smart contracts and cryptocurrencies is not legally defined in Russia, but we believe that this is just a matter of time: at present, several bills on digital financial assets are known [18].

Students of the International Law Faculty of MGIMO-University are taught the following legal tech competencies within the framework of the practical course "Legal Technique": 1) be able to work with the State Automated System of the Russian Federation "Justice" (SAS Justice); 2) have the skill to compile legal documents in electronic form and to carry out professional activities through "My Arbiter" tool and other electronic applications and/or official websites of government bodies; 3) be able to use electronic databases providing information about unfair counterparties; 4) be able to work with domestic and foreign legal research services like ConsultantPlus, Garant, Westlaw Academics; 5) know the basics of using Russian and foreign lawbots.

4 Discussion

Some experts believe that the essence of the legal profession has irrevocably changed: most of the work can be automated and performed by robots [17], clients want more services for less money, and legal services cease to be a unique product. In this case, there is only one way out: to learn to provide more services at lower costs, which means that it is necessary to attract new technologies to the profession [20, 21]. In this regard, expert opinions are being actively expressed on the need to adjust the curriculum at law schools in terms of introducing such subjects as, for example, coding for lawyers [4]. Nevertheless, the Russian state educational standards consider digitalization of the legal profession only in its most general form: for example, the already

mentioned educational standard for undergraduate studies states that a Bachelor of Laws must be well-aware of the basic methods and means of obtaining, storing, processing information and must be able to work with information in global computer networks. In recent years, the labor market has already begun to require graduates to consider digitalization [10]: it is now important for successful employment to be able to work professionally with legal research services, fill out and file documents in electronic form (for example, with tax authorities and courts), hold client webinars and business conference calls with clients, etc. Thus, it has been established that digitalization of the legal profession directly affects the labor market. For universities, in turn, one of the key performance indicators is the employment of graduates [5]. For this reason, the issue of the timely development of new skills among future lawyers is extremely important. Given the transition to remote work for lawyers and remote training for students, one can assume an increase in the growth rates of digitalization: it is believed that up to one third of office workers can permanently remain on a remote mode of work after the end of the pandemic [16], and digital transformation before the pandemic was considered as a measure to reduce transaction costs by large companies [19]. According to the authors, under such conditions, the need for digitalization of legal education, especially by adjusting the curriculum, will increase.

5 Conclusion

To sum up, there is an increasing trend in digitalization of higher legal education, which has begun before the Covid-19 pandemic. The pandemic is a mere catalyst for the digital transformation process. Now, for the absence of any alternatives to offline learning, law schools are forced to adapt to new conditions as quickly as possible and create/improve a digital educational environment. However, potential digitalization of legal education is much larger, since it is not only about the use of digital technologies in education, but changing the very content of legal education, considering digital transformation of the legal profession. These changes are not on the surface, but new trends in labor market conditions will gradually bring changes into the educational process.

References

1. Angelos, C., Berman, S., Bilek, M.L., Chomsky, C.L., Curcio, A.A., Griggs, M., Howarth, J.W., Kaufman, E.R., Merritt, D.J., Salkin, P., Wegner, J.W.: The bar exam and the COVID-19 pandemic: the need for immediate action. Ohio State Public Law Working Paper, 537 (2020). https://ssrn.com/abstract=3559060. Accessed 20 Apr 2020
2. Blumberg: Zoom sued for fraud over privacy, security flaws (2020). https://www.bloomberg.com/news/articles/2020-04-08/zoom-sued-for-securities-fraud-over-privacy-security-flaws. Accessed 20 Apr 2020
3. Decree of the President of Russia No. 204 dated 05.05/2018 "On National Goals and Strategic Objectives of the Development of the Russian Federation for the Period Until 2024". http://kremlin.ru/acts/bank/43027. Accessed 20 Apr 2020

4. Fenwick, M., Kaal, W.A., Vermeulen, E.P.M.: Legal education in a digital age. In: Corrales Compagnucci, M., Forgó, N., Kono, T., Teramoto, S., Vermeulen, E. (eds.) Legal Tech and the New Sharing Economy. Perspectives in Law, Business and Innovation, pp. 1–31. Springer, Singapore (2020)

5. Gadzhiev, G.M., Ramazanov, S.A., Maithanova, K.D.: Employment of graduates as an indicator of the effectiveness of the educational environment. News of the Dagestan State Pedagogical University. Psychol. Pedagogical Sci. **1**(30), 51–56 (2015)

6. Law Technology Today: AI trends driving the legal industry (2018). https://www.lawtechnologytoday.org/2018/03/ai-trends/. Accessed 20 Apr 2020

7. Mantulenko, V.V., Yashina, E.Z., Ashmarina, S.I.: Personal brand of university teachers in the digital age. In: Ashmarina, S., Vochozka, M., Mantulenko, V. (eds.) Digital Age: Chances, Challenges and Future. Lecture Notes in Networks and Systems, vol. 84, pp. 62–70. Springer, Cham (2020)

8. MGIMO: Distance learning continues: statistics of classes (2020). https://mgimo.ru/about/news/main/distant-11-04/. Accessed 20 Apr 2020

9. Morgan, N.T.: Blockchain challenges traditional contract law: Just how smart are smart contracts? Wyoming Law Rev. **19**(1), 87–117 (2019)

10. Online Edition of the Clerk: TOP 10 key lawyer skills (2020). https://www.klerk.ru/law/articles/466818/. Accessed 20 Apr 2020

11. Order of the Ministry of Education and Science of Russia No. 1511 dated 01.12.2016 (as amended on 11.01.2018) "On the Approval of the Federal State Educational Standard of Higher Education in Training 40.03.01 Jurisprudence (undergraduate level)". http://base.garant.ru/71579274/. Accessed 20 Apr 2020

12. Order of the Ministry of Education of the Russian Federation No. 104 dated March 17, 2020 "On the Organization of Educational Activities in Organizations Implementing Educational Programs for Primary, Basic, General and Secondary General Education, Educational Programs for Secondary Vocational Education, Corresponding Additional Professional Education, and Additional General Educational Programs, in the Context of the Spread of the New Coronavirus Infection in the Territory of the Russian Federation". https://www.garant.ru/products/ipo/prime/doc/73679183/. Accessed 20 Apr 2020

13. Order of the Ministry of Science and Higher Education of the Russian Federation No. 397 dated March 14, 2020 "On the Organization of Educational Activities in Organizations Implementing Educational Programs of Higher Education and Relevant Additional Professional Programs, in the Event of the Prevention of the Spread of the New Coronavirus Infection in the Territory of the Russian Federation". https://www.garant.ru/products/ipo/prime/doc/73645128/. Accessed 20 Apr 2020

14. Passport of the national project "National Program "Digital Economy of the Russian Federation" (approved by the Presidium of the Presidential Council for Strategic Development and National Projects, Minutes dated 04.06.2019 N 7). https://legalacts.ru/doc/pasport-natsionalnogo-proekta-natsionalnaja-programma-tsifrovaja-ekonomika-rossiiskoi-federatsii/. Accessed 20 Apr 2020

15. Pogorelova, E.V., Efimova, T.B.: Digital transformation of education, science and innovations. In: Ashmarina, S., Vochozka, M., Mantulenko, V. (eds.) Digital Age: Chances, Challenges and Future. Lecture Notes in Networks and Systems, vol. 84, pp. 54–61. Springer, Cham (2020)

16. RBC: The viral revolution: How the pandemic will change our world (2020). https://www.rbc.ru/opinions/society/27/03/2020/5e7cd7799a79471ed230b774. Accessed 20 Apr 2020

17. Remus, D., Levy, F.S.: Can robots be lawyers? Computers, Lawyers, and the Practice of Law (2016). https://ssrn.com/abstract=2701092. Accessed 20 Apr 2020

18. Sidorenko, E.L., Khisamova, Z.I.: Legal regulation of the digital assets market: advantages and possible risks of an alternative bill. Bank. Serv. **11**, 20–23 (2018)
19. Sidorenko, E.L., Khisamova, Z.I.: The readiness of the economy for digitalization: basic methodological approaches. In: Ashmarina, S., Vochozka, M., Mantulenko, V. (eds.) Digital Age: Chances, Challenges and Future. Lecture Notes in Networks and Systems, vol. 84, pp. 308–316. Springer, Cham (2020)
20. Susskind, R.: The End of Lawyers? Rethinking of Nature of Legal Services (Revised Edition). Oxford University Press, Oxford (2010)
21. Susskind, R., Susskind, D.: The Future of the Professions: How Technology will Transform the Work of Human Experts. Oxford University Press, Oxford (2016)
22. Vermeulen, E.P.M.: The future of law, lawyers and law professors…And the exponential growth of disruptive technology. Medium: Chatbots Life (2017). https://chatbotslife.com/the-future-of-law-lawyers-and-law-professors-and-the-exponential-growth-of-disruptive-technology-b5c979608c9c. Accessed 20 Apr 2020
23. Werbach, K., Cornell, N.: Contracts ex machina. Duke Law J. **67**(2), 313–382 (2017)

Digitalization in Activities of Non-state Actors: Example of the Church

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Abstract. This study considers the role of digitalization in activities of religious institutions using the example of the Roman Catholic Church. The digital innovations undertaken by the Holy See and their results are being studied. The analysis revealed the intense impact of digitalization on approaches of the RCC with the world community, namely the opportunities expanded that allowed the Holy See to strengthen the efficiency of its own ideas. It is noted that digitalization processes have acquired special significance for the church during the coronavirus pandemic in 2020, when traditional formats for the implementation of political aspirations were not available. Thus, digitalization contributes to the fact that even the church, being oriented towards traditionalism and keeping the fundamental principles in its activity, successfully uses digitalization as an instrument of adaptation to modern social changes in society.

Keywords: Digitalization · Holy See · Non-state actors · Roman Catholic Church · Vatican

1 Introduction

Like any social revolution, digitalization has a significant impact on activities of non-state actors in international relations, for example, religious institutions. The authors' choice of the church as an example to consider the impact of digitalization is due to the desire to demonstrate that activities of even the most "conservative" actors in international relations did not escape the impact of the "knowledge economy", but rather gave it new opportunities. If we turn to the history of the issue, the emergence of monotheism would have been unthinkable without the invention of writing, and the birth of Protestantism would have been impossible without the emergence of a set through moving letters. In turn, digitalization can lead to a new religious way of life, possibly even to the formation of new religions [13].

Digitalization leads to a gradual decrease in the distance between people and groups - this leads to a gradual but inexorable devaluation of the material component in many

areas of human existence, primarily in the field of information exchange. Now, not only the human voice has received a digital dimension, but the phones through which it is transmitted are becoming less common in the form of an analog gadget. Not only communication devices, but also all traditional means of culture have been digitized. A paper book is becoming increasingly rare, as is a vinyl record for sound reproduction, and in the cinema, where digital technologies are increasingly used, real actors are less featured [8].

But this devaluation of the material and the increasing role of numbers have affected other social areas [7]. Not only books and informational materials are converted into digital form, but such universal human notions, friendship, and even love are gradually being taking into the digital sphere. Thus, the concept of "friendship" from a real relationship between people turns into a banal connection between two accounts registered in a social network. Of course, these trends are widely used by NGOs and public institutions to digitalize their activities in those areas where this is appropriate.

2   Methodology

The authors determined the methods considering the purposes and objectives of the study in the format of the interdisciplinary approach, involving the use of historical and political science research principles in a comprehensive manner. The study is dominated by qualitative and quantitative content analyzes. The qualitative research methods are mostly based on documentary research, scientific articles and analyses. The objective is to understand opinions, perceptions and activities of the Roman Catholic church implementing digitalization. Quantitative methods proved to be especially useful while analyzing the church's activity on online platforms.

3   Results

Active digitalization of its resources is carried out by the Roman Catholic Church, represented in international relations by the state called the Holy See. The Holy See, due to its unique legal personality (a combination of both state and religious components), at the present stage develops foreign policy and diplomacy, making maximum use of all types of influence at the religious level: activates forms of communication alternative to official diplomacy, uses a flexible approach to changing conditions of international relations.

It must be understood that the term "Holy See" combines two entities – religious and political. Religious is the Roman Catholic church, with its extensive network of dioceses around the world. Political is the State Secretariat, which conducts the country's foreign policy through the Second Section on Relations with States and some nunciatures and papal representations abroad. Both institutions are directly subordinate to the Pontiff. The city-state of the Vatican, on the territory of which the administrative buildings of the Secretariat are located, in turn, stands as a separate formation under the management of a special body – the Governorate with the Chairman at the head [6].

The Holy See is actively updating its public diplomacy, making it more inclusive, open to all, rebranding the Roman Catholic Church. The Pope pursues this policy gradually and imperceptibly: using existing methods and internal resources, redistributing functions. Solving the problem of reducing the number of believers and parishioners, the Pope does not tighten politics, but is looking for reasonable ways, meets principles which are contrary to some canonical ones, and incidentally it is confronted by certain religious and public circles.

As part of informatization of its resources, the Holy See launched a site that is visited by more than 0.5 billion people, Pope Francis has launched his pages on social networks Facebook, Twitter and Instagram. More than 1 million users subscribed to the Pontiff's Instagram account within 12 h after its launch. The most popular pontiff account is on Twitter in different languages. The number of subscribers to the English version is 18.3 million, plus 17.6 million subscribers to the Spanish version, 4.9 million – Italian, 4.5 million – Portuguese, 1.4 million – French, almost 1 million – Latin, and about 500 thousand – Arabic. Thus, the total number of followers of the Roman First Hierarch on Twitter reaches about 50 million people. This is almost 10 times more than that of French President E. Macron (4.9 million) and almost 100 times more than that of Italian Prime Minister J. Conte (525.4 thousand). Appeals that the Pope addresses every Sunday flock, broadcast on all information channels of the Holy See. These appeals are an effective tool for soft power.

According to a 3RDPlace study [11], the number of Pope Francis searches on Google reached 1.737.300 per month. In 2013, it was one of the most requested on the network (more than 49 million references) and fell in line with V. Putin, B. Obama and A. Merkel.

Pontiff's Twitter account (in different languages) with publication statistics of 0.79 per day shows an average engagement level of 6.637. For comparison, Barack Obama's account, according to the study, has an average engagement level of 2.309, despite the statistics of daily publication of 7.76 tweets per day. This feature is explained by the fact that Obama's account is focused on delivering his own political idea, and the Pope uses social networks to communicate with believers and to develop the concept of a universal church.

The Vatican has always communicated using the latest technology. In 1989, the Vatican's press service installed 40 of the most modern computers at that time. Since 1991, the Vatican began to actively use programs and services (WORM, SEDOC), which contribute to more active and high-quality dissemination of information in a format convenient for recipients. In 1992, a special DEI system was created through which all the messages of the Pope are transmitted [5]. Thus, throughout the 90 s, the Vatican did everything possible so as not to remain in the "backyard" of new technologies and to "keep up with the faithful". In the mid-90 s, the Vatican did not have its own website. However, all the important events of the Catholic Church (Christmas masses, solemn blessed papal blessings of Urbi et Orbi) were broadcast through the services of the French satellite operator Eutelsat and the British WRN Broadcast. Pope John Paul II addressed believers during the genocide in Rwanda in 1994 and the conflict in Kosovo in 1999. For five and a half months, the Vatican Radio broadcast Albanian programs for the people of Kosovo with calls for peace and solidarity, as well as regularly updated information about the victims of the conflict for people who have

lost their loved ones. John Paul II considered the technological development of modern media to be an advantage for humanity [2]. As you know, pontiffs pay special attention to digital diplomacy in the acute phases of crises and conflicts, which often Italian authors call "direct dialogue with the disadvantaged". So, during the Apostolic visit of Pope Francis to the United States in September 2015, the Vatican Television Center, together with the American television channel ABC, released a program in which American and Cuban young people could discuss various topics relevant to them. This was another stage at normalization of public relations between the two countries after the establishment of diplomatic dialogue.

On March 30, 1997 the Vatican launched its own official website www.vatican.va. According to the former head of the Pontifical Council for Mass Communications, Claudio Maria Celli, the Vatican's activities in the Network space have become "a continuation of the Pope's pastoral mission" and, accordingly, his digital diplomacy. The Vatican is closely following new trends in technology and does not stand aside: in 1999, on the eve of the Jubilee Year, Sony and the Vatican City launched a large-scale project, AbbaPater, in which 11 tracks were recorded combining music and the voice of John Paul II, in five languages. The media of the Vatican worked vividly and effectively in 2000, when the Vatican media was tasked with the most intensive and round-the-clock broadcasting of anniversary events, acquainting the public (not only the Catholic, but the entire world community) with the goals of the Holy See in the new millennium.

On January 28, 2013, in Rome, at the conference "The Future of Communication is Responsibility" (Rome, January 28, 2013), a study by Eurisko was presented under the auspices of the Pontifical Council for Mass Communications, which aimed to determine the potential of Catholic media that expand and implement new principles of work, based on the following criteria: seriousness, accuracy, firm position, clarity of criteria and logic. According to the results of the study, being Catholic is becoming popular, which means participating in the universal "right" mission [3].

In the framework of this area, a policy is being developed to reorganize the activities of the Holy See mass media, which resulted in the creation of a unified information network Aleteia. This reform has yielded results – more than 67 million Catholics from the USA, Great Britain and Ireland have already been on the social network [11]. Aleteia is the first worldwide Catholic information network under the auspices of the Pontifical Commission on Mass Communications, which discusses issues of life, faith and society in 6 languages (English, Spanish, French, Portuguese and Arabic). According to the agency, more than 1300 are participating in its work. Catholic partners and more than 800 experts preparing materials. In addition, in the very near future it is planned to launch a new electronic resource, Dot.catholic, which will become the main electronic platform, uniting all the marked churches and dioceses of the Roman Catholic Church.

From the point of view of the Vatican, the church is called to be where there are people. Since now the entire electronic network also consists of people, there should be a church there. The Pope calls not to be afraid to become full-fledged "citizens" of the 21st century information society. It is important to note that Francis puts a special meaning in the concept of "citizen" in his messages, bearing in mind that being so means commitment and the desire to create a common good for society [12]. In his

opinion, modern digital technologies have given impetus to the creation of a completely new social space within which it is possible to build such connections that will have an impact on societies and their culture. Thus, the Pontiff raises the question of relations between the church and society, which are regulated at different levels, the most important of which, in his opinion, is the global Internet. He gives him central importance in building a new type of relationship between believers and representatives of secular society. With his call for active participation in digital contacts, he paves the way for building such a dialogue. This model of behavior of the Catholic Church is rooted in history. At the time when society was moving from verbal to written communication, the Church was the first to use a new type of communication. Thus, its written appeals acquired importance, and even holiness. The same attitude was won by their authors. So now the Catholic Church is striving to be the first to apply new forms of communication in the digital space for the effective implementation of its policy.

The rapid development of digitalization of the Roman Catholic Church is due to the orientation of young believers. It is no coincidence that the XV General Assembly of the Synod of Bishops, which was held in the Vatican in October 2018, was dedicated to the theme "Youth, Faith, and Recognition of Callings". The work of the synod was not only accompanied by official comments of the Vatican, but was also tracked and posted on social networks by the faithful Catholics: 1,400 tweets marked with the official hashtag "# Synod2018" in six different languages published by the Vatican News and Vatican Radio channels, with 100 000 reposts on Twitter, 10 million users following the event on Facebook, 650 thousand views on Instagram [14]. In total, five hundred different full-fledged materials were posted on social networks, including publications, articles, images and videos. And 50 million people all over the world noted a message on Twitter by Pope Francis on the Synod and published on October 24, in which the Pontiff explained in nine languages that "this Synod should become a symbol of the Church that can listen, a church that does not always have ready Answers". These statistics are published by the Secretariat for Communications as a report on the activities of the Vatican in social networks and on the activities of the Synod on Youth Issues.

During the Synod, participants were presented a study conducted by the Catholic information network Aleteia in collaboration with St Mary's University in London and Ramon Lull University in Barcelona, which analyzed Facebook and Instagram accounts of 540 million people around the world – representatives of young people aged 18 to 25 years who used social networks to search for information on religious issues. Among the most mentioned queries – the primacy was given to the figure of the Pontiff – Pope Francis.

The results of the study showed that only 4% of young people share content related to Catholicism in social networks. This share is much less than the number of those who use the Internet to search for branded items and consumer goods. However, it was noted that young people who are interested in religion have a higher level of education. The overall picture was approximately as follows: 5 million young people are interested in the issues of faith in Brazil, 2 million are registered in the Philippines, 1 million in India, and 700 thousand young people in Italy, and a smaller number were recorded in other countries.

When considering digitalization of religion and the Roman Catholic Church, the Catholic world was divided into two camps on social networks, as well as in real life – the so-called "liberals" who support the reforms of Pope Francis, and the "conservatives" who they do not approve of his innovations and are grouped around several cardinal oppositionists. One of the most prominent representatives of the latter is Cardinal Raymond Leo Burke, who is considered the leader of the traditionalist wing of the church. However, when typing the hashtag #cardinalburke in any search service, you can easily find the full chronicle of the life of the prelate, published by different users from all over the world, and see that it is very popular.

At the same time, digitalization is not only an instrument of the internal polemics of the church, it is an important element in the spread of dogma around the world. Earlier the Congregation for the Doctrine of the Faith (the current Congregation of Evangelization) sent missionaries to different parts of the globe, now it can be done through online resources [10]. In any case, online sites that unite Catholics on Skype or other instant messengers regularly publish new services for Catholics: for example, a specially created application for the DinDonDan smartphone, which allows you to find the closest mass to the user's location, as well as get the current working hours of temples and service schedules.

The next striking achievement of Catholic digitalization was the development of electronic beads "Click to Pray eRosar"". An interactive cross is placed in the center of the device (the cost of which does not exceed 100 euros), which stores the technological data of the connected application on the smartphone. This device was created to assist believers in prayer [9].

The application that ensures the operation of the gadget is very easy to use: after activation, it allows you to access audio guides, exclusive images and personalized content, depending on the type of rosary chosen (there are thematic collections of prayers for young people, the elderly, for migrants and refugees, etc.). The Click to Pray eRosary application was completely "launched" by the Vatican. According to Frederic Fornos, head of the Pope's Worldwide Prayer Network website (Rete Mondiale di Preghiera del Papa), "the challenge is to offer the world one of the millennia-old spiritual traditions of the Church through the best of modern technology," always with a focus on acquiring new and supporting the youngest believers. After creating the "DinDonDan" application (Android and Apple), the Roman Catholic Church received the "Church 2.0" feature in the media, and the appearance of "Click to Pray eRosary" "updated" the religious institute in Italian media to version 3.0.

4   Discussion

Digitalization of the church played a role in the crisis that took place in the world; it turned out to be prepared for isolation caused by the coronavirus. RCC broadcasts not only the Holy Mass, which is served by Pope Francis every day, but also many other priests. All broadcasts are live thanks to the Tv2000 Vatican TV channel, which completely changed its schedule during the day, offering people, in addition to news about the coronavirus infection, all the necessary programs about spiritual life.

In conditions of self-isolation, the possibilities for leading a spiritual life for believers became even more increased. This is because 10 years ago, the Conference of Bishops of Italy (CEI) began to actively develop a project called the "Digital Shepherd". Between 2009 and 2011, CEI organized four national conferences to push the Italian dioceses and Catholic media to make more active use of the digital platform. The conference data already received the following names: "Church on the Web 2.0" (2009), "Digital Certificate" (2010), "Diocese on the Web" (2010) and "Digital Residents" (2011). At that time, Don Domenico Pompili, who was firmly convinced in the choice of digital language as a new tool for evangelization and dissemination of Catholic culture, was the director of the National Service for Social Communication of CEI. Today, D. Pompili is a bishop and it is no coincidence that he belongs to the circle of proxies of Pope Francis. The site of his diocese is an example of the spread of the Christian faith over the Internet. The materials of the electronic resource called "Faith Clings to the Network" (developed by D. Pompili) contain information on dozens of social initiatives of parish priests, laity and Catholic educators.

Thus, digital investments made by CEI from 2009 to 2011 are bearing fruit. The diocesan sites of the Roman Catholic Church that have arisen in recent years provide opportunities for streaming divine liturgies performed by bishops, as well as many other religious events. In the same way, there is an extensive network of Catholic weekly newspapers that work full time and guarantee online support for believers informing them about the activities of the parish/diocese and enable people to participate in the spiritual life of church communities in a timely manner.

At the same time, the idea of digitalization belongs not only to the Roman Curia and to the staff of the respective church institutions. Digitalization initiatives are supported by simple priests and laity. For example, Don Paolo Padrini (diocese of Torton) is one of the first Italian priests to be engaged in digital shepherding: every day he sends WhatsApp to his endless list of friends, links to the live broadcast of the mass on the Youtube channel from the episcopate's chapel Tortona.

Don Alessandro Di Medio, the parish priest of San Francesco Saverio in Garbatella, is well known in Rome for his "innovative pastoral ways", thanks to which young people from 19 to 29 years old can go through the daily "spiritual route for thought" during Lent through the Sir website (informational CEI agency). Also, in Rome, Father Roberto Cassano, the parish priest of São Paulo della Croce in Corvial, did not want his believers to forget about the liturgy, so he broadcasts the mass via Facebook. He also activated a chat for believers in WhatsApp and prepared an app for the parish, where every parishioner can find comments on gospel, prayers, fundraising announcements for charity, in times of crisis.

Parish priest initiatives are being reported throughout Italy, especially regarding maintaining relations with their communities. "There are many masses on the net, but for each of us it is of great importance," prelates remark, "if we conduct them specifically for our parishioners". In addition, any church, for example the Roman Catholic Church, has a significant archive. The Vatican Archive is a valuable repository of documents of interest to historians from around the world. Following current trends, the Holy See began to translate and archive activities in digital format.

The process of archiving all editorial documents, now in a multimedia format, will allow you to access the documents, as well as make their full digitization and

preservation. In addition, the media will also include media inherited from other organizations that are part of the Holy See Communications Department. Starting from 2019, materials are acquired and gradually digitized, to become publicly available to scientific community.

The Vatican Archive is the central archive of the Holy See, where all documents relating to the state and pastoral activities of the Pontiff and the activities of the Holy See are stored. The documents limited to specific periods are available for review by qualified researchers upon written application and submission from the accredited historical research institute [1]. The documentary heritage stored in its vast collections covers a chronological period of about twelve centuries (VIII–XX centuries) and consists of more than 600 archival collections. Although it is not the largest archive in the world in number, it is the largest in the world in geography of coverage – all continents and all states where the Catholic Church is present.

5   Conclusion

The Roman Catholic Church is an example of a traditional religious institution that, despite two major stages of reformation - the First and Second Vatican Councils, has changed many principles, but has not abandoned the fundamental doctrine of Christian doctrine [4]. Traditional religious institutions that adhere to this doctrine cannot fully transfer their activities to online mode. That is why the sacraments of the church, such as confession and communion, will always remain inaccessible to the digital format. However, in cases where this seems possible, the church actively and successfully applies the achievements of digitalization, which is a positive example of adaptation to modern social changes in society. The presence of such an approach allows a religious institution (as, indeed, any other actor in public life) to exist and strengthen its position in the present with a view to the future.

References

1. Albertoni, M.: Vendetta and career: Nunzio Decio Francesco Vitelli and Ferrante Pallavicino. Hypotheses and Documents Originating from the Secret Vatican Archive. Studi Secenteschi **59**, 195–223 (2018)
2. Anyidoho, P.: Pope John Paul II and contemporary media. Integrating understanding of media in culture. Compass Rev. Top. Theol. **50**(2), 6–8 (2016)
3. Ballardini, B.: Leader come Francesco. Piemme, Milano (2014)
4. Barnebeck, T., Peter, A., Jensen, S.: Preaching democracy: the second vatican council and the third wave. J. Comp. Econ. **47**(3), 525–540 (2019)
5. Bea, F., De Carolis, A.: Ottant'anni della Radio del Papa (T. I, II). Città del Vaticano: Libreria Editrice Vaticana (2011)
6. Borrelli, M.: "To show concern": Early coverage of John Paul II, Benedict XVI, and Francis in the American National News Media. Palgrave Studies in Religion Politics and Policy, Las Vegas (2018)
7. Carlton, N.: Digital culture and art therapy. Arts Psychother. **41**(1), 41–45 (2014)

8. Carolyn, H.: The Multimediated Rhetoric of the Internet: Digital Fusion. Routledge, New York (2014)
9. Click to Pray: Click to pray erosary: New smart rosary to pray for peace in the world (2019). https://clicktopray.org/click-to-pray-erosary-the-new-smart-rosary-to-pray-for-peace-in-the-world/. Accessed 02 Apr 2020
10. Gesiak, L.: Reform of the Vatican media, a difficult search for a new path. Person Challenges J. Theol. Educ. Canon Law Soc. Stud. Inspired Pope John Paul II **7**(2), 5–22 (2017)
11. La Vita del Popolo: La rete ama Papa Francesco: Il Pontefice "personaggio dell'anno" anche online (2020). https://www.lavitadelpopolo.it/Chiesa/La-rete-ama-papa-Francesco-il-pontefice-personaggio-dell-anno-anche-online. Accessed 02 Apr 2020
12. Regan, E.: The Bergoglian principles: pope Francis' dialectical approach to political theology. Religions **10**(12), 1–16 (2019)
13. Serres, M.: Hermes: Literature, Science, Philosophy. The Johns Hopkins University Press, Baltimore (1983)
14. Synod18: Conferenza Stampa di presentazione della XV Assemblea Generale Ordinaria del Sinodo dei Vescovi I giovani, la fede e il discernimento vocazionale (2018). https://press.vatican.va/content/salastampa/it/bollettino/pubblico/2018/10/01/0711/01519.html. Accessed 02 Apr 2020

Legal Regulation of Digital Platforms: Reference Points of Modern Legislation

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Abstract. The paper analyzes the current state of Russian and foreign legislation regarding the regulation of digital platforms. The study is based on the differentiation of platforms according to the area of their activities and the main functional tasks. But at the same time, the authors insist on common reference points in the legal regulation of different platforms. Their analysis allows not only to assess the quality and completeness of legal regulation, but also to formulate a number of proposals for improving the current legislation. To the reference points of the rights of digital platforms the authors refer the following ones: the legal status of the platforms, the contractual basis of their activities, the responsibility of the parties for inappropriate goods (services), labor relations with employees of digital platforms, etc. These issues are considered in the article with reference to current legislation and modern judicial practice.

Keywords: Digital platforms · Digital platforms' right · Contract · User agreement · Legal status · Consumers

1 Introduction

The effectiveness of today's digital economy is directly connected with the development of digital platforms. In the Report on Digital Economy at United Nations Conference on Trade (UNCTAD) in 2019, "over the past decade, many digital business models emerged transforming key industries. In 2017, the aggregate value of platform-based companies with a market capitalization of more than $ 100 million exceeded an estimated $ 7 trillion, up 67% from 2015. Some global digital platforms gained very strong market positions in certain segments." As an example, UNCTAD specialists cite examples of giant platforms that became first on search engine market (Google company), online sales (Amazon and Alibaba companies), payments via cellular networks (Alipay), etc.

A set of factors provides the basis for the economic success of platform solutions:

– platforms create a digital market infrastructure, providing the user with necessary digital services and facilitating interaction with contractors,

– consumer engagement is carried out through multi-channel marketing, as a rule, in narrow segments and niches,
– if the growth is higher, Metclough's law comes into force (the value of the network for its participants is in direct quadratic dependence on their number),
– platform economy is based on the collection and analysis of big data, that generates forecast demand at first, and then manage it.

The marketing relies on the following principle: as the platform's sales increase, users' costs related to the transition to competing providers increase significantly. Thus, the market monopolizes taking over competing platforms. International organizations highlight the high dynamics of digital platforms' development mainly in the areas of operational and innovative solutions, they express concern about the insufficient elaboration of legal issues for their functioning. In particular, there are disputes regarding the definition of jurisdiction in relation to multinational companies, as well as fixing the legal status of platforms, an algorithm for the responsibility of the company and its customers for goods or services of inadequate quality, etc. Solving these issues requires specialists to give a competent answer to the question if modern law can satisfy current needs of the platform economy or if there should be new legal constructions that reflect economic and technical features of digital platforms.

2   Methodology

The methodological basis of the research is the system of general scientific and special cognition methods of legal phenomena. The authors used historical, comparative legal, formal-logical and system-structural research methods. For complex and reliable analysis, the logical-legal and statistical methods are also used. Conclusions regarding the prospects for the legal regulation of digital platforms are based on forecasting and modeling methods. The methods of analogy and sampling of the maximum similarity assume considering digital platform as a theoretical construction of legal relations and offer solutions in a similar way with related legal phenomena and institutions.

3   Results

During the study, differentiation of platforms is carried out depending on what kind of legal relations are between users; the most important legal issues related to platform's status, applicable law, regulation of labor relations between the platform and its employees are identified. The legal status of digital platforms is researched via corporate regulation and consumer protection.

Applying systematic analysis of general and applied issues of legal regulation of digital platforms, the authors offer a number of recommendations on the development of legal parameters and protection of user rights. Emphasizing the importance of legal regulation of digital platforms, World Bank experts identify four blocks of legal issues:

- antitrust regulation: the World Bank proposes either to recognize them as natural monopolies with a limit on their income, or to establish an obligation to share customer data with new market participants, partially equalizing their chances;
- licensing: there is possibility of introducing licensing or certification requirements which are common for services provided by traditional participants and for platforms (such as taxis or rental housing). At the same time, licensing standards should be specified for people providing payment services on the platform to ensure high speed of payments, and their security;
- taxation. Accounting the specifics of the platforms, several taxation models are proposed: tax on the users' number, on data collected from citizens, treating this information as a valuable resource;
- protection of personal information. The directions of this regulation can be divided into 1) owners rights' of personal data; 2) cross-border movement of data; 3) data protection regulations.

Taking into account the fact that now developed and developing countries use opposite approaches to regulating digital platforms (the first ones restrict data exchange, the second ones, on the contrary, stimulate market openness), the World Bank supports "sensible middle": stimulating transnational exchange through establishing the optimal legal restrictions so that digital platforms can function safely.

In Europe, there is no solution if the framework for legal regulation of digital platforms should be created at the level of the European Union or individual states [32]. Nevertheless, experts of the European Commission identify 5 main areas and ways of possible future regulation of the platform economy at the European level:

- licensing and other restrictions on market entry;
- detailed legislation on the regulation of labor relations at the level of individual countries;
- establishing basic requirements for the protection of consumer rights, protection of copyright and personal data at the European Union level;
- data laws: legal regulation of data transfer between digital platforms is necessary; access mode to authorities' data, use of open data received from authorities; as well establishing new copyright regimes for text and data mining [32].

According to experts of the commission antitrust and tax law, it doesn't impede the development of digital platforms, although they need additional elaboration in new reporting forms. It is essential that the European Union obliges digital platforms to collect VAT on sales, and this practice is recognized by OECD exports as effective [25, 26]. OECD highlights the main activities of digital platforms, they are now related with the services' providing, making payments or searching for information. The Organization considers the protection of consumer rights as the main task of developing the law of digital platforms.

OECD developed the basic principles for protecting users of digital platforms: fair business and advertising, the same as in usual trade; transparency of contracts and transactions; simple and convenient payment methods; clear client's consent to the transaction; ensuring information security and customer confidentiality, product safety; effective dispute resolution mechanism within the platform [24].

Determining principles and priority areas of legal regulation suggested by international organizations seems to be welcomed. However, the proposed program is quite abstract and can be considered as a guide when answering a number of key questions related to the platforms' operation.

First of all, digital platforms differ from each other in their functionality.

UNCTAD experts suggest highlighting operational and innovative platforms [36]. Depending on the activity area, the level of information processing and the main beneficiary, instrumental, infrastructural and applied digital platforms are distinguished [28].

The European Commission suggests distinguishing the following types of crowdfunding digital platforms: donation crowdfunding, reward or pre-payment crowdfunding, crowdfunding lending, equity crowdfunding [15]. In addition, the platform is proposed to be divided by functionality into operational, innovative, aggregated and social, by scale into global, regional and national [17].

Accounting the diversity of digital platforms, proposals for their legal regulation should not cover the individual amendments to laws, but answer to the question: "Should the rules be differentiated depending on the business model, beneficiary or functional task of the digital platform?" However, at present, the answer to this question cannot be unique, not only because of platforms' variety, but also because in modern law the reference points on law scale of digital platforms are still not defined.

The dynamism and flexibility of new digital technologies, as well as obvious differences in characters, interests and needs of participants in economic relations make it difficult to find common parameters for legal regulation of mobile commerce platforms (m-commerce), but they have to be defined [31].

Global digital platforms are the basis for new legal relations, and in this regard, it is fundamentally crucial to highlight key parameters that, on the one hand, will satisfy universal requirement, and on the other hand, will indicate significant differences in the legal structures of digital platforms. We propose to consider among such criteria the legal status of digital platforms and contractual relationship "Platform - Client".

4 Discussion

4.1 The Legal Status of Digital Platforms

Most modern experts are forced to admit that at present the legal status of digital platforms is blurred, but not because of the novelty of this tool, but because most businessmen use imperfect legislation and create hybrid designs to minimize responsibility.

The most detailed issues of the legal status of digital platforms are studied in European law. Here digital platforms are considered mainly as commercial organizations that perform different information and other services. According to the rule proposed by the European Commission, a digital platform should be considered as an enterprise operating in bilateral or multilateral markets and using the Internet to ensure interaction between two or more interdependent groups of users (consumers) [14]. The European Parliament significantly developed this definition by including provision or

aggregation of services (content) from service providers (content) to final consumer [16]. In accordance with the requirements of the European Union, most online platforms are considered information society service providers (EU Electronic Commerce Directive (E-Commerce Directive 2000/31/EC)) [11]. However, directive is not the case of interest but judicial decisions taken regarding individual digital platforms in connection with its application. So, on December 20, 2017, the European Court passed the judgement that the Uber service, which via application connects an unprofessional driver using his own car, with a person who wants to use the car, should be considered as a transport service, not an information society service, and this means that Uber does not fall under the regulation of the EU Directive 2000/31/EC [11] and should be considered as a company providing transport services [5]. This decision caused controversy about the platform: if it is possible to limit its functionality only to digital information services, or the platform takes the responsibility about the companies' activities which are placed on it [22].

The next platform that the EU Supreme Court assessed is Airbnb. The key issue for the court was whether its activities could be defined as "information society services" (EU Directives 2000/31/EC) [11]. In its decision of December 2019, the European Court concluded that Airbnb and Uber have different legal status [27]. Refusing to recognize Uber as a company providing only information services, the court emphasized that it offered transport services, without it drivers could not carry passengers, therefore, Uber has a "determining influence" on economically significant aspects of the transport business, and has to bear responsibility as a transport services organization.

As for Airbnb, this company is subject to Directive 2000/31/EC [11], because the Platform: 1) did not offer accommodation services; 2) hosts could offer their hosting services regardless the platform; 3) did not have a "determining influence" on economically significant aspects of service; 4) did not set prices for accommodation, etc. Thus, in European law, a serious step was taken to develop common parameters for determining the legal status of a digital platform as an organization providing information or other services. In fact, the following algorithm was proposed: determination of the legal status of a digital platform actually depends on its control and influence on the services offered. Platforms should control the services that they consider most essential for their business model. It does not matter if the Platform collects fees for the services offered, the important issue is if it participates in setting prices, commissions, etc.

The proposed model exceeded the scope of individual decisions and is now actively used by the courts of various countries in terms of determining the platform's responsibility for people's actions who provide the services. The challenging issue was European Court's decision of Airbnb case (C-390/18) [20] in terms of assessing further development of digital platforms in December 2019. This case brought into sharp focus the problem of determining the company's jurisdiction and the possibility of imposing additional restrictions on it.

Airbnb was accused of unfair competition with hotels. The Tourism Law Violation Association reported that Airbnb acts as an unlicensed real estate agency and violates the 1970 Act, known as the Hoge Act. The European Court was not asked if Airbnb meets the requirements of Directive 2000/31 and if Directive 2006/123/can be applied

to it (Directive 2006/123/EC of the European Parliament and of the Council of 12 December 2006 on services in the internal market) [12] as far as domestic markets are concerned.

According to this Directive, a country's law can restrict the freedom of an economic operator to provide services established in another Member State, provided the fulfillment of detailed conditions. This issue is of particular importance due to the fact that the European Union intends to revise Directive 2000/31 and strengthen the principle of country of origin for digital companies [11].

In the court judgement, Member States can take measures that violate the principle of freedom to provide the services of the information society, if two general conditions are observed: it is important to notify the Control Commission and the state on which territory the service provider is located.

Thus, the decision confirmed the ability of the countries to go beyond the framework of European standards and impose additional restrictions. However, this requirement is mitigated by articles 3 (4) and 15 Directives 2000/31, which allow platforms to resist the laws that require them to report data to public authorities. This makes it incredibly complicated to reveal violations for local authorities, creates gray areas and encourages breaking the law. The demarcation of platforms on the basis of their control over the services offered was one more dangerous issue for digital law (European Court decisions C-434/15 Uber and C-320/16 Uber France) [20].

In fact, the issue of the platform's responsibility is dependent on how ready it is to control the price of the service and manage the service. But as practice shows, this criterion is relative. It is not clear which company invests more in optimizing its services: the one that directs the location of the client to the taxi driver or the one that creates an interactive map with the selection of the most suitable hotels. Due to existing variables, the issue is completed and cannot have a unique solution.

The criteria proposed by the European Court led to unexpected results. There is such dependence: the higher the company's control over the quality of services, the higher its responsibility. Digital platforms responded to this situation by looking for options to weaken control over the services.

The alternative option for the platforms' development was proposed to design them as consumer cooperatives or interest platforms. These models are well known to both Russian, European and Asian markets. But they are also linked with a number of difficulties in terms of assessing the cost of services provided by the consumer platform, determining the team of responsible persons, etc. [1, 31].

Russia shows an interesting approach to assess the legal status of digital platforms – aggregators. In paragraph 18 of the Decree of the Plenum of the Supreme Court of the Russian Federation of June 26, 2018 No. 26 "On some issues of the application of the legislation on the contract for goods carriage, passengers and baggage by road and on the contract of transport expedition" [8], it indirectly indicates the responsibility of the person to which the client applies to conclude a contract to carry passengers and baggage. This person has responsibility before a passenger for harm caused during the carriage, if this person entered into a carriage contract on his own behalf or from the circumstances of the contract (included the information on Internet website, correspondence between parties when concluding an agreement, etc.). Fair consumer can have the opinion that the contract of carriage is concluded directly with this person, and

the actual carrier is his employee or a third party involved to fulfill transportation obligations. Now this rule is fully applied to digital platforms that provide transport services (Gett, Uber, Yandex.Taxi).

This approach was legally formalized in the Federal Law of the Russian Federation of July 27, 2018 No. 250-FZ «On Amending the Law of the Russian Federation "On Protection of Consumer Rights"» [18]. The law defines the status of the aggregator of information on goods (services) as organizations or individual entrepreneurs who are the owners of the site or program that provide the consumer the opportunity to simultaneously study seller's proposal to conclude a contract for the sale of goods, conclude such an agreement, and also make advance payment by transferring funds to the owner of the aggregator within the applicable forms of cashless payments.

The aggregator is determined to be responsible for: losses incurred by the consumer as a result of providing him with inaccurate or incomplete information about the product or seller; for performing the contract, as well as for the observance of consumers' rights violated as a result of transferring goods of inadequate quality to the consumer and the exchange of non-food goods of appropriate quality for similar goods. Thus, Russian law did not copy the European way which recognizes a person providing the services offered on the platform as an aggregator, the law just indicated information services. And this means that in order to carry out its activities, the aggregator is not obliged to have an appropriate license to provide transport, tourism or other services. The USA uses the similar approach [22, 23, 37].

4.2   Contractual Relations "Platform-Client"

Platforms often represent tripartite business models that obligate the lender and the supplier not only to conclude an agreement with each other, but also to conclude an agreement with the platform operator [13]. It is important to take into account the fact that the platform is primarily a technological base that combines computer programs, a domain name and a website, databases with access, storage, exchange and other processing by sellers and buyers to ensure the network or electronic trading platform functioning [29]. Moreover, the owner does not always combine the functions of an administrator and a platform operator at the same time. Often the type of relations is built in the framework of the agency contract model.

Depending on the platform's business model, the following agreements can be the basis of its activity: an assignment agreement, a commission agreement, a service contract for the transfer of goods and manufacturer recruitment, or mixed models formed within the agreement's freedom. Some authors highlight sui generis, a special type of contractual relationship involving a digital platform [21]. The three-way construction of legal relations (consumer, aggregator and contractor) is also proposed to be applied on the basis of two contracts: a contract for services' providing concluded between the aggregator and the consumer, and a contract for services' providing between the aggregator and the contractor [9].

Increasingly, in the literature there is the idea for the necessity to develop a fundamentally new area of law - transnational consumer law, which protects the interests of platform users regardless their citizenship and company location [2]. However, unresolved issues remain: on what principles these norms will be established, on what

will be based and how they relate to national law. In fact, further development of this theory can result in the discussion of law autonomy of the platforms, that is not relevant now [33].

Currently, contractual relationships of digital platforms directly depend on the area and nature of their activities. If they are companies that provide information services, then contracts are concluded for providing services with customers, and agency; mixed contracts are made with companies that perform work or provide services. As our analysis showed, these agreements are concluded 90% of Russian digital platforms. At the same time, modern legislation uses the principle of contract freedom and create various legal structures, provided that they do not establish enslaving conditions and do not violate the rights and legitimate interests of parties to the agreement or third parties.

In this regard, the case of Craig Comb v. PayPal, Inc. is of great interest. The court recognized the PayPal user agreement as unfair under the laws of the State of California on the basis that it was concluded in the form of an adhesion agreement, i.e. "standard contract", drawn up and imposed by the stronger party in the transaction, when the other party can just join it [6].

Currently, there are similar PayPal provisions in user agreements of the largest American (Amazon, eBay, Walmart) and European corporations. And this means that this judicial precedent can become global. The user agreements of digital platforms as new sources of law should be emphasized. Nowadays, a new subject of digital civil circulation is being formed – digital technology platforms (digital corporations). Many of them become transnational, and internal regulatory standards are used to optimize their work [3]. It is presumed that the user, choosing a platform, agrees with the rules described in the user agreement. Platforms moderate user behavior within the "on/off" model. Sanctions are usually applied by system administrators (banishment).

The establishment of rules and responsibility for their non-compliance is a form of rule-making, which is not regulated by national law at all. In fact, there is one more parallel regulatory environment (digital platform law [22]), which forms individual rules of behavior and business traditions [7, 19, 30].

The contradictions in the legal status of digital platforms also affected the determination of the legal parameters of the relations between the platforms and their employees. The courts are proceeding to establish their position, but this position is no longer unified. For example, on March 4, 2020, the Cour de Cassation (the highest court of France) recognized that there is an employee-employer relations between Uber and the driver who operated under the platform [4]. In the future, the labor court will resolve the issue if this former employee is entitled to compensation under the rules of labor law [10]. In 2017, Uber was deprived of a license to work in London, because it did not fulfill the obligation to report crimes and check the convictions of its drivers [18]. A year earlier, an English court recognized that there is a full-fledged labor relations between Uber drivers and Uber, which entitles drivers to paid weekends and a minimum wage [34, 35]. As for other countries, the issue of labor relations on digital platforms remains open. In particular, in Russia, drivers of transport aggregators are mostly attached to taxi companies and only use the platforms' services.

5   Conclusion

The paper considers the main issues in the field of legal regulation of digital platforms. They clearly show the obvious deficit of legal norms in this sphere of relations. Due to the uncertainty of its legal status, digital platforms are forced to lower the threshold for monitoring the work of employees and companies, which inevitably affects the quality of goods and services. The lack of uniform standards of legal regulation have to be taken into account as it leads to chaotic rule-making of companies. User agreements withdraw some of the contradictions in terms of specifying the legal status of aggregators, determining the contractual basis for their work, protecting the rights of users, etc., But there are contradictory issues related to determining the scope of responsible persons and applicable law. The internal law of the platforms undermines the law power, which in the future can adversely affect the development of transnational aggregators. While supporting the proposal of international organizations regarding the legal regulation of digital platforms, the prioritizing tasks have to be emphasized. First of all, it is crucial to develop global criteria for differentiating platforms depending on their legal status and approve common principles – basic requirements for protecting the rights of platforms' consumers.

References

1. Appeal ruling of the Krasnodar Regional Court of December 19, 2017 in the case N 33-41539/2017
2. Calliess, G.-P.: Transnational consumer law; Co-regulation of B2C-e-commerce. In: Dilling, O., Herberg, M., Winter, G. (eds.) Responsible Business: Selfgovernance in Transnational Economic Transactions, pp. 225–258. Hart Publishing, Oxford (2008)
3. Cohen, J.E.: Law for the platform economy. Univ. California **51**(133), 133–204 (2017)
4. Cour de Cassation: Arrêt n°374 du 4 mars 2020/ruling/sentencia (2020). https://www.courdecassation.fr/jurisprudence_2/communiques_presse_8004/prestation_chauffeur_9665/374_4_44528.html. Accessed 23 Apr 2020
5. Court of Justice of the European Union Press release N 136/17 Luxembourg, 20 December 2017. Judgment in Case Asociacion Profesional Elite Taxi v. Uber Systems Spain SL. https://curia.europa.eu/jcms/upload/docs/application/pdf/2017-12/cp170136en.pdf. Accessed 23 Apr 2020
6. Craig Comb, v. PayPal, Inc. Cases N C-02-1227 and C-02-2777 JF (N. D. Cal., August 30, 2002). https://casetext.com/case/comb-v-paypal-inc-2. Accessed 23 Apr 2020
7. Dasteel, J.H.: Consumer click arbitration: a review of online consumer arbitration agreements. Arbitr. Law Rev. **9**(1) (2017). https://elibrary.law.psu.edu/arbitrationlawreview/vol9/iss1/18/. Accessed 23 Apr 2020
8. Decree of the Plenum of the Supreme Court of the Russian Federation of June 26, 2018 No. 26 "On some issues of the application of the legislation on the contract for goods carriage, passengers and baggage by road and on the contract of transport expedition". http://www.consultant.ru/document/cons_doc_LAW_301030/. Accessed 23 Apr 2020
9. Deryugina, T.V.: The legal nature of the contract mediating the emergence of legal relations with the participation of the aggregator. Civil Law **6**(5), 3–6 (2018)
10. Dillet, R.: Uber driver reclassified as employee in France (2020). https://techcrunch.com/2020/03/04/uber-driver-reclassified-as-employee-in-france/. Accessed 23 Apr 2020

11. EU: Directive 2000/31/EC of the European Parliament and of the Council of 8 June 2000 on certain legal aspects of information society services, in particular electronic commerce, in the Internal Market ('Directive on electronic commerce') (2000). https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32000L0031. Accessed 23 Apr 2020

12. EU: Directive 2006/123/EC of the European Parliament and of the Council of 12 December 2006 on services in the internal market (2006). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32006L0123. Accessed 23 Apr 2020

13. EU: Online platforms and the digital single market opportunities and challenges for Europe (2016). https://eur-lex.europa.eu/. Accessed 23 Apr 2020

14. European Commission: Online platforms and the digital single market (2019). https://publications.parliament.uk/pa/ld201516/ldselect/ldeucom/129/129.pdf. Accessed 23 Apr 2020

15. Euronews: What does the European Commission do? (2019). https://www.euronews.com/2019/04/26/what-does-the-european-commission-do. Accessed 23 Apr 2020

16. European Parliament: Digital platforms: An analytical framework. Challenges for competition in a digitalised economy (2015). https://www.europarl.europa.eu/RegData/etudes/IDAN/2015/563432/IPOL_IDA(2015)563432_EN.pdf. Accessed 23 Apr 2020

17. Evans, P.C., Gawer, A.: The rise of the platform enterprise (2016). https://www.thecge.net/app/uploads/2016/01/PDF-WEB-Platform-Survey_01_12.pdf. Accessed 23 Apr 2020

18. Federal Law of the Russian Federation of July 27, 2018 No. 250-FZ «On Amending the Law of the Russian Federation "On Protection of Consumer Rights"». https://rg.ru/2018/08/01/potrebiteli-dok.html. Accessed 23 Apr 2020

19. González, A.G.: eBay law: the legal implications of the C2C electronic commerce model. Comput. Law Secur. Rep. **19**(6), 468–473 (2003)

20. InfoCuria: Judgment of the court. http://curia.europa.eu/juris/document/document.jsf?text=&docid=221791&pageIndex=0&doclang=EN&mode=lst&dir=&occ=first&part=1&cid=4084659. Accessed 23 Apr 2020

21. Ivanov, A.A.: Business aggregators and law. Law **5**, 145–156 (2017)

22. Kartskhia, A.A.: Digital technological (online) platforms: Russian and foreign regulatory experience. Civil Law 3 (2019). https://urfac.ru/?p=2426. Accessed 23 Apr 2020

23. Newman, K.T., Murphy, G.R.: Oberdorf v. Amazon.com, Inc. (2019). https://www.martindale.com/legal-news/article_thomas-thomas-hafer-llp_2519310.htm. Accessed 23 Apr 2020

24. OECD: OECD digital economy outlook 2017 (2017). https://espas.secure.europarl.europa.eu/orbis/sites/default/files/generated/document/en/9317011e.pdf. Accessed 23 Apr 2020

25. OECD: Toolkit for protecting digital consumers (2018). https://www.oecd.org/internet/consumer/toolkit-for-protecting-digital-consumers.pdf. Accessed 23 Apr 2020

26. OECD: The role of digital platforms in the collection of VAT/GST on online sales (2019). www.oecd.org/tax/consumption/the-role-of-digital-platforms-in-the-collection-of-vat-gst-on-online-sales.pdf. Accessed 23 Apr 2020

27. Poyton, D.: What makes Uber and Airbnb different in the eyes of the EU – And why it matters (2019). https://theconversation.com/what-makes-uber-and-airbnb-different-in-the-eyes-of-the-eu-and-why-it-matters-121708. Accessed 23 Apr 2020

28. Rostelecom: Approaches to defining and typifying digital platforms (2019). https://files.data-economy.ru/digital_platforms.pdf. Accessed 23 Apr 2020

29. Rozhkova, M., Kuznetsova, L.: On the responsibility of aggregators in the context of understanding their activities as agency services. Econ. Law **1**, 27–34 (2019)

30. Schiek, D.: Private rule-making and European governance – issues of legitimacy. Eur. Law Rev. **20**(1), 3 (2007)

31. Soifer, T.V.: Civil law regulation of relations on the collective use of goods and services (Sharing economy): Development directions (2019). https://urfac.ru/?p=2752. Accessed 23 Apr 2020

32. Strowel, A., Vergote, W.: Digital platforms: to regulate or not to regulate? Message to regulators: fix the economics first, then focus on the right regulation (2016). https://ec. europa.eu/information_society/newsroom/image/document/2016-7/uclouvain_et_universit_ saint_louis_14044.pdf. Accessed 23 Apr 2020

33. Symeonides, S.C.: Party autonomy and private-law making in private international law: The Lex Mercatoria that isn't (2006). http://dx.doi.org/10.2139/ssrn.946007

34. The Guardian: Uber loses appeal over driver employment rights (2018). https://www. theguardian.com/technology/2018/dec/19/uber-loses-appeal-over-driver-employment-rights. Accessed 23 Apr 2020

35. The Guardian Weekly: Factbox: Uber's legal challenges around the world (2016). https:// www.theguardian.com/technology/2016/oct/28/uber-uk-tribunal-self-employed-status. Accessed 23 Apr 2020

36. UNCTAD: Value creation and capture: Implications for developing countries (2019). https:// unctad.org/en/PublicationsLibrary/der2019_overview_ru.pdf. Accessed 23 Apr 2020

37. Wolfer, M.: And you are not done; The future of products liability claims against Amazon still uncertain (2019). https://www.jdsupra.com/legalnews/and-you-are-not-done-the-future- of-41953/. Accessed 23 Apr 2020

Development of an Innovative Project
to Provide Cosmetic Services on the Move

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Abstract. Quite often, due to the lack of time, people face the choice between business and beauty. It can be very difficult to make this choice regardless of the status and position of the person. Therefore, it seems relevant to develop an innovative project to provide a unique proposal for providing cosmetic services on the move. In this regard, this article presents some provisions of the market study of cosmetic and transport services in the metropolis. Beauty-taxi is a unique innovative project that allows active people to become more beautiful in the process of moving around the city in the car, and using time rationally. It seems that this proposal can compete with traditional taxis and represent a certain interest for business people, whose activities make it incumbent on them not only to solve a large number of business problems and actively move around the city, but also to look well-groomed, tidy and stylish. In the development of the innovative project, the methodological basis was the study of trends and patterns of the development of the cosmetic market, including the sale of cosmetics and the provision of care services, as well as research of key participants in the taxi market.

Keywords: Beauty-taxi · Cosmetic services · Taxi market

1   Introduction

Each stage of human development is conditioned by certain stereotypes, ideals and standards of beauty to which everyone aspires. Beauty criteria are changing at an unthinkable pace. Beauty and fashion are very popular spheres, so not only women, but men as well watch and follow the modern fashionable trends. Manicure, pedicure, hairdressing services, care products, make-up, cosmetic services, stylish clothes – these are integral elements of modern people. Nowadays, any modern person before any event can make arrangements and sign up for the salon, hire a stylist to create the appropriate image, sign up for manicure and pedicure, but to do all this you need to find time, which in today's world one lacks badly. The cosmetic market is deluged with a large number of studios and salons that are trying to win the attention of customers through various services and offers, but, to a large extent, due to the high competition it is quite difficult to form a unique selling point. A lot of scientific papers are devoted to the study of these questions, including the articles by Gudyreva [3], Laskina [4],

Petrova, Rezaikina, & Rotanov [5], Bajenova, Danilova, & Chetoshnikova [1]. However, this article, which is based on an analysis of taxi and cosmetic services markets, attempts to describe the key provisions of an innovative project to provide cosmetic services on the move for the inhabitants of the metropolis, the project is supposed to contribute to the effective solution to many problems of modern business people and the formation of a new market niche.

2   Methodology

The beauty industry is an industry that is rapidly gaining momentum in its development, which includes a wide range of activities. In recent decades, the consumption of cosmetic products has been actively increasing. In turn, the range of goods offered by the market is huge, and manufacturers are increasing production every year. Russia occupies about 2% of the global market for cosmetics and perfumes. Studies show that the average woman in Russia consumes much more decorative cosmetics than the average woman in Europe. Despite the decrease in incomes of the population during the economic downturns, the market of cosmetic products in Russia continues to grow, albeit at a slower pace. Despite the fact that the average receipt amount is getting smaller, the frequency of purchases does not decrease, at least because people get accustomed to the use of a certain product and need it on a permanent basis. The most preferred products for which the consumers are willing to pay, according to Euromonitor International are facial care, perfumes and decorative cosmetics.

A new trend in the beauty industry is the production of organic products, it has become important to buyers that the composition should consist of natural components. Also in today's world, the market benchmarks for product creation are versatility and immediate effect. This is due to the change in the rhythm of life in the society. Nowadays people have a lot to do and to worry about every day and in order to save time they want to acquire such products that would have an instant effect, and would combine several functions and would be compact at the same time. The development of the cosmetics market is also evidenced by the active use of digital technologies, for example, as the ways to promote goods and services manufacturers use websites, mobile applications, advertising in various social networks, which are gaining more and more popularity.

According to many years of practice, in order to increase the customer base and reduce the risk of bankruptcy, it is necessary to offer a set of services designed for the average family, that is, to adhere to the traditional format, without divisions by gender and age factors. Nowadays, the "express" salons are gaining momentum, which are focused on accelerated mode, and services are provided simultaneously by several masters to save the client's time.

Since the most suitable transport for providing cosmetic services on the move is the taxi, it is necessary to investigate the features of the development of the taxi market. This means of transport has a lot of advantages over others. First, if a person is in an unfamiliar place or does not know how to get to the destination, a taxi is the best solution, as you only need to know the address to get around. Secondly, in comparison with any other public transport taxi has more comfortable conditions, there are no

crowds of people or stuffiness and suffocation, and you also do not need to make transfers and walk, because taxi will deliver you to the destination. And thirdly, taxi rides allow you to do the necessary things on the way, which brings significant time savings. It is the latter advantage that plays a fundamental role in the choice of transport for the provision of cosmetic services on the move. The Russian taxi market is developing quite actively, as evidenced by the volume growth of the market (Fig. 1).
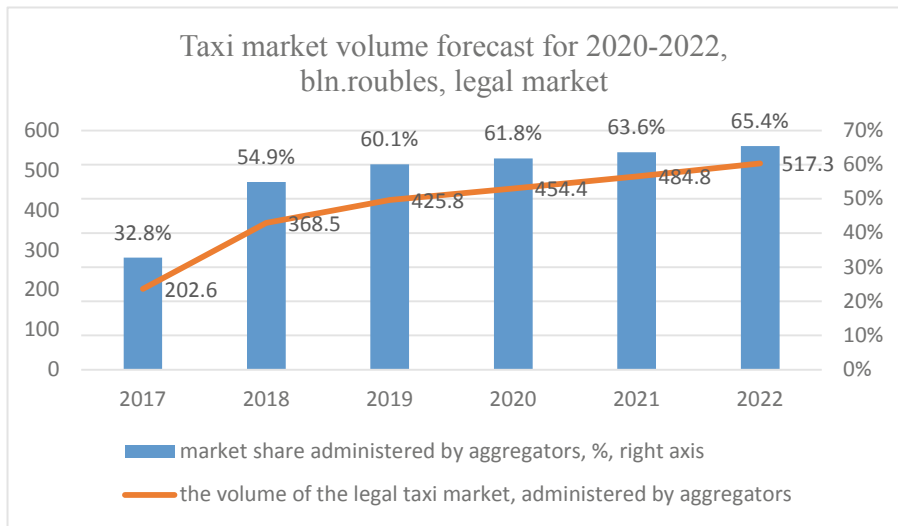
Fig. 1. Taxi market volume forecast for 2020–2022, bln.roubles, legal market (Source: authors based on [7]).

In general, people have started to use taxis more often than before, this is due to the establishment of fair prices and the emergence of new aggregators. The market has become popular. The increase in the number of competitors encourages the search for new advantages, the creation of various bonus systems and convenient online services for the implementation of orders. The main indicators of work quality of the aggregators in the taxi market are digitalization, safety and comfort. In other words, in order to enter and maintain a position in the market, it is necessary to establish acceptable prices for services which are similar to the prices of other aggregators, to develop a unique mobile application for orders, to reduce the time of delivery of the car and to provide a safe and comfortable trip, which will provoke an increase in demand.

In general, according to the report of Discovery Research Group at the moment in the structure of the legal Moscow market the key positions are occupied by Yandex. Taxi, Vezet and Maxim (Fig. 2) [7].

These aggregators occupy the lion's share not only of the capital, but also of the regional market. Taxi Vezet and Maxim are widely known among consumers in cities with a population from 100,000 up to 500,000 people, but in cities with the population of over 500,000 people the leader is Yandex.Taxi.
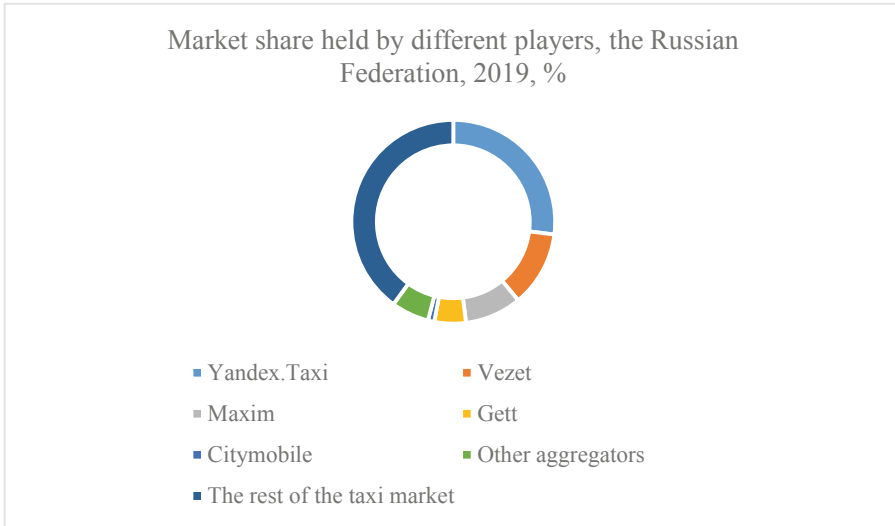
Fig. 2. Market share held by different players, the Russian Federation, 2019, % (Source: authors based on [7]).

Having read the customer reviews of Yandex.Taxi, you can identify the following main positive aspects that must be taken into account when ensuring the quality of the new beauty-taxi:

– fast car delivery;
– democratic prices in comparison with other taxis;
– the ability to call the driver or write in a chat;
– the ability to track the way on the map;
– fast support service;
– availability of additional services.

The main drawback – inadequate taxi drivers. The main claim of the customers – boorish, strange behavior of the drivers, the delivery of another car instead of the promised one. Yandex.Taxi should organize more thorough criteria for selecting drivers not only on high-end tariffs, but also in the economy sector, if they value their customers and want to increase their number.

3   Results

In megacities modern people live in a tight schedule, at a dynamic pace of life people are busy with a lot of things and try to use their time wisely and efficiently, which refers to looking after their appearance as well. As a result, quite a lot of people find it challenging to organise their schedule in such a way that it is possible to combine business and skin and bodycare rationally using time. Therefore, this challenge could be solved with the help of the proposed business idea of providing cosmetic services on

the move. The concept of the idea is to develop beauty-taxis in megacities, which will allow not only to get to the desired destination within a fixed period of time, but also to use the provided cosmetic services, which will significantly save time and improve the emotional state of the client.

It is worth noting that despite the non-typical conditions of the cosmetic services provision, beauty-taxis can provide a fairly wide range of care services. The target audience of the beauty-taxis may include the representatives of the middle and upper-middle class. These services can be in demand among business people with tight schedules, women with children, tourist visitors to the capital or flight attendants/conductors, who are forced to go to meetings or events immediately after the airports or stations. Women are the predominant customers of the service, but men can also occasionally call a beauty taxi.

In order to test the business idea of providing cosmetic services on the move regarding its relevance, you need to evaluate it against certain criteria. The authors have presented the customer value proposition (CVP) of the "Voyage de beaute" project using the sketch by Peter Thompson – a model that best allows you to assess the needs of customers and provide the information in a structured way (Fig. 3).
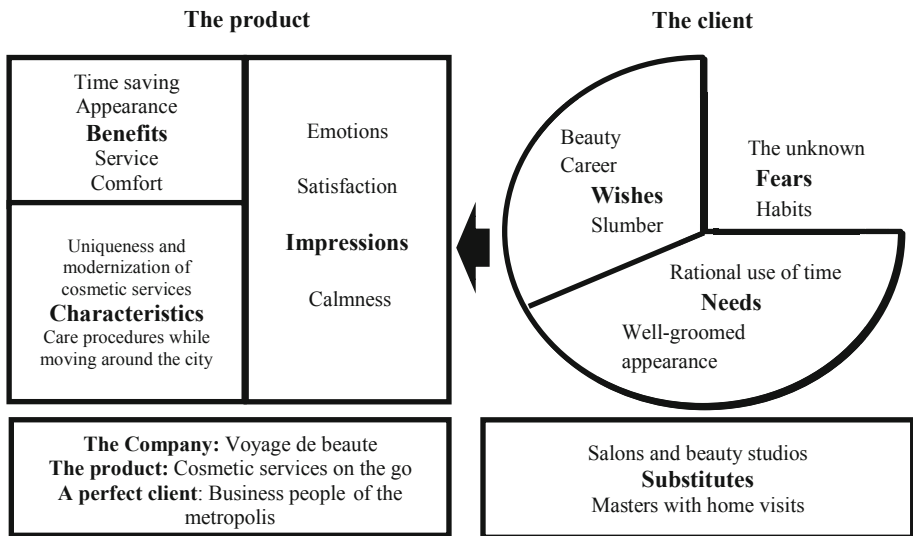
Fig. 3. Value Proposal of the Innovative Project «Voyage de beaute» (Source: authors).

Characteristics

«Voyage de beaute» – is a unique project to provide cosmetic services on the go. The key idea of the project is the synthesis and modernization of the cosmetic and taxi services that are already familiar to everyone. The main task is to solve the current problem of society, namely the answer to the question "How can one look great without compromising the planned business schedule?". Beauty-taxi allows you to save

the most valuable resource of today – the time, as the customers can simultaneously engage in at least three activities: moving to the desired destination, getting cosmetic or care services and, for example, doing business with the help of electronic devices, or they can simply relax and enjoy the beauty ride.

Benefits

– Time-saving
– Great looks
– Opportunity to combine several things at the same time
– Ride in a cozy and comfortable car
– Unusual pastime in Moscow traffic jams
– Express service, when there is no time at all
– A great gift to someone
– Relaxing services after a hard day or flights
– A quality service and an individual approach
– Learning games for children

Impressions

The customers who will use the offered services will get unforgettable emotions and impressions, because never before have they beautified themselves while looking at the changing streets of the city from the windows of the car, never before could they transform their appearance during a trip to the events. People will feel a kind of relief and satisfaction, because one of their problems gets solved. They will become calmer, as their tight schedule will provide them with some free time.

Wishes

Modern people want to look 100% every day, achieve success at work and move up the career ladder, at the same time everyone dreams of waking up later in the mornings without spending time on grooming themselves. But due to their schedule not everyone can afford to go to the salon, as it is a very time-consuming process. Therefore, new ways to mix business with pleasure that is the personal care or beauty routine are required nowadays.

Needs

– Looking well-groomed and beautiful in a busy schedule,
– Spending time wisely and efficiently
– Looking after one's appearance not at the expense of everyday business
– Making oneself look presentable after the airport/station

Fears

The fundamental fear of all consumers is the fear of the unknown. Changing any familiar product to a new product is always associated with the so-called "switching pain". In this case, there is a transition not just to a similar product of a different manufacturer, but to something that previously was not presented on the market and no one has heard about it. People are inherent in conservatism, they get accustomed to what they use on a regular basis, and to take a step into the unknown and try something new is sometimes difficult, so it takes time for people to see the benefits of the new offers before they start using them.

Substitutes

At this stage, for the purpose of cosmetic services, people can turn to salons and beauty studios, which abound, they can also invite a home salon master, but these substitutes do not meet the current needs, which are mentioned above, so the project "Voyage de beaute" is a really valuable proposition.

Advertising is a potential advantage of "Voyage de beaute", provided the services are of a high quality. In addition to the fact that the taxi is a new direction in the market of taxis and cosmetic services very few people know about, people are also incredulous about everything new, so they need time to comprehend how this proposal will simplify their lives. To speed up this process, you need a well-built quality advertising that will reflect the whole concept of the idea and will arouse interest in the audience. In order to attract customers, it is advisable to use the following promotion tools:

– websites with modern design and layout technology, where you can book a taxi, see samples of work and compare prices. In order to better understand what a beauty taxi is, you need to attach a commercial to the web page. Since this video is designed to introduce the general idea to the people, it should be more conceptual, dynamic, informative, vivid and memorable;
– endorsement from celebrities is a common way to form an audience, as they have a large number of subscribers and people trust them;
– one's own account in the popular network Instagram.

4   Discussion

In order to assess the potential and threats that affect the success of an innovative project, to formulate the strengths and errors and shortcomings that a company may face, it is advisable to conduct a SWOT analysis – a classic tool of strategic management. It reveals internal and external factors that influence the success of the business. The results of the SWOT analysis of "Voyage de beaute" project are presented in the consolidated summary Table 1.

The final step in the development of a business strategy is to consider the paired ratios of factors previously presented in the matrix.

Strengths + Opportunities. Taken together, these items provide active business development and increase the solvent consumer demand. "Voyage de beaute" helps make people's lives easier while they benefit at the same time.

Weaknesses + Opportunities. Listed opportunities will reduce the number of weaknesses. Fashion and rising incomes will help solve the problem of payback and the inconstancy of cash flows. The absence of a large number of competitors will help to gain a significant share of the market.

Weaknesses + Threats. The combination of these factors makes it difficult to develop the business, leading it to losses. In order to minimize risks, you can use well-built advertising to increase market share, thereby resisting the emergence of new competitors, as well as forming your own competitive advantages.

Strengths + Threats. Thanks to the strengths, the project will be able to minimize the negative impact of the external factors. High-quality promotion and endorsement

Table 1. SWOT-analysis of "Voyage de beaute" project

Strengths	Weaknesses
− Unique offer/selling point − High-quality service − Qualified personnel − Well built marketing − Variety of cosmetic services − Comfortable car with electricity, light music, TV and comfortable chairs − A glass of champagne as a compliment − Qualified masters − Prime high-quality cosmetics − 24/7 work schedule − Celebrity endorsement −Sanification	− Complexity of the car equipment − Weak market representation − The inconstancy of cash flows − Relatively long payback period
Opportunities	**Threats**
− The absence of a large number of competitors − Creating separate vehicle lanes in the city for public transport − Increasing incomes of the population − Fashion for the provision of services in the car	− Lack of solvent demand − The emergence of new competitors and the improvement of the competitor's advertising campaign − Legislative ban on the provision of cosmetic services in the car − Tightening of sanitary standards

Source: authors.

can reduce the threat from competitors, and the continuous improvement in the quality of services will help to comply with all existing sanitary standards, including when they are tightened or new regulations are put in place.

5 Conclusion

The market for cosmetic services, as well as the taxi market in Moscow is actively developing. They are characterized by a huge number of sellers and buyers. With the emergence of new entrants in these areas of activity, we have to come up with new ways to attract and retain the customer's attention, develop quality advertising campaigns, expand services and surprise with unusual offers [2, 6, 8]. Despite the fact that the market of cosmetic services is overflowing with various goods and services, competitors are trying to surprise customers with new beauty services and design solutions, but the modern customer needs the quality of service, so that cosmetic services are mobile and accessible. The main idea of the innovative beauty-taxi project is to modernize the usual format of beauty salons and to implement them in the area of taxis at the convenience and enhancing life standards of business people. All this can generally contribute to the development of a new market niche, which could prove interesting for many residents of the metropolis.

References

1. Bajenova, S.A., Danilova, L.G., Chetoshnikova, L.A.: The marketing of anti-aging services in aesthetic medicine. Problems Soc. Hyg. Health Care Med. Hist. **27**(4), 424–428 (2019). https://doi.org/10.32687/0869-866X-2019-27-4-424-428
2. Faggio, G., Silva, O.: Self-employment and entrepreneurship in urban and rural labour markets. J. Urban Econ. **84**, 67–85 (2014). https://doi.org/10.1016/j.jue.2014.09.001
3. Gudyreva, L.V.: Key aspects of marketing communication policy in shaping a sustainable positive image of the cosmetics market. Eur. Soc. Sci. J. **2–2**, 7–14 (2018)
4. Laskina, O.S.: Strategic marketing of innovations in the cosmetic market. Bull. Voronezh State Univ. Eng. Technol. **1**(67), 277–281 (2016)
5. Petrova, N.P., Rezaikina, A.V., Rotanov, S.V.: System of independent evaluation (confirmation) of correspondence of perfumes and cosmetics in the Russian Federation. Herald Dermatol. Venereol. **6**, 90–96 (2015)
6. Razomasova, E., Romanova, N.: Lack of free time of citizens as an incentive for entrepreneurship in services. Ideas Ideals **11**(3), 303–316 (2019). https://doi.org/10.17212/2075-0862-2019-11.3.2-303-316
7. The Analytical Center under the Russian Government: Study of the taxi market (2019). https://ac.gov.ru/files/content/24166/rynok-taksi-2019-pdf.pdf. Accessed 14 Apr 2020
8. Tripon, A.: Requirements on management practices for the development of entrepreneurial creativity in a global social-ecological system – case study. Procedia Technol. **19**, 483–489 (2015)

Big Data and Big Challenges
in Production Networks and Systems

Big Data Technology Application in the Taxation Sphere

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Abstract. In the context of the economy digitalization, modern technologies penetrate into all spheres of human activity. The sphere of taxation is no exception. Digital technologies allow processing and transmitting large amounts of information, thereby reducing the risk of errors. The use of information technologies contributes to the creation of a transparent system of relations between the state and society. A new form of interaction between tax authorities of different countries is being formed by automatic exchange of tax information. The article investigates the use of Big Data technologies in the field of taxation. Opening up new potential opportunities, the use of digital technologies, at the same time, creates certain difficulties in the process of tax administration. The practical significance of this research work is to assess consequences of the Big Data technology application for tax authorities and taxpayers.

Keywords: Automated control system · Big data · Digital technologies · Digitalization · Tax control

1 Introduction

Today, we can see that digital technologies are being actively implemented in all spheres of activity. Digitalization is making significant changes in the field of taxation. In all countries of the world, there is a process of digital technologies application in tax relations. In the field of taxation, digitalization changes the current legislation, tax authorities use modern software in their activities, there is an increase in tax revenues to the budget, and a decrease in the tax evasion. The use of Big Data processing technology in the tax sphere is pushing for a revision of the existing information interaction between the state and society. In the future, the application of Big Data technologies will expand possibilities of tax administration.

2   Methodology

When studying issues in the field of taxation, we pay special attention to the development of empirical research and the application of theory to practical solutions. Applied research is determined by the interest of participants in tax relations. The authors of this research examine the role of such advanced technologies as Big Data. In particular, a comparative analysis is carried out, which allows structuring the information and determining a direction of further research. In the practical aspect, significant problems were identified, further study of which is possible with the help of theoretical tools. The development of applied research, in turn, requires a variety of methods. During this research, the authors used such methods as theoretical (dialectical logic, rational cognition, etc.); diagnostic (diagnostic analysis of the state and causes); empirical ones (description of facts, measurement and generalization of research results).

3   Results

Digitalization makes it necessary to review some approaches to taxation. In modern conditions of a wide use of new digital technologies, the format of interaction between participants in tax relations is changing. The tax authorities are faced with the task of using, processing and analyzing large amounts of information. In this regard, new ways and methods are emerging for processing, storing and analyzing data sets using automated information systems.

The use of Big Data technology has conceptually changed the approach to conducting control checks, minimizing the impact of the human factor. Big Data technologies allow tax services to quickly get the necessary information about a taxpayer, allowing them to have all the relevant data about tax objects. Due to Big Data technologies, the Federal Tax Service of Russia will be able to improve its work tools, which will facilitate the transition to contactless service mode and enable to create personalized services. In the future, digital technologies will increase the level of trust between the state and society, ensure the transparency of the economy and guarantee the stability of state revenues.

4   Discussion

There is no official definition of digitalization, although this term is widely used in various sources to describe transformations in all spheres of public life. The term "digitalization" came into use relatively recently – at the turn of the XX–XXI centuries, although the spread of digital technologies began a little earlier – in the 70 s of the XX century with the development of computer technology [6]. According to Afanasenko, Borisova [1] digitalization represents a process of adopting a new form of data submission, the growth in the use of digital or computer technologies in an individual enterprise, in an industry, or in a country as a whole. Yudina and Tushkanov consider digitalization in a narrow and broad sense of the word:

- in a narrow sense, it is a creation of information and digital platforms and operators at different levels of the economy (global, mega, macro, meso, micro, nano) that allow solving various economic tasks, including strategic ones: the development of medicine, science, education, transport, new industrialization, state regulation of the economy and planning, etc.;
- in a broad sense, it means changing the production nature or economic relations, changing their subject-object orientation. With the help of algorithms, machine-to-machine (M2M) relationships appear, where a person may no longer act as a subject. The productive forces of the society and/or factors of production are also changing. This is how the Internet of Things and, even the Internet of "Everything", arises [15]. Marei considers digitalization as a change in the paradigm of communication and interaction with each other and society [3]. Vartanova, Vyrkovsky, Smirnov, Makeenko clarify the content of this concept – it is not only the transition of information into digital form, but a complex solution of infrastructure, management, behavioral, and cultural character [14].

Digitalization is a modern stage in the development of informatization, characterized by the predominant use of digital technologies for generating, processing, transmitting, storing and visualizing information, which is determined by the emergence and spread of new technical tools and software solutions [11]. Analyzing the various approaches to defining the term "digitalization", it should be noted that this process includes the use of digital technologies. Thus, digitalization can be understood as a process of implementing digital technologies in all areas of human activity, changing the approach to processing, storing and using information.

According to the digitalization level of the Russian tax system, it ranks first in the digital tax administration. The use of Big Data technologies allows tax authorities to get more benefit from existing data, fight tax evasion and fraud. Digitalization also raises new, fundamental questions, such as privacy protection, the future of work, cybersecurity, the market power of digital platforms, who has access to data, what information is reliable, how new technologies can be used ethically, and how to ensure that people and companies can keep up with this transformation [4]. Digitalization and integration of data from all sources of information into a single information space with subsequent analysis based on the use of Big Data technologies will improve and increase the work efficiency of tax authorities.

Big Data refers to the use of heavy-duty computers and high-tech software to collect, process, and analyze huge amounts of data with rapid changeability. The term Big Data was first mentioned by the editor of the journal "Nature", who prepared a special issue of the journal with the theme: how can technologies that open up opportunities to work with large amounts of data affect the future of science? [10]. According to him, new tools and more advanced technologies will help to master the growth of world information. This technology, radically expanding sources of information available to the organization in the online mode, as well as its collection, storage, processing and analysis, turns into a valuable and unique resource in its characteristics. Cloud storage will also be developed further, which will provide easy access to a huge amount of information and contributes to more effective communication between employees [9].

In 2012, IBM published a report called "Big Data Brings Marketing Big Numbers" [8] with a number of indicators that characterize the current state of Big Data: 5 exabytes are generated in the world, every 2 days, and 2.7 zetabytes are in the world in digital form. In the IBM forecast for 2020, there are figures about 35 zetabytes of information accumulated by mankind and stored in digital form.

In 2017, the Federal Tax Service of Russia conducted a research to study the level of digitalization of tax systems in different countries and their success in managing Big Data [2]. 26 tax authorities of countries that are members of the OECD forum on tax administration (FTA) advisory group were interviewed. Most of the countries surveyed understand the importance of Big Data and its management. The more countries are adopting new technologies, the better the taxpayers feel. This increases taxpayer transparency and reduces tax uncertainty and administrative burden.

A system of data processing centers (DPC) has been created in Russia to process and store a huge amount of data. A federal data warehouse, which is formed in the DPC, allows you to compare and analyze any tax data. This greatly complicates attempts to use illegal schemes of evasion from payment of taxes. Big Data technologies allow taking a fresh look at the risk assessment process. If you previously had to use information about past events and conduct a long-term analysis, then using Big Data, risk assessment can be performed automatically in real time using all the incoming information that can affect the situation. In turn, tax authorities can use the constantly received data to improve their activities and interaction with taxpayers.

The advantage of Big Data is its almost unlimited potential for storing information, as well as its speed [12]. As defined by Tapscott and Tapscott, "… blockchain is an eternal digital distributed economic transaction log that can be programmed to record not only financial transactions, but almost everything that has value" [13, p. 201]. The use of Big Data ensures transparency of tax processes, allowing you to track VAT transactions and tax refunds, tax returns. The use of Big Data analytical tools by tax authorities allows controlling VAT accrual and payment. The automated control system of the VAT-2 analyzes a huge array of taxpayer data according to the established risk criteria. This makes it possible to detect and prevent tax evasion or attempts to recover it through illegal schemes. For 2019, the Federal Tax Service reduced the share of suspicious transactions within the system of VAT-2 to 0.47%. This indicator is one of the best in the world [5].

The Federal Tax Service of Russia provides taxpayers with secure access to personal tax information, as well as services, regardless of the taxpayers' location. Now through their personal accounts, taxpayers have the opportunity to communicate contactless with the tax authorities from anywhere in 24/7 mode. Switching to the remote interaction between tax authorities and taxpayers allows abandoning the printed form of documents. The Federal Tax Service of Russia has joined the Common Data Transmission System (CTS) of the OECD, which will technically ensure the automatic exchange of information with foreign partners. The information obtained via the CTS will allow detecting the presence of undeclared foreign financial accounts and assets, as well as comparing information provided by Russian citizens on controlled foreign companies (CFC).

Despite the large-scale and rapid digitalization of the taxation sphere, the most common problem still remains the lack of stable access to channels of information and

communication interaction in individual localities. The application of Big Data technologies in the field of taxation determines the tax risks affecting the information security of participants in tax relations. Goncharenko, Malkova, and Advocatova noted the importance of tax risks for individuals and legal entities in the new digital environment [7]. In this regard, it is necessary to improve the system for protecting user's data, completely abandon foreign software, switching to the cooperation with Russian manufacturers.

5   Conclusion

Recently, the Federal Tax Service of Russia has become a source of information for analytical databases. The breakthrough technologies applied in the field of taxation include Big Data and its real-time analytics. Big Data technologies open up new opportunities for tax authorities not only to analyze and improve the efficiency of tax administration, but also to interact with taxpayers. At the same time, there are technological challenges associated with information processing. As a result, there is a need to modernize the software and develop new analytical tools. The use of Big Data technologies will bring a number of significant effects such as: reducing the shadow sector of the economy, increasing transparency of relations between the state and society, comfortable working conditions and reducing the administrative burden. Effective operation of the tax system in the context of a huge increase in the volume of tax information is possible thanks to the use of Big Data technologies for storing, processing and analyzing an information array.

References

1. Afanasenko, I.D., Borisova, V.V.: Digital Logistics. Peter, Saint Petersburg (2018)
2. Bazanova, E.: The Federal tax service has studied the tax technologies of other countries. Vedomosti (2017). https://www.vedomosti.ru/economics/articles/2017/04/25/687343-fns-tehnologii. Accessed 21 Apr 2020
3. BCG: Digitalization as a paradigm change: Interview with A. Marey (2019). https://www.bcg.com/ru-ru/about/bcg-review/digitalization.aspx. Accessed 23 Apr 2020
4. Dutch Digitalisation Strategy. Ministry of economic affairs and climate policy, 06 June 2018 (2018). http://www.government.nl/documents/reports/2018/06/01/dutch-digitalisation-strategy. Accessed 21 Apr 2020
5. Federal Tax Service: Daniil Yegorov summed up the work of the tax authorities in 2019 (2019). https://www.nalog.ru/rn63/news/activities_fts/9611238/. Accessed 21 Apr 2020
6. Gnatyshina, E.V., Salamatov, A.A.: Digitalization and formation of digital culture: social and educational aspects. Bull. Chelyabinsk State Pedagogical Univ. **8**, 19–24 (2017)
7. Goncharenko, L.I., Malkova, Yu.V., Advocatova, A.S.: Current problems of the tax system in the digital economy. Econ. Taxes Pravo **2**, 166–172 (2018)
8. Karr, D.: Report IBM Big Data brings marketing big numbers (2012). https://martech.zone/ibm-big-data-marketing/. Accessed 21 Apr 2020
9. Larkin, J.: HR digital disruption: the biggest wave of transformation in decades. Strateg. HR Rev. **16**(2), 55–59 (2017)

10. Lynch, C.: How can technologies that open up opportunities to work with large amounts of data affect the future of science? Nature **455**(7209) (2008). https://www.nature.com/nature/volumes/455/issues/7209. Accessed 21 Apr 2020
11. Plotnikov, V.A.: Digitalization of production: theoretical essence and prospects of development in the Russian economy. Izvestiya St. Petersburg State Univ. Econ. **4**(112), 16–24 (2018)
12. Reese, H.: Understanding the differences between AI, machine learning, and deep learning. Tech Republic (2017). https://www.techrepublic.com/article/understanding-the-differences-between-ai-machine-learning-and-deep-learning/. Accessed 21 Apr 2020
13. Tapscott, D., Tapscott, A.: Blockchain Revolution: How the Technology Behind Bitcoin is Changing Money, Business, and the World. Portfolio: Penguin, London (2016)
14. Vartanova, E.L., Vyrkovsky, A.V., Smirnov, S.S., Makeenko, M.I.: Industry in the Russian Media: The Future is Digital: Academic Monograph. Mediamir, Moscow (2017)
15. Yudina, T.N., Tushkanov, I.M.: Digital economy through the prism of economic philosophy and political economy. Philos. Manag. **1**(109), 193–201 (2017)

Identification Ramsay Curve Total Instrumental Variables

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Abstract. Logistics curves are widely used in various fields of economics, technology, biology, chemistry. Estimating the parameters of logistic trends from the results of observations of the dynamic process in the economic system, with the aim of the reliable analysis of economic indicators and predicting their future behavior, is one of the main tasks in the economy. One of the logistic models is the Ramsay function. The advantage of this function is the ability to use a linear difference equation to estimate its parameters. At the same time, non-linear data transformations are not required for the logistics functions of Ferhulst or Gompertz. A two-step algorithm based on the method total instrumental variables is proposed for estimating the parameters of the Ramsay curve. To improve the numerical stability of the solution, augmented systems of equations are used. Tests showed that the accuracy of the proposed estimate of parameters is higher than that of the estimate obtained using the least squares (LS) method.

Keywords: Instrumental variables · Logistic curve · Ramsay function · Total least square

1 Introduction

In the mathematical description of dynamic processes in various fields of technology, biology, chemistry, economics, logistic functions (logistic curves, logistic trends, logisticians) are widely used [7, 9, 11]. The problem of increasing the accuracy of the parametric identification of dynamic processes described by logistic functions is the most important problem for applied mathematics, an effective solution of which is possible based on statistical methods for processing the results of observations.

Estimating the parameters of logistic trends from the results of observations of the dynamic process in the economic system, with the aim of the reliable analysis of economic indicators and predicting their future behavior, is one of the main tasks in the economy [4, 8]. Various models are used to describe the logistic dynamics, for example, the Ferhulst (Pearl-Reed) model, the Gompertz function, etc.

2 Methodology

One of the logistic models is the Ramsay function [5], which depends on two parameters A and b. The advantage of this function is the ability to use a linear difference equation to estimate its parameters. At the same time, non-linear data transformations are not required as for the logistics functions of Ferhulst or Gompertz:

$$y_i = A(1 - (1 + b \cdot T_i)\exp(-b \cdot T_i)) + \xi_i, \tag{1}$$

where $T_i = i \cdot \Delta t$ and Δt is a sampling interval.

An efficient identification technique for short-range samples is expressing Eq. (1) as a linear difference equation based on Z-transform tools [2, 6]. Since expression (1) contains a constant coefficient, we will write a difference equation with first-order differences for

$$z_i - z_{i-1} = c_1(z_{i-1} - z_{i-2}) + c_2(z_{i-2} - z_{i-3}),$$

$$y_i = z_i + \xi_i, \tag{2}$$

where $c_1 = 2\exp(-b \cdot \Delta t)$ and $c_2 = -0.25c_1^2$.

The generalized error for the model (8) can be written as

$$\varepsilon_i = \xi_i - \xi_{i-1} - c_1(\xi_{i-1} - \xi_{i-2}) - c_2(\xi_{i-2} - \xi_{i-3}) \tag{3}$$

The use of the ordinary least squares method does not allow consistent estimates of parameters to be obtained for Eq. (3) because of the autocorrelation in the generalized error ε_i.

We use the extended instrumental variables method [3, 10] to find estimates of parameters vector $\hat{c}$

$$\left(\frac{1}{N}\sum_{i=1}^{N}\psi_i\varphi_i^T\right)c = \left(\frac{1}{N}\sum_{i=1}^{N}\psi_i y_i\right) \Leftrightarrow \hat{R}_{\psi\varphi}c = \hat{r}_{\psi y}, \tag{4}$$

where

$$\hat{R}_{\psi\varphi} = \frac{1}{N}\sum_{i=1}^{N}\psi_i\varphi_i^T, \; \hat{r}_{\psi y} = \frac{1}{N}\sum_{i=1}^{N}\psi_i y_i,$$

$$\varphi_i = \begin{pmatrix} y_{i-1} - y_{i-2} & y_{i-2} - y_{i-3} \end{pmatrix}^T,$$

$$\psi_i = \begin{pmatrix} y_{i-4} - y_{i-5} & y_{i-4} - y_{i-5} & \cdots & y_{i-20} - y_{i-21} \end{pmatrix}^T.$$

Since Eq. (4) contains the covariance estimates, we will seek a solution based on the total least squares method

$$\min_{c} \frac{\left\|\hat{r}_{\psi y} - \hat{R}_{\psi\varphi}c\right\|_2^2}{1 + c^T c}, \tag{5}$$

The criterion minimization (5) can be based on a solution to a biased normal system.

$$\hat{c} = \left(\hat{R}_{\psi\varphi}^T \hat{R}_{\psi\varphi} - \sigma^2 I \right)^{-1} \hat{R}_{\psi\varphi}^T \hat{r}_{\psi y}, \tag{6}$$

$\sigma = \sigma_{\min}\left(\hat{R}_{\psi\varphi}, \hat{r}_{\psi\varphi} \right)$ is the minimal singular value for the matrix $\left(\hat{R}_{\psi\varphi}, \hat{r}_{\psi\varphi} \right)$.

The summand $(-\sigma^2)$ in expression (6) makes it impossible to calculate $\hat{c}$ with efficient numerically stable methods that do not involve first forming the matrix $\hat{R}_{\psi\varphi}^T \hat{R}_{\psi\varphi} - \sigma^2 I$.

In paper [12] proposes using an augmented system that is equivalent to the biased normal system:

$$\begin{pmatrix} I & 0 & \hat{R}_{\psi\varphi} \\ 0 & I & j\sigma \\ \hat{R}_{\psi\varphi}^T & j\sigma & 0 \end{pmatrix} \begin{pmatrix} \upsilon \\ \upsilon_\xi \\ \hat{c} \end{pmatrix} = \begin{pmatrix} \hat{r}_{\psi\varphi} \\ 0 \\ 0 \end{pmatrix}. \tag{7}$$

System (7) is solvable with standard methods for solving linear algebraic equation systems – for example, with LU decomposition.

Using the estimate of $\hat{c}$, we can find an estimate for $\hat{b}$:

$$\hat{b} = -\frac{1}{\Delta t} \ln(0.5 c_1) \text{ or} \tag{8}$$

$$\hat{b} = -\frac{1}{\Delta t} \ln(0.25(c_1 + 2\sqrt{-c_2})). \tag{9}$$

Estimates of the parameter $\hat{A}$ can be found as a solution to the normal system of equations:

$$\hat{A} = \left(\Phi_A^T \Phi_A \right)^{-1} \Phi_A^T Y_A,$$

$$\Phi_A = \begin{pmatrix} 1 - \left(1 + \hat{b} \cdot T_1\right) \exp(-\hat{b} \cdot T_1) \\ \vdots \\ 1 - \left(1 + \hat{b} \cdot T_N\right) \exp(-\hat{b} \cdot T_N) \end{pmatrix}, \quad Y_A = \begin{pmatrix} y_1 \\ \vdots \\ y_N \end{pmatrix}.$$

Björck [1] proposes using the augmented system that is equivalent to the normal system:

$$\bar{\Phi}_A \bar{A} = \bar{Y}_A, \tag{10}$$

$$\bar{\bar{\Phi}}_A = \begin{pmatrix} kI & \Phi_A \\ \bar{\Phi}_A^T & 0 \end{pmatrix}, \quad \bar{A} = \begin{pmatrix} k^{-1}r \\ A \end{pmatrix}, \quad \tilde{d} = \begin{pmatrix} \hat{r}_{\psi y} \\ 0 \end{pmatrix}, \quad k_2 = \frac{\sqrt{2}}{\mu_{\min}}.$$

$\mu_{\min}$ is the minimum eigenvalue of the matrix $\Phi_A^T \Phi_A$.

3   Results

The proposed identification algorithms of total instrumental variables were run in MATLAB and compared with the algorithms that estimate autoregression parameters in the first step of the least-squares technique [8].

We used the determination coefficient

$$R^2 = 1 - \frac{\sum_{i=1}^{N} (y_i - \hat{z}_i)^2}{\sum_{i=1}^{N} (y_i - E[y_i])^2}$$

and the relative mean-square error of parameter estimation

$$\delta c = \sqrt{\frac{\|\hat{c} - c\|^2}{\|c\|^2}} \cdot 100\%$$

as quality indicators for the model.

The Ramsay curve is given by the equation

$$y_i = 2(1 - (1 + 0.05 \cdot T_i) \exp(-0.05 \cdot T_i)) + \xi_i, \tag{11}$$

Difference equation corresponding to the Ramsay curve (11)

$$z_i - z_{i-1} = 1.9025(z_{i-1} - z_{i-2}) - 0.9048(z_{i-2} - z_{i-3}),$$

$$y_i = z_i + \xi_i.$$

The number of observations is $N = 100$ the sampling interval is $\Delta t = 1$.

$\{\xi_i\}$ is a Gaussian distributed sequence with zero mean and standard deviation $\sigma_\xi = 10^{-4}$.

The results of a computational experiment are presented in Table 1 and Fig. 1.

Table 1. The results of the identification of the model (10).

	c_1	c_2	$\delta c, \%$	b_1	A	R^2
TRUE	1.9025	−0.9048	–	0.05	2	1.00
LS	1.8333	−0.8357	4.64	0.0870	1.633	0.888
TLS	1.9046	−0.9070	0.15	0.0489	2.022	0.969

Source: author.
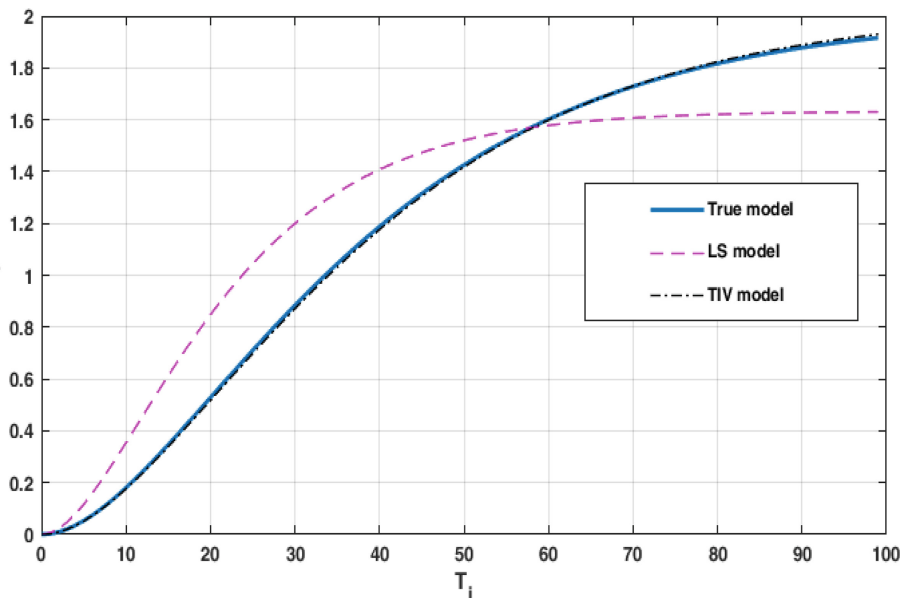
Fig. 1. The results of the identification of the model (10) (Source: author).

4 Discussion

In this paper, we propose an algorithm for estimating the parameters of the Ramsay curve based on the method of total instrumental variables. The advantage of the proposed method is better noise immunity compared to the least squares method [8]. A further area of research may be the construction of an algorithm that takes into account the quadratic relationship of the parameters of the difference equation. The development of regularized algorithms [13, 14] for estimating Ramsay curve parameters is also an urgent task.

5 Conclusion

The method proposed in the article allows one to evaluate the parameters of the Ramsay curve at a higher noise level than the least squares method. The proposed algorithm can improve prediction accuracy in many economic applications using S-curves. The proposed method also shows the best results in the case of an inaccurate model. The use of instrumental variables makes it possible to obtain high accuracy of parameter estimates on short data. This is because instrumental variables do not require knowledge and estimation of the correlation function of the prediction error. The algorithm can be generalized to the case of colored noise by an appropriate choice of the vector of instrumental variables.

References

1. Björck, Å.: Iterative refinement of linear least squares solutions. BIT Numer. Math. **7**, 257–278 (1967). https://doi.org/10.1007/BF01939321
2. Ivanov, D.V., Chertykovtseva, N.V., Terekhova (Zharkova), A.A., Andreeva, E.A.: Identification of exponential trend models with fractional white noise. In: Journal of Physics Conference Series, vol. 1368, p. 042061 (2019). https://doi.org/10.1088/1742-6596/1368/4/042061
3. Ivanov, D.V., Sandler, I.L., Kozlov, E.V.: Identification of fractional linear dynamical systems with autocorrelated errors in variables by generalized instrumental variables. IFAC-Papers-OnLine **51**(32), 580–584 (2018). https://doi.org/10.1016/j.ifacol.2018.11.485
4. Ivanov, D.V., Tikhomirov, E.A., Nazarenko, E.B., Andreeva, E.A., Ilmushkin, A.G., Grygoryants, I.A.: Innovation growth: mathematical modeling and forecasting. In: Vihman, V.V. (ed.) Humanities and Social Sciences: Novations, Problems, Prospects. Advances in Social Science, Education and Humanities Research, vol. 333, pp. 700–704. Atlantis Press, Paris (2019). https://doi.org/10.2991/hssnpp-19.2019.133
5. Ramsay, J.O.: A comparative study of several robust estimates of slope, intercept and scale in linear regression. J. Am. Stat. Assoc. **72**(359), 608–615 (1977). https://doi.org/10.1080/01621459.1977.10480624
6. Refaat, E.A.: Lecture Notes on Z-Transform. Lulu Press, Morrisville (2005)
7. Semenichev, V.K., Kurkin, E.I., Semenichev, E.V., Danilova, A.A., Fisun, G.A., Kasatkina, E.I.: Non-renewable recourses life cycles modeling aspects. Procedia Comput. Sci. **65**, 872–879 (2015). https://doi.org/10.1016/j.procs.2015.09.046
8. Semenychev, V.K., Korobetskaya, A.A., Kozhukhova, V.N.: Proposals of Econometric Tools for Modeling and Forecasting Evolutionary Processes: Monograph. SAGMU, Samara (2015)
9. Shields, L.B., Gertz, T.A., Wilson, K.C., Figg, G.L., Hester, S.T., Honaker, J.T.: The S-curve discontinuity theory predicts the path towards a "well" society and increased longevity. Med. Hypotheses **121**, 99–102 (2018). https://doi.org/10.1016/j.mehy.2018.09.006
10. Söderström, T.: A generalized instrumental variable method for errors-in-variables. Automatica **47**(8), 1656–1666 (2011). https://doi.org/10.1016/j.automatica.2011.05.010
11. Tomić, D.: Empirical evidence of an S-curve in croatia. Ekonomska Istraživanja **32**(1), 2212–2230 (2019). https://doi.org/10.1080/1331677X.2019.1645718
12. Zhdanov, A.I., Shamarov, P.A.: Direct projection method in the problem of complete least squares. Autom. Remote Control **61**(4), 610–620 (2000)
13. Golub, G., Hansen, P., O'Leary, D.: Tikhonov regularization and total least squares. SIAM J. Matrix Anal. Appl. **21**(1), 185–194 (1999). https://doi.org/10.1137/S0895479897326432
14. Zhdanov, A.I.: Regularization of unstable finite-dimensional linear problems based on augmented systems. Comput. Math. Math. Phys. **45**(11), 1845–1853 (2005)

Small Business in the Regions of Russia: Statistical Analysis and Modeling

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Abstract. The article is aimed to analyze the dynamics of small business development in the Russian Federation. The study offers an econometric model for small business development in the RF regions based on preliminary distribution of regions into homogeneous groups. The study follows statistical and econometric design. Small enterprises turnover is analyzed as one of the major indices of small business operational activity. The dynamics of the RF small enterprises turnover for 2005–2018 is explored. The econometric *ARIMA* (1, 1, 0) model is constructed and point and interval forecasts are made. The impact of socio-economic indicators on small business development in the RF regions is also studied for 2018. Cluster analysis was applied to break down multidimensional statistical data into homogeneous groups of regions (clusters). Regression models of small business turnover were constructed for every cluster. The hypothesis, that there is a regional differentiation in small business development, is proved. The constructed models demonstrate relevant explanatory power and can be applied to the analysis of small business, e.g. in the sphere of investment and state support issues, and to forecasting.

Keywords: Cluster analysis · Econometric model · Forecast · Small business · Small enterprises turnover · Sustainability

1 Introduction

Small business sector is an important and integral part in economic system of any country. Small business contributes to increasing employment, creating a competitive environment, affects the innovative activity of economic entities, and responds quickly to consumer demand, which affects the well-being of the society at whole. Assessing the sustainability of small businesses [10], various tools and methods of such assessment are always of great relevance.

Updated IT operating model is now a prerequisite for successful operation of a small enterprise. It ensures business's sustainable development and competitiveness when entering the digital economic system. This allows managers to continuously monitor the company's activities, reduces the time for making management decisions, and makes it possible to forecast the economic indicators of the market. Information technologies are used for collecting, processing, analyzing, and systematizing statistical data about an enterprise. IT is also applied to modeling and forecasting the results of business activities [6, 11]. In this study, information technologies for sustainable

development of small businesses are defined as an environment for the implementation of mathematical, statistical and econometric methods to study enterprise performance indicators and their relationships.

Researchers have treated small business issues in much detail. They are reflected in a number of modern studies. The papers that consider the statistical-econometric approach to small business problems differ in the statistical methods used [3, 5, 8, 12], in model types [7, 9, 13, 15], and in analyzed indicators [1, 4, 14].

The purpose of this paper is to analyze the dynamics of small business development in the Russian Federation, as well as to econometrically model the level of small business development by regions of the Russian Federation with a preliminary classification of regions to obtain homogeneous groups.

2   Methodology

Small enterprises turnover indicates the efficiency of small business operational activity in the Russian Federation. The results of small business operation depend on the state of the country's economy as a whole, on the values of its socio-economic indicators that reflect the degree of small businesses activity.

In this study the RF small business was analyzed in two stages. First, on the basis of official statistics [2] the dynamics of turnover of small enterprises in Russia from 2005 to 2018 was investigated. The econometric model of turnover time series was constructed and the forecast for 2019–2020 was made.

Next, the RF regions were analyzed separately. The regions were grouped according to certain socio-economic indicators and the econometric model was constructed for each regional group. For this, various factors, that reflect the level of economic development of regions, indicators of industry, construction activity, trade, education and employment, were considered. The turnover of small enterprises, which is seen as one of the major enterprise operation characteristics, was chosen as a effective feature (explained variable). As a result, the set of following indicators was selected:

Y – small enterprises turnover (billion rubles);
X_1 – gross regional product (GRP) (million rubles);
X_2 – monthly average per capita income (rubles);
X_3 – the volume of own production shipped goods, work and services regionally performed (mining, manufacturing, electricity, gas and water production and distribution) (million rubles);
X_4 – retail turnover (million rubles);
X_5 – the number of vocational secondary education institutions (institutions);
X_6 – the proportion of 15–72 years old in labor force (labor force sample study data) (%);
X_7 – labour requirements from employers to employment agencies (people);
X_8 – commissioning of residential and nonresidential buildings (total area) (thousand square meters);
X_9 – the volume of fee based service (million rubles).

80 regions of the Russian Federation were selected for analysis. After Grubbs' test the regions with the surge indicators (discordant observations) were excluded from the sample, namely Moscow, St. Petersburg, Moscow *oblast*, as well as the Nenets and Chukotka Autonomous *okrugs*.

The regional information array of the study was formed on the basis of official data [2]. It represents statistical data on selected indicators for the regions of the Russian Federation for 2018 (the sample represents 80 observations for ten indicators). The methodology used in this study complies methods of multidimensional object classification (cluster analysis) and methods of econometric modeling. Information processing, calculations, and analysis were performed using Excel, Statistica, and Gretl programs.

3 Results

3.1 Dynamics Analysis and Forecast of Small Enterprises Turnover

The dynamics of changes in the turnover of small enterprises in the Russian Federation from 2005 to 2018 is shown in Fig. 1. During this period, on average, there was an increase (although uneven) in the turnover of small enterprises in the Russian Federation. It was especially noticeable in the period from 2015 to 2018. Over these 14 years, the value of this indicator increased by more than 5,5 times.
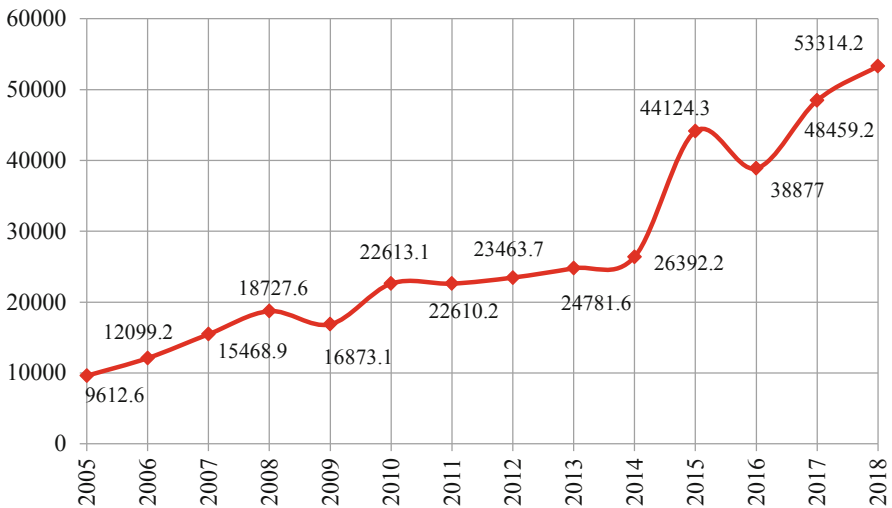
Fig. 1. The dynamics of the RF small enterprises turnover for 2005–2018 (in bln. rub.) (Source: author based on [2]).

To forecast the turnover of small enterprises in the Russian Federation, an econometric model of this indicator (*Y*) was built based on statistical data from the study period (14 observations). The model of autoregression and integrated moving

average of the first order *ARIMA* (1, 1, 0) was optimal for the time series of this indicator (according to Akaike and Schwarz information criteria). The results of the model parameters estimation are presented in Table 1.

Table 1. Model parameters estimation (1)

Variable	Parameter estimate	Standard error	z-statistics	p-value
const	3345,34	888,241	3,7663	0,0002
ΔY_{t-1}	−0,483635	0,225745	−2,1424	0,0322

Source: author.

Thus, time series of the RF small enterprises turnover takes the form of:

$$\Delta Y_t = 3345,34 - 0,48\Delta Y_{t-1} \tag{1}$$

Estimates of the constructed model parameters are statistically significant on 5%-level of significance. It was found that the model residues (1) are stationary (according to the Dickey–Fuller test, the observed value was $t = -3,28$ at p-value equal to 0,03998). There is no autocorrelation of residues (according to the analysis of the autocorrelation (ACF) and private autocorrelation (PACF) functions of residues of the model). The point and interval forecast of small business turnover for 2020 was calculated with the constructed model. According to the calculations, in 2019, the turnover of small businesses in the Russian Federation averaged 55929,4 billion rubles, and in 2020-might average 59627,9 billion rubles. It can be expected with 95% confidence, that in 2020, the turnover will be from 4941,3 to 69842,5 billion rubles. Thus, the turnover of small enterprises in the Russian Federation will continue to grow.

3.2   The RF Regions Grouping and Econometric Modeling

It is important to take into account that enterprises of different industries operate in different regions of Russia and that small businesses in most cases have a closed cycle in a particular region. Consequently, the impact of socio-economic factors on the results of economic activity of small businesses throughout the Russian Federation should be analyzed at the regional level.

While studying the Y dependence (small enterprise turnover) from the factors $X_1,\ldots, X_9$, we hypothesized that the factors under study for different homogeneous regional groups could influence the Y differently. That was proved by the results obtained. Therefore, before econometric modeling, first the entire array of data (for ten indicators) was divided with cluster analysis method into homogeneous (in a statistical sense) groups (clusters). Next, econometric models were constructed separately for each cluster.

Hierarchical methods of cluster analysis were used to divide the analyzed set of regions into homogeneous groups, namely the full link method, the unweighted and weighted pairwise average methods, the Ward method, and the iterative clustering method – k-means method [14].

The results of regional grouping with different hierarchical methods in dendrograms, allowed estimating the quality and approximate structure of clusters obtained. Based on these results the number of clusters was set in *k*-means method $k = 3$. The regional structure and number of regions by cluster is shown in Table 2.

Table 2. Classification of regions with *k*-means method

Cluster number	Number of regions	Cluster structure (regions)
1	14	*Oblast:* Rostov, Nizhny Novgorod, Samara, Sverdlovsk, Tyumen, Chelyabinsk, Novosibirsk, Kemerovo. *Republic:* Tatarstan, Bashkortostan. *Territory:* Krasnodar, Perm, Krasnoyarsk, Primorsky
2	27	*Oblast:* Belgorod, Vladimir, Voronezh, Ivanovo, Kaluga, Lipetsk, Tula, Yaroslavl, Arkhangelsk, Vologda, Kaliningrad, Leningradskaya, Volgograd, Orenburg, Saratov, Irkutsk, Omsk, Tomsk, Sakhalin. *Republic:* Komi, Dagestan, Udmurtia, Sakha (Yakutia). *Territory:* Altai, Stavropol, Khabarovsk, Khanty-Mansi Autonomous *Okrug*
3	39	*Oblast:* Bryansk, Kostroma, Kursk, Oryol, Ryazan, Smolensk, Tambov, Tver, Murmansk, Novgorod, Pskov, Astrakhan, Kirov, Penza, Ulyanovsk, Kurgan, Amur, Magadan. *Republic:* Karelia, Adygea, Kalmykia, Crimea, Ingushetia, North Ossetia-Alania, Karachay-Circassian, Mari El, Chechen, Mordovia, Chuvash, Kabardino-Balkarian, Altai, Buryatia, Tyva, Khakassia. *Territory:* Transbaikal, Kamchatka. Jewish Autonomous Oblast, Yamalo-Nenets Autonomous *Okrug*. Sevastopol

Source: author.

The average values of indicators throughout three clusters and for comparison throughout Russia (without excluded regions) are demonstrated in Table 3.

As it can be seen from the table, the average values of the regions in the 1st cluster are much higher than the average values of the corresponding indicators in Russia (except X_5, X_6). The regions in the 2nd cluster have average values of indicators closer to the average for Russia (but still exceed them), and the indicators of the regions of the largest 3rd cluster have average values below the average values for Russia. The highest level of economic development is observed in the regions of the first two clusters. Thus, the information array of initial data on the considered indicators was divided into three homogeneous groups of regions. For each group (cluster), econometric models were constructed to determine the impact of socio-economic factors (X_1, ..., X_9) on the effective feature – the turnover of small enterprises (Y).

First, the matrices of paired correlation coefficients built in each cluster analyzed. As a result, multicollinearity was eliminated and factors that do not have a significant impact on Y were excluded.

Table 3. Average values of indicators

Indicators	Cluster 1	Cluster 2	Cluster 3	Russia (80 regions)
Y	1023,2	389,7	142,5	384,6
X_1	1337002,7	766428,8	280397,1	636629,2
X_2	29051,2	27980,3	24655,6	27259,7
X_3	1571999,4	836592,4	242638,7	685157,3
X_4	704675,1	300140,1	128839,4	290595,8
X_5	29,3	30,3	18,9	24,7
X_6	68,1	68,3	67	67,7
X_7	35031,6	16300,9	7858,3	15638,2
X_8	3096,8	1366,7	573,3	1292,6
X_9	218349	85792,2	36194,3	85727,9

Source: author.

Different models of paired and multiple linear dependence of small business turnover (Y) on the analyzed explanatory variables were constructed for each cluster. The best model was selected based on the analysis of the model quality characteristics, namely the determination coefficient R^2, the adjusted determination coefficient $\bar{R}^2$, the standard error of the regression residues S_e, and the observed value of the F-statistics. Parameter estimates and statistical characteristics of model quality for three clusters are shown in Tables 4, 5, 6 and 7.

Table 4. Parameters estimates and statistical properties of the model quality (Cluster 1)

Variable	Parameter estimate	Standard error	t-statistics	p-value
Const	−3690,79	1908,56	−1,934	0,0793
X_4	0,000775484	0,000228052	3,400	0,0059
X_6	61,2229	27,8522	2,198	0,0502
$R^2 = 0{,}6531$; $\bar{R}^2 = 0{,}590$; $S_e = 356{,}6254$; $F = 10{,}3547$				

Source: author.

The models for the dependence of the turnover of small enterprises (Y) on the following explanatory variables: (X_1), (X_1, X_6), (X_4), (X_4, X_6), (X_9), were constructed for the 1st cluster regions. When comparing the quality indicators of the constructed models, the model with variables (X_4, X_6) was selected. The parameters estimates, which were found, are statistically significant (the critical value $t(0,1;11) = 1,7959$), so is the model (the critical value F $(0,1;2;11) = 2,8595$) on 10% level of significance (Table 4). The model residues were checked for heteroscedasticity. The White test (p-value $= P(\chi^2(5) > 3,4142) = 0,6364$) and the Breusch-Pagan test (p-value $= P(\chi^2(2) > 1,7209) = 0,4229$) demonstrated homoscedasticity of the model residues.

Table 5. Parameters estimates and statistical properties of the model quality (Cluster 2)

Variable	Parameter estimate	Standard error	t-statistics	p-value
Const	84,3100	57,9505	1,455	0,1587
X_4	0,000515328	0,000178612	2,885	0,0081
X_7	0,00924611	0,00242380	3,815	0,0008
$R^2 = 0,5903$; $\bar{R}^2 = 0,5562$; $S_e = 101,8507$; $F = 17,2899$				

Source: author.

Table 6. Parameters estimates and statistical properties of the mel quality after heteroscedasticity elimination (Cluster 2)

Variable	Parameter estimate	Standard error	t-statistics	p-value
Const	86,6117	62,2360	1,392	0,1768
X_4	0,000403965	0,00013679	2,953	0,0012
X_7	0,0113968	0,00269981	4,221	0,0003
$R^2 = 0,6344$; $\bar{R}^2 = 0,6039$; $S_e = 2,5025$; $F = 20,8228$				

Source: author.

Table 7. Parameters estimates and statistical properties of the model quality (Cluster 3)

	Parameter estimate	Standard error	t-statistics	p-value
Const	−7,4941	17,0141	−0,4405	0,6622
X_4	0,00078	0,00016	4,875	<0,0001
X_8	0,0874	0,0253	3,455	0,0014
$R^2 = 0,7547$; $\bar{R}^2 = 0,7410$; $S_e = 48,8346$; $F = 55,3659$				

Source: author.

Thus, for Cluster 1 the small enterprises turnover model takes the form of:

$$\hat{Y} = -3690,79 + 0,00078X_4 + 61,22X_6 \tag{2}$$

The determination coefficient shows that the variation in the turnover of small businesses (Y) by an average of 65,31% is due to the variation of the factors included in the equation (retail trade turnover (X_4) and the level of 15–72 aged participation in the labor force (X_6)).

For Cluster 2 the models with the following explanatory variables were constr (X_4, X_7), (X_4), (X_7), (X_8), (X_8, X_9). The set of (X_4, X_7) provided the best model. The estimates of Cluster 2 model parameters (other than the absolute term of the equation) are statistically significant (the critical value $t(0,1;24) = 1,7109$), the model is also statistically significant (the critical value $F(0,1;2;24) = 2,5383$) on 10%-level of significance (Table 5).

Thus, for Cluster 2 the model takes the form of:

$$\hat{Y} = 84,31 + 0,0005X_4 + 0,009X_7 \tag{3}$$

According to the White test, the model (3) showed heteroscedasticity (p-value = $P(\chi^2 (5) > 5{,}3897) = 0{,}0097$), and the opposite result was demonstrated according to the Breusch-Pagan test (p-value = $P(\chi^2 (2) > 10{,}2904) = 0{,}3492$). After eliminating heteroscedasticity using generalized least squares estimation, the model (3′) was obtained, which has all the standard errors reduced and the quality characteristics improved (Table 6).

Thus, after the elimination of heteroscedasticity, the following econometric m small enterprises turnover in Cluster 2 was performed:

$$\hat{Y} = 86,61 + 0,0004X_4 + 0,011X_7 \tag{3'}$$

The coefficient of determination shows that the variation in the turnover of small enterprises by an average of 63,44% is explained by the variation of the factors included in the equation. The effective feature (Y) in the regions of the second cluster is significantly affected by the retail turnover (X_4), as well as the need for employees declared by employers to the employment agencies (X_7).

The best model for Cluster 3 was selected among models with the following set of explanatory variables: (X_4, X_8), (X_4), (X_5 X_7), (X_5 X_8), (X_7), (X_7, X_9). Among them the model with the variables (X_4, X_8) was selected. The results of its estimation are given in Table 7. The estimates of Cluster 3 model parameters (other than the absolute term of the equation) are statistically significant (the critical value $t(0,05;36) = 2,0281$), the model is also statistically significant (the critical value $F(0,05;2;36) = 3,2595$) on 5%-level of significance. The residues of the model were also tested for heteroscedasticity. Both White and Breusch-Pagan tests confirmed its absence.

Thus, for Cluster 3 the model takes the form of:

$$\hat{Y} = -7,49 + 0,00078X_4 + 0,087X_8 \tag{4}$$

The model 4 determination coefficient (4) shows that the variation in the turnover of small enterprises by an average of 75.5% is explained by the variation of the factors included in the equation. The effective feature in the cluster with the largest number of regions is determined by the retail turnover (X_4) and the total area of residential and non-residential buildings being put into exploitation (X_8).

Based on the models constructed for each cluster, the forecast of small enterprises turnover (Y) was made with the average values of the factors included in the corresponding models. Calculated forecast values in comparison with actual values (calculated in Table 3) are presented in Table 8.

The forecast values, which were obtained, do not differ significantly from the actual average Y values (for each cluster).

Table 8. Actual and forecast values of small enterprises turnover (Y) for each cluster

Cluster number	Model	Actual value	Forecast value
1	(2)	1023,2	1027,94
2	(3′)	389,7	385,98
3	(4)	142,5	143,10

Source: author.

4   Discussion

In Russia the small business sector represents one of the forms of economic activity with good prospects. The researchers pay great attention to this sector and assess its level of development. A number of papers address the problems of small business at the micro level. For example, in order to model the turnover of small enterprises, three-factor production functions of the dependence of turnover on the wages of employees, investments in fixed capital and the number of employees are estimated by Pinkovetskaya and Lebedev [9]. Malesios, Skouloudis, Dey, Abdelaziz, Kantartzis, Evangelinos use Bayesian regression modeling to assess the sustainable development of small and medium-sized businesses [7]. Sukhanova, Shirnaeva and Repina use binary choice models to reflect the financial sustainability of an enterprise [15].

The formation and development of small businesses in the Russian Federation is influenced by social and economic indicators of regional development. That is also reflected in a number of studies. Filonova and Bukreeva analyze the state of Russian regions by indicators of small and medium-sized businesses, using cluster analysis for grouping the regions [3]. Ermolina analyzes factors of innovative activity development in small industrial enterprises [1]. A comprehensive assessment of the state of small businesses in the Russian Federation is carried out using the Maximin method [5], and the principal components analysis is used [8]. Ignatova and Ignatov note a direct correlation between the positive dynamics of small business development and the volume of state subsidies [4].

In this study, the turnover of small businesses is considered as an indicator that reflects the level of development and efficiency and sustainability of small businesses in the regions of the Russian Federation. The study confirmed the hypothesis that socio-economic indicators have different effects on the turnover of small businesses in different groups of regions. This result confirms the need for a differentiated approach to tax policy, investment, and government support for small businesses.

The sustainable development of a small enterprise, along with other factors, is not possible without constant monitoring of its performance indicators, as well as temporary forecasting of crisis situations. Updated information technologies of data processing can be necessary tools here. Special software products for data analysis can be useful (SPSS, Statistica, Stata, Excel, EViews, Gretl, etc.).

5 Conclusion

The paper analyzes the dynamics for 2005–2018 and forecasts the turnover of small enterprises in the Russian Federation for the upcoming periods. Socio-economic indicators that affect the economic activity of small businesses in the regions of the Russian Federation are also identified. The regions under analysis were divided into three homogeneous groups (clusters). For each cluster econometric models were constructed for the indicator of the small business development level – the turnover of small enterprises. It is found that in each group of regions, the turnover of small enterprises is characterized by a different set of factors. Despite the fact that over the past 14 years, almost all regions of the Russian Federation have demonstrated fairly sustainable development of small businesses, the level of development in the regions of the first and second groups is higher. The models have a fairly good explanatory power and can be used for further analysis, e.g. in projects to stimulate small business activity in the regions of the Russian Federation, as well as for forecasting. The use of information technologies allows expanding the range of possible applications of statistical and econometric methods to analyzing and forecasting both the activities of small businesses and other organizations.

References

1. Ermolina, A.A.: Socio-economic characteristics of the region as determinants of innovation activity of small enterprises in Russia. Innov. Dev. Econ. **6**(42), 47–54 (2017)
2. Federal Service of State Statistics: Regions of Russia. Socio-economic indicators (2019). https://gks.ru/folder/210/document/13204. Accessed 19 Dec 2019
3. Filonova, E.S., Bukreeva, Y.V.: Analysis of the Central Federal district regions by indicators of small and medium-sized businesses. Bull. Financ. Univ. **6**(78), 35–47 (2013)
4. Ignatova, I.V., Ignatov, E.S.: Development of entrepreneurship in the region: drivers and problems. Econ. Soc. Changes-Facts Trends Forecast **10**(5), 143–157 (2017). https://doi.org/10.15838/esc/2017.5.53.10
5. Leonov, S.N.: Current state and the features of location of small business in regions of Russia. Econ. Soc. Changes-Facts Trends Forecast **11**(5), 103–119 (2018). https://doi.org/10.15838/esc.2018.5.59.7
6. Lu, H., Pishdad-Bozorgi, P., Wang, G., Xue, Y., Tan, D.: ICT implementation of small- and medium-sized construction enterprises: Organizational characteristics, driving forces, and value perceptions. Sustainability **11**(12), 3441 (2019). https://doi.org/10.3390/su11123441
7. Malesios, C., Skouloudis, A., Dey, P.K., Abdelaziz, F.B., Kantartzis, A., Evangelinos, K.: Impact of small- and medium-sized enterprises sustainability practices and performance on economic growth from a managerial perspective: modeling considerations and empirical analysis results. Bus. Strategy Environ. **27**(7), 960–972 (2018). https://doi.org/10.1002/bse.2045
8. Manukhina, A.V.: Analysis of the impact of socio-economic factors on the formation of small businesses in the regions of the Russian Federation. Bull. Univ. **3**, 172–177 (2012)
9. Pinkovetskaia, I., Lebedev, A.: Entrepreneurial capital and the volume of small enterprises production: Russian regions data. J. Dev. Entrepreneurship **24**(2), 1950013 (2019). https://doi.org/10.1142/S1084946719500134

10. Soto-Acosta, P., Cismaru, D.M., Vatamanescu, E.M., Ciochina, R.S.: Sustainable entrepreneurship in SMEs: a business performance perspective. Sustainability **8**(4), 342 (2016). https://doi.org/10.3390/su8040342
11. Spirina, S.G.: Information technologies for assessing the financial stability of enterprises (corporations). Inf. Resour. Russia **5**(147), 22–26 (2015)
12. Sukhanova, E.I., Shirnaeva, S.Y.: Different approaches to macroeconomic processes simulation and forecasting. Fundam. Res. **12**, 406–411 (2015)
13. Sukhanova, E.I., Shirnaeva, S.Y., Mokronosov, A.G.: Econometric models for forecasting of macroeconomic indices. Int. J. Environ. Sci. Educ. **11**(16), 9191–9205 (2016)
14. Sukhanova, E.I., Shirnaeva, S.Y., Konstantinova, E.O.: Statistical analysis and modeling of the influence of socio-economic factors on the level of small business development in the regions of the Russian Federation. Fundam. Res. **5**, 126–132 (2019). https://doi.org/10.17513/fr.42471
15. Sukhanova, E.I., Shirnaeva, S.Y., Repina, E.G.: Binary choice models-based assessment of company's financial sustainability. In: Mantulenko, V. (ed.) Proceeding of the International Conference «Problems of Enterprise Development: Theory and Practice 2018», SHS Web of Conferences, vol. 62, p. 13002. EDP Science, Les Ulis (2019)

Analytical Support of the Retailer's Purchasing Activity Security

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Abstract. Despite the crisis in the domestic economy, the reduction in the number of small and medium-sized enterprises, it is impossible not to notice the growing level of competition between different manufacturers. According to many experts, the rate of growth in the supply of goods today exceeds the growth of the population's welfare, and the margin of financial strength of most suppliers does not allow an adequate reduction in output, which provokes them to pursue an aggressive sales policy. Aggressive promotion of non-competitive products carries risks not only for the supplier, but also for the retailer. Offering customers products that do not have consumer value is a strategic mistake of any retailer, which is a significant risk to its economic security. The purpose of the study is to develop a methodology for determining the competitiveness of a retailer's suppliers based on the full range of information available from external and internal, accounting and non-accounting sources. The main methods used in the study were analysis, abstraction, modeling, and induction. The result of the study is to obtain a methodology that has a possibility of digitalization and implementation as a software product within the overall management system of the retailer's purchasing activity.

Keywords: Business analysis · Competitiveness analysis · Economic security · Management accounting · Sustainable development · Quality information

1 Introduction

The current state of the domestic retail market is characterized by a high share of large federal retail chains, and the introduction of information systems for which is not only a way to increase their competitiveness and to provide their sustainable development, but also a necessary condition for their survival. In addition, these economic entities have both the resources to develop and implement modern information technologies, and the scale to quickly repay investments in the development of information technologies [1].

Perhaps no management decision is made today without analyzing the activities of competitors. Competitive analysis is carried out both by the organization itself (its marketing and analytical services), and with the involvement of outsourcing consulting, marketing and analytical agencies. Recently, retailers have started to occupy a certain niche in providing competitive analysis services for product suppliers. The economic dictionary defines a retailer as a retail operator, a commercial organization that has a network of retail objects. In the Russian legal field, the concept of "retailer" is absent,

but it is appropriate to use the concept of "retail network", which implies a set of two or more retail objects belonging to one economic entity (several interdependent), or using the same means of individualization.

As for the analysis of the retailer's competitiveness, despite the apparent paradoxical nature of this situation, it turns out to be quite logical when examined in depth [8]. Thus, a retailer has a lot of practical experience and competence in the field of product sales, interacting with the end consumer. In addition, only he is the primary owner of an objective information and statistical database containing quantitative and qualitative data related to sales volumes, returns, defects, specifics of transportation and storage, customer loyalty to the brand of a particular manufacturer against the background of its competitors, etc. Close interaction of the retailer with suppliers reveals yet another aspect of the competitive struggle of manufacturers: the flexible sale strategy, the willingness to invest in channels to promote their products, reliability of construction of logistics channels – availability of all the declared products in warehouses to organize their delivery. Thus, the appearance on the market of consulting services of retail companies (or subsidiaries of these companies, which is especially important in the light of future changes in the field of legislation regulating trade activities) can significantly displace the positions held by consulting, marketing and analytical agencies in a number of areas, and is an indicator of increasing the level of domestic retail trade.

2 Methodology

To make adequate management decisions, a company needs to know almost everything about its competitors. Some methods of competitive analysis even provide for the preparation of psychological portraits of managers and senior managers of a competitor company, and the methods of obtaining information vary from customer surveys and analysis of open sources to bribery of the organization's staff, which raises the question of the ethics of the events. However, the scope of information submission should be determined not so much from the point of view of ethics (although this is important), but from the point of view of the legality of information collection and disclosure procedures.

In determining how to gather information for competitive analysis should be guided by the Federal laws "On accounting" and "On commercial secret" [3, 4]. Note that the purpose of this study is not to study the legal side of the issue concerning commercial secrets of an economic entity.

Summarizing the experience described in the periodical literature concerning accounting and record-keeping in organizations, we come to the conclusion that, despite the existence of a legal framework, business entities, in particular small and medium-sized enterprises, rarely take measures to protect their trade secrets (issuance of local acts; definition of a list of information related to trade secrets; conclusion of appropriate contractual relations with staff and third-party organizations), which contributes to its unpunished dissemination by both employees and contractors. But it is the protection of commercial information in the presence of an effective legal framework that should be the basis of information support for civilized competitive analysis

conducted by external organizations (including retailers), since, for example, the presence of facts of opening various types of legal proceedings significantly reduces the image component of any economic entity.

Taking all this into account, we have developed a method of competitive analysis recommended for consulting, marketing, analytical agencies, as well as retailers. Since the purpose of competitive analysis is to identify the real and potential advantages of the organization and its competitors, first of all, we will separate the concepts of the organization's competitiveness and product competitiveness. These concepts are interdependent, but we believe that the competitiveness of an organization consists of the competitiveness of its products is incorrect. Organization's competitiveness is based not only on the commercial success of its products, but also for proper formation of the business model, effective management of financial flows and financial condition, quality of management [14], potential development, etc. However, to underestimate the competitiveness of products should not, after all, generated the cash flow (revenues from sales) is the natural basis for the functioning of the business. Product competitiveness is a key, fundamental, but by no means the only factor of competitiveness, because the organization usually works with a wide range of products of different levels of competitiveness. Thus, the task of the proposed method is to form and analyze qualitative and quantitative characteristics of activities that are important for building sales activities. We believe that the information obtained during the analysis can be used as a separate information block when conducting a classic benchmarking analysis, which consists in comparing sales volumes, financial results, financial condition indicators, market capitalization, etc.

3 Results

The first information unit – analysis of organizational and legal information concerning the competitors – includes analysis of data about organizational-legal form, about the size of the share capital, number of founders (as potential possibilities of increasing the financial resources of the economic entity), changes in the governing body, the place of incorporation, types of activities, the presence of litigation, open enforcement proceedings, the availability of debt to budget and extrabudgetary funds. Access to this information is possible with the help of most information services, and their use and publication is not a disclosure of commercial secrets [4].

The analysis of this information block allows us to form assumptions about a number of fundamental aspects of the functioning of a business. In particular, among the important aspects, it is possible to highlight the following:

– number of founders. The presence of several founders may indicate greater or at least diversified financial support for the organization,
– personalities of the founders and the sole management body (head). The question of the emerging trend towards the emergence of the Institute of top management, the differentiation of ownership and disposal functions in business is becoming more and more relevant for Russian organizations, including small and medium-sized businesses. In relation to the methodology under consideration, it is assumed that if

the founder and the Director are the same person, then this organization is more mobile, prone to rapid strategic decision-making, but has less financial support. If there are several founders and a top Manager involved, it is possible to expect more professional tactical management against the background of slow, bureaucratic strategic decision-making. At the same time, personal characteristics of individuals are of great importance, information about which can be obtained from the media;
– "seriousness" of the business: the absence of a "mass" legal address and a "mass" Director; registration of the organization to the actual address of the office (production), and not to the home address of the Director (founder); a logically formed list of activities; the declared amount of authorized capital, etc.

We offer to analyze the information of this block in tabular form using the point system of evaluation (Table 1). The maximum number of points is 8. A positive conclusion on the indicators of this block is given when you set 4 points or more.

Table 1. Tabular representation of organizational and legal information analysis

Criterion	Value	
	0 points	1 point
Number of founders	1	More than 1
The founder and CEO are not the same person	Yes	No
Media coverage of personalities (CEO, founders)	Negative or absent	Positive or neutral
The use of "massive" legal address	Yes	No
Having a "mass" CEO	Yes	No
Compliance of the actual type of activity declared during the registration of a legal entity	No	Yes
Logic of forming a list of economic activities	Absent	Exist
Amount of authorized capital	Up to 50 thousand rubles	More than 50 thousand rubles

Source: author.

The second information block is information generated by the organization. This includes the official website of the organization, its presence on business portals ("Goods and services", "Pulse of prices" and their analogues), activity in social networks, advertising and media coverage.

At this stage, the competitive advantages of the business, its mission and goals, the originality of the idea underlying its operation, the scale of its activities (including in geographical terms) and possible prospects for development are revealed, which in most cases the organization does not hide, publishing information on finding new partners or scaling the business through franchising in its official resources. We suggest analyzing this information as shown in the Table 2.

Here, the maximum number of points is 6 a positive conclusion is issued if the score exceeds 2 points. The result of consideration of the presented information blocks

Table 2. Tabular representation of the information generated by the organization analysis

Criterion	Value	
	0 points	1 point
The adequacy of the mission and achievable goals	No	Yes
Scale*	Small and medium-sized businesses	Major business
Company web-site evaluation	Outdated. Does not meet modern requirements	Meets modern requirements (ease of navigation, timely updates, information, feedback, online payment, etc.)
Presence on business web-portals	No or in free mode	Availability of companies own page and paid services
Promotion in social networks	No	Yes
Regional development (own branches and representative offices or franchisees)	No	Yes

Source: author.
*According to [5].

is the formation of a certain background – qualitative characteristics of the organization's activities that form the basis for interpreting the results of the analysis of quantitative indicators. In addition, we recommend that all interested parties systematically analyze the submitted blocks of information as part of measures to verify the reliability of contractors.

The third block of information is product analysis [11]. Because the retailer gets the product to the end customer, then, as noted earlier, it has the most accurate data about the demand for a product by consumers and their loyalty to the brand and what the retailer knows about the properties and qualities of the product relevant to the shelf life (the actual time stated), etc.

In addition, the competitiveness of a product depends on the ability of its manufacturer to actively respond to emerging challenges, which may include:

– the need to eliminate the shortcomings identified in a particular batch of goods or in the product itself. Disadvantages may arise due to technical shortcomings or obsolescence, the appearance of new requirements from consumers;
– activity of competitors. Deep research of competitors activities is important, but not the only condition for winning the competition; however, the company must take into account the price-quality ratio of competitors products;
– working with the assortment. Updating the product range, eliminating items that are not in demand, and introducing competitive new products is one of the best ways to increase sales. Quality-price matching of the offer to demand increases the probability of purchasing this product, which is why it is important to identify and strengthen the position of a popular product, refusing to support products that are not in demand. The evaluation of the work with the assortment can be made using

the coefficient of updating the assortment series (Cua), based on the SKU (Stock Keeping Unit), that is, the assortment unit entered during the year (period):

$$Cua = SKUb/SKUe \qquad (1)$$

where
    SKUb – number of SKU at the beginning of the year (period);
    SKUe – number of SKU at the end of the year (period).

– the interpretation of this indicator is related to a detailed analysis. So, the value of the Cua close to zero indicates that there are no changes in the range, which can be considered as a lack of work with the range, but it can also indicate that the organization has selected the same range that is most in demand from customers and is competitive against the existing analogues;
– the ratio of the volume of return of the product to the volume of its delivery, estimated by the indicator Cr (return coefficient):

$$Cr = R/D, \qquad (2)$$

where
    R – return of the product for the year (period) (cost expression);
    D – the product delivered to the retailer for the year (period) (cost expression).

This indicator has a common basis with the previous one and is interesting because today the goal of most organizations (mainly dealers and distributors, who play an important role in organizing the supply of regional retailers) is not so much to deliver a demanded product as to "load" large batches. In this case, there is a financial interest: the implementation of sales plans is rewarded with bonuses from manufacturers, and the manufacturer gets the opportunity to save due to the economies of scale, distributing costs to a larger volume of products. The success of such events, as a rule, is not of a long-term nature and is contradicted by increasing the volume of return of unrealized products by the retailer. However, this practice is quite common and reflects the imperfection of the system of motivation of dealers and distributors;

– smoothness of logistics processes. Maintaining an optimal balance level is one of the key tasks of the retailer, which cannot be solved without an established supply process from suppliers. That is why the contracts with the retailer pay great attention to the organizational aspects of the product delivery process, and significant penalties are provided for their violation. It is possible to assess the smoothness of logistics processes through the quality of delivery indicator (Iqd):

$$Iqd = V/D, \qquad (3)$$

where
    V – number of cases of violation of the terms of delivery for the year (period);
    D – number of deliveries per year (period),

– marketing support. The activity of an organization in stimulating the sale of its products can be estimated in relation to the funds aimed at promoting the product

(FP), to the volume of deliveries of this product (D), expressed in terms of the promotion coefficient of the Cpr:

$$Cpr = FP/D \qquad (4)$$

Analysis of the third information block is recommended according to the criteria given in the Table 3. Here the maximum number of points is 12. A positive conclusion is issued if you get more than 6 points.

Table 3. A tabular view of the organization's products analysis

Criterion	Value		
	0 points	1 point	2 points
Elimination of product deficiencies	Missing or delayed	Low	Fast
Reaction to competitors' activities	Missing or delayed	Low	Fast
Coefficient of updating the product range*	Lower than competing counterparts	At the level of competing analogues	Higher than competing counterparts
Return rate	Higher than competing counterparts	At the level of competing analogues	Lower than competing counterparts
The rate of shipments quality index	Higher than competing counterparts	At the level of competing analogues	Lower than competing counterparts
Product promotion coefficient	Lower than competing counterparts	At the level of competing analogues	Higher than competing counterparts

Source: author.
*Subject to the identified need to update the product range.

The fourth block of information is a vertical and horizontal analysis of sales of the organization's products and its competitors. Taking into account the richness of benchmarking analysis tools, the possibilities of detailed information and its graphical representation, we consider it necessary to highlight key indicators in this information block:

- sales volume – the number of goods sold in kind for the year (period);
- dynamics of sales volume – the growth rate of product sales over the previous five years (periods);
- dynamics of sales volume of the previous year (period);
- occupied share in sales volume – the share of product sales in physical terms in the total sales of similar products;

– dynamics of the occupied share in sales volume – the growth rate of the share of product sales in physical terms in the total sales of similar products for the previous five years (periods);
– dynamics of the occupied share in the sales volume of the previous year (period).

It is extremely important to analyze the dynamics of changes in sales volume and the occupied share in sales volume both in the long and short-term retrospect. A long-term retrospective allows to determine the trend of change, while a short-term retrospective allows to pay attention to current risks and opportunities. Moreover, it is assumed that the use of natural indicators in the calculations will contribute to a more objective analysis of sales volumes, since the factor of price changes is excluded.

As a base for comparison, it is advisable to use the average values of the listed indicators according to the retailer's data. This is due to the fact that all competitors within the same retail chain follow the same rules and operate under the same conditions (differences in conditions are detected when analyzing the third information block). In Table 4 the analysis of sales of goods of the organization and its competitors is presented [15].

Table 4. A tabular view of the sales analysis

Criterion	Value		
	0 points	1 point	2 points
Sales volume	Below average level	Slightly* below (above) the average level	Above the average level
Dynamics of sales volume	Below average level	Slightly* below (above) the average level	Above the average level
Dynamics of sales volume for the previous year (period)	Below average level	Slightly* below (above) the average level	Above the average level
Occupied share in sales volume	Included in the retailer's TOP 10 sales	Included in the retailer's TOP 5 sales	Included in the retailer's TOP 3 sales
Dynamics of the occupied share in sales volume	Negative (share reduction)	No (or minor* positive change)	Positive (increase in the occupied share)
Dynamics of the occupied share in the sales volume of the previous year (period)	Negative (share reduction)	No (or minor* positive change)	Positive (increase in the occupied share)

Source: author.
*The deviation does not exceed 3%.

The absolute value of the third and fourth information blocks is the exclusivity of the source of information, concentrated in retailer database.

4   Discussion

The issues of increasing the competitiveness of retailers and, consequently, creating conditions for their sustainable development are not only typical for domestic practice. This is a global task that many foreign scientists are engaged in, and it is worth noting the contribution of Asian researchers. So, Yu, Yin, Yang and others considering the retail energy market note a high share of uncertainty, for which they suggest using the fuzzy evaluation method [16]. Also, the scientific interest of Chinese scientists is directed to the study of methods for improving the competitiveness of retail network suppliers using mathematical modeling of key business processes [7]. A study by British scientists Pantanoa, Priporasa, Stylos [13], their research notes not only the need for timely implementation of innovations, but also the rapid withdrawal of techniques and technologies that are losing their relevance. It should also be noted that British scientists pay special attention to the activities of retailers. Such companies not only play a key role in the process of ensuring product turnover, but also note their significant contribution to the development of advanced innovative technologies, including in the field of digitalization. That is why Jones, Comfort [10] identify retailers as the main drivers of sustainable economic development. A joint study by Japanese and American scientists Kim, Takashima and Newell [12]. this paper notes the need for increased attention not only to the clarity of the organization of internal business processes related to procurement, but also the processes of the external environment, as a new source of increasing the competitiveness and sustainable development of the retailer.

An alternative approach to ensuring the economic security of a retailer is presented by Balas, Kaya [2]. According to the presented research, the basis for ensuring the economic security of a retailer is not to debug key business processes or minimize the risks of working with suppliers through the development of digital analytical products. The authors see the solution to the problem of ensuring the economic security of the retailer in the use of protective financial instruments, the market of which was significantly risky during the crisis of 2008.

The analysis of big data and metadata is considered by Grewal, Puccinelli, Monroe, Roggeveena, Rajendra, Nordfält [6, 7]. According to them, the key area of analytical work should be the marketing aspects of the business. In General, the authors' approach presented in this article largely corresponds to the position of the presented authors. Develop the importance of marketing in ensuring economic security and sustainable development of the retailer and scientists Hillebrand, Driessen, Koll, [9]. According to them, the key element is the stakeholders, whose interests should first pay attention to the retailer.

5   Conclusion

The results of the study are largely consistent with the international experience of studying the activities of retailers in the context of their innovative development. The quality of the information basis for making management decisions depends directly on the completeness and detail of the information provided. However, the complexity and

financial costs of recording, collecting, systematizing, analyzing and interpreting such a large amount of information make these actions economically impractical. In this case, digitalization and development of modern software products (including those used within CRM platforms) can reduce labor and financial costs, improving not only the quality of management decisions, economic security, but also the profitability of the business.

The advantages of the proposed method are that it can be integrated into other methods of competitive analysis, used both in an integrated form (comparing the amounts of points received) and in a detailed form (suitable for identifying the shortcomings of the activity). In addition, its use helps to improve the quality of sales channels.

References

1. Angle, J.W., Dagogo-Jack, S.W., Forehand, M.R., Perkins, A.W.: Activating stereotypes with brand imagery: the role of viewer. Polit. Identity J. Consum. Psychol. **27**(1), 84–90 (2017). https://doi.org/10.1016/j.jcps.2016.03.004
2. Balas, A.N., Kaya, H.D.: The global economic crisis and retailers' security concerns: the trends. SocioEconomic Challenges **3**(2), 5–14 (2019). https://doi.org/10.21272/sec.3(1).5-14.2019
3. Federal law "On accounting" No. 402-FL of 6 December 2011 (2011). http://www.consultant.ru/document/cons_doc_LAW_122855/. Accessed 07 May 2020
4. Federal law "On commercial secret" No. 98-FL of 29 July 2004 (2004). http://www.consultant.ru/document/cons_doc_LAW_48699/. Accessed 07 May 2020
5. Federal law "On the development of small and medium-sized businesses in the Russian Federation" No. 209. July 24, 2007 (2007). http://www.consultant.ru/document/cons_doc_LAW_52144/. Accessed 07 May 2020
6. Grewal, D., Puccinelli, N., Monroe, K.B.: Meta-analysis: Integrating accumulated knowledge. J. Acad. Mark. Sci. **46**, 9–30 (2018). https://doi.org/10.1007/s11747-017-0570-5
7. Grewal, D., Roggeveena, A.L., Rajendra, S., Nordfält, J.: Enhancing customer engagement through consciousness. J. Retail. **93**(1), 55–64 (2017). https://doi.org/10.1016/j.jretai.2016.12.001
8. Han, K., Jung, J., Mittal, V., Zyung, J.D., Hajo, A.: Political identity and financial risk taking: insights from social dominance orientation. J. Mark. Res. **56**(4), 581–601 (2019). https://doi.org/10.1177/0022243718813331
9. Hillebrand, B., Driessen, P.H., Koll, O.: Stakeholder marketing: theoretical foundations and required capabilities. J. Acad. Mark. Sci. **43**, 411–428 (2015). https://doi.org/10.1007/s11747-015-0424-y
10. Jones, P., Comfort, D.: "Better retail, better world": a commentary on the localisation of the sustainable development goals. J. Public Aff. **19**(2) (2019). https://www.doi.org/10.1002/pa.1910. Accessed 11 Feb 2020
11. Jost, J.T.: The marketplace of ideology: "elective affinities" in political psychology and their implications for consumer behavior. J. Consum. Psychol. **27**(4), 502–520 (2017). https://doi.org/10.1016/j.jcps.2017.07.003
12. Kim, C., Takashima, K., Newell, S.: How do retailers increase the benefits of buyer innovation? An intra- and inter-organization perspective. Asia Pac. J. Mark. Logistics **30**(3), 571–586 (2018). https://doi.org/10.1108/APJML-03-2017-0043

13. Pantanoa, E., Priporasa, C.-V., Stylos, N.: Knowledge push curve (KPC) in retailing: evidence from patented innovations analysis affecting retailers' competitiveness. J. Retail. Consum. Serv. **44**, 150–160 (2018). https://doi.org/10.1016/j.jretconser.2018.06.004
14. Saim, K., Vijay, M.: Values that shape marketing decisions: Influence of chief executive officers' political ideologies on innovation propensity, shareholder value, and risk. J. Mark. Res. **54**(2), 260–278 (2017). https://doi.org/10.1509/jmr.14.0110
15. Yang, H., Guo, N.: Analysis of supplier competitiveness in supply chain profit distribution from the perspective of quantity supplied and price research based on cournot model and Bertrand model. In: Zhang, L. (ed.) International Conference on Strategic Management, pp. 22–27. Web of Proceedings, Milan (2019). https://doi.org/10.25236/icsm.2019.003
16. Yu, X., Yin, S., Yang, M., Wang, L., Zhao, Y., Jiang, Ch.: Competitiveness evaluation and research of electricity retailers based on fuzzy comprehensive evaluation method. In: Qui, X. W. (ed.) Asia Power and Energy Engineering Conference (APEEC), New Jersey, pp. 322–325. IEEE (2019). https://doi.org/10.1109/APEEC.2019.8720686

Intellectual Property Protection in Conditions of Engineering and Digital Economy

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Abstract. One of the main resources of the economy is intellectual property, which currently forms the market for digital, information and engineering technologies. Obtaining a right for an intellectual property object is a particularly relevant aspect during the development of engineering and digital economy. The authors consider a way to protect intellectual property and digital data as an opportunity to ensure the security of an enterprise and any individual. Improving the development of the engineering economy can increase economic indicators, economic growth rates, and the share of the gross national product. This goal can be achieved through the interaction of engineering economy, industrial enterprises' development, and digital and information technologies. The purpose of this research is to develop and implement an algorithm that protects intellectual property.

Keywords: Digital technologies · Digital watermarks · Digital data protection · Engineering economics · Intellectual property

1 Introduction

Currently, the digital economy is developing, information technologies are rapidly improving, computer programs are being updated, and complex engineering tasks are being solved. New methods of using intellectual property in the field of engineering economics are developing, and the efficiency of industrial application of an intellectual product is growing.

In this regard, it is necessary to pay attention to protection methods of intellectual property rights. There are several ways to protect information, such as cryptography and steganography. The main difference between these methods is that cryptographic methods hide the contents of a file by encryption, while steganography methods hide the fact that any information is transmitted.

In this context, there is a close relation between engineering, digital economy, economic growth, intellectual and human capital. In the course of this research, the authors consider the impact of human capital formation and the impact of the Internet on economic growth [4].

At this point in time, the development of information technology is very rapid, and the number of Internet users is growing every day. Any file submitted in the digital form can be copied, modified, and distributed. This is why multimedia products are

vulnerable to their illegal use. To solve this problem, various methods of information protection are being developed.

The problem of copyright protection focuses on the protection of intangible property and intangible assets. The main component of intangible property is intellectual property [3]. This issue has become particularly important with the development of digital technologies and the transition to a digital economy. One way to solve this problem is to embed digital watermarks in multimedia files, in particular in digital images and video data.

A digital watermark is usually understood as a special label that is used to authenticate digital data, as well as to protect it from illegal use [10]. An embedded sign can be either visible or invisible to the human eye. The second option, in turn, is divided into fragile, semi-fragile and persistent digital watermarks. Fragile digital watermarks are destroyed after any minor container transformations. In the case of semi-fragile digital watermark systems, the watermark has selective stability: it can be resistant to some transformations and unstable to others. In contrast to fragile digital watermarks, persistent signs must be resistant to various types of attacks: geometric transformations, compression, etc. The main tasks that can be solved with the help of digital watermark systems:

– protection against unauthorized copying;
– copyright protection;
– protection from changes;
– protection against falsification.

The problem of copyright protection can be solved using the "demonstration of ownership" scenario [5]. If the author of a work wants to prove that he is its sole legal owner, then after creating this object, he inserts a persistent watermark that can uniquely identify him as the owner. Due to the specific nature of this application area, the digital watermark has to be as resistant as possible to a wide range of container distortions, such as linear and nonlinear filtering, lossy compression, cropping, and others. In addition, the algorithms for embedding digital watermarks should have a low computational complexity.

The spread of such technologies at enterprises shows the need to spread and develop scientific and technological developments that are a prerequisite for a long-term economic growth of the Russian economy.

Scientific developments in this area are possible with the use of intellectual capital, which, according to some authors, is closely related to the effective implementation of an intellectual product and the development of new technologies [1]. Currently, the problem of research in the area of intellectual capital, copyright and digital technologies in the space of interaction with the engineering economy is not sufficiently studied. In order to study this issue, we propose to consider the interaction between information technology, engineering economics and copyright protection. The problem of information literacy and the development of information and communication technologies have been considered in the works of scientists at the domestic and international levels [2].

2   Methodology

In the course of the research, methods of mathematical analysis were applied, empirical research methods were used, as well as methods of analogy, interpretation, comparison, and generalization. The applied statistical methods helped to obtain quantitative characteristics that allow us to reject minor deviations in the research process. Computer steganography is a branch of steganography that studies systems of hidden information transmission, in which computer hardware or software, digital data act as a container. The popularity of research in the field of steganography is due to the growing need to transmit hidden information through public communication channels, as steganography systems allow you to make changes to the file container unnoticed by third parties.

The main directions of computer steganography are text steganography methods, digital steganography methods, and data format-oriented methods. In digital steganography methods, the container is one-dimensional or multi-dimensional digital signals that have a physical nature.

These signals include images, video data, and audio files. One of the most popular and effective methods in the field of steganography for copyright protection and protection against unauthorized copying is to embed steganographic inserts – tags that carry a certain identifier of the copyright holder in the protected object. These labels are called digital watermarks. It is worth noting that there is no algorithm that is resistant to all types of attacks. Every existing approach to creating a digital watermark embedding system has been designed to counter certain attacks or to counter a specific set of attacks. The purpose of an attack on a system for embedding information in video data may be not only to extract or delete embedded information, but also to distort it in such a way that it becomes impossible for a legitimate copyright holder to detect or extract this information. Attacks of this sort are geometric attack in a shift of each frame to an indefinite number of pixels along the spatial coordinate axes, or rotate each frame for an uncertain corner, or uncertain changes in the magnitude of the frame size.

When shifting by a fixed amount, all points in the spatial area of the image-container are moved according to a certain rule. The position of the container counts after the shift is determined by the following formulas:

$$x' = x + t_x, \tag{1}$$

$$y' = y + t_y, \tag{2}$$

where

x is the initial reference position on the abscissa axis;
y – initial reference position on the ordinate axis;
t_x – shift along the abscissa x-axis;
t_y – shift along the ordinate y-axis;
x' – position of the reference point on the abscissa axis after the shift;
y' – position of the reference point on the ordinate axis after the shift.

If embedding a watermark was performed in a spatial area, then, accordingly, the digital watermark will be transformed according to the same rule as all points in the image-container. In this case, the task of the detector is reduced to restoring synchronization, since the digital watermark does not deteriorate, but moves to unknown points in the spatial area of the container.

When zooming, the corresponding coordinates of points in the spatial area will be multiplied by the zoom factors:

$$x' = a_x \times x, \tag{3}$$

$$y' = a_y \times y, \tag{4}$$

where

a_x is a zoom factor for the abscissa axis;
a_y − a scale factor for the y-axis.

Scaling results in a loss of synchronization between the digital watermark and the detector.

When rotating relative to the origin, the angle φ is used to set the rotation. Let's assume that there is some vector r that specifies a point from the container's spatial area. Then the coordinates of this point can be described by the following formula:

$$x = |r| \times \cos(\alpha), \tag{5}$$

$$y = |r| \times \sin(\alpha), \tag{6}$$

where α is the angle describing the position of the point in the spatial area.

When the container is rotated by an angle φ, the final coordinates of the image can be set as follows:

$$x' = |r| \times \cos(\alpha + \varphi) = |r| \times (\cos(\alpha) \times \cos(\varphi) - \sin(\alpha) \times \sin(\varphi)) =$$
$$= x \times \cos(\varphi) - y \times \sin(\varphi), \tag{7}$$

$$y' = |r| \times \sin(\alpha + \varphi) = |r| \times (\sin(\alpha) \times \cos(\varphi) + \cos(\alpha) \times \sin(\varphi)) =$$
$$= x \times \sin(\varphi) + y \times \cos(\varphi). \tag{8}$$

After the container is rotated, the digital watermark, as in the case of a shift, moves to the spatial area counts, the coordinates of which are unknown to the detector. There is no loss of information, but the synchronization of the detector and watermark is disrupted [9].

Due to the possibility of carrying out the described attack scenarios, the following requirements should be met for the developed algorithm of embedding persistent digital watermarks:

– resistance to lossy compression;
– resistance to the framing of the container;
– resistance to the rotation of the container.

In order to understand the complexity of ensuring the stability of the algorithm, it is necessary to consider problems of the consequences of distortions and existing approaches to the counteraction.

3   Results

One of the methods to counteract geometric distortions is direct iteration. Since the main problem with geometric distortions is not the loss of information, but rather the desynchronization of the detector and the digital watermark, a possible solution is to search for a watermark by all possible shifts, zoom factors, and rotation angles. A significant disadvantage of this approach is the computational complexity. The detector has to take into account a huge number of geometric configurations, which leads to an extremely high computational load.

Another way to resist geometric attacks is to evaluate the conversion parameters and invert it. To do this, a certain synchronization pattern is inserted at fixed points in the frequency domain. This synchronization pattern can be a set of peaks or have a more complex form. To increase the security, the pattern may depend on a secret key that is known only to authorized users [5].

The same watermark is periodically embedded in the spatial or frequency domain, and the period of repetition of the digital watermark is known. This period is then estimated by the detector by analyzing autocorrelation peaks. Such templates do not contain confidential information, but only serve for synchronization [9].

The third way to solve the problem of geometric distortion is to use self-synchronizing watermarks. This approach is based on the autocorrelation properties of the watermark [9]. By comparing this period with the expected one, the detector can determine zoom factors and the rotation angle that was applied to the data carrier during the conversion process [5]. Using the found coefficients, the geometric transformations are inverted, and the original position of the counts is restored.

Another solution to deal with the problem of geometric transformations is to embed in areas that do not depend on geometric transformations. For example, to ensure the stability to shifts, the most common solution is to embed the digital watermark in the DFT coefficients of the container.

The next type of algorithms aimed at solving the problem of geometric distortions is based on geometric normalization based on features. The idea of this method is to embed and decode or detect a watermark when the container takes some reference geometric position, that is, it has some reference values of zoom factors, and rotation angle. The reference geometric position has to be assumed relative to the coordinate system that is known to the encoder and detector. To do this, the reference geometric position is assumed relative to any container features. These signs can be corners or edges, if the container is an image.

The reliability of this method depends on the stability of features used for the image normalization. Such algorithms can usually be very sensitive to framing, since reference features may be lost during framing. Next, we will consider the existing algorithms for embedding persistent digital watermarks, which are based on some of the listed methods to counteract geometric distortion.

The algorithms for embedding persistent digital watermarks that currently exist can be divided into two classes:

– algorithms for embedding the digital watermarks in the area of transformation invariant to the required types of distortion;
– algorithms that use "sync labels" [8].

4   Discussion

Many existing algorithms for embedding persistent digital watermarks have a significant drawback: embedding in the frequency areas of the image-container. Accordingly, the necessary stages of embedding a watermark are the forward and reverse Discrete Fourier transformation of the image-container. This approach, although it ensures the stability of the digital watermark to geometric transformations, significantly increases the computational complexity of the embedding algorithm [8]. When embedded in the transformation area, the information is embedded in the container's conversion coefficients. The most common embedding is in the frequency domain of the container. Most often, the Fourier transform or cosine transform is applied to the image-container. Usually, methods of embedding a digital watermark in the container transformation area show higher resistance to various attacks than methods of embedding in the spatial area. In particular, these methods are more resistant to image framing.

Also, embedding in the transformation area shows its resistance to other types of geometric transformations, such as shifting and scaling. This is achieved by choosing the transformation in such a way that it is invariant to the required transformations of the container.

The disadvantage of such algorithms is their instability to "watermark template attack" attacks. In such an attack, the attacker, without knowing the embedding key, can detect and delete the "sync tags". In fact, the intruder finds the peaks – "sync marks" and averages them with neighboring values, which makes it impossible to detect the digital watermark further.

In scientific papers [6], a double ratio of four collinear points was used for embedding a digital watermark. The dual relation is preserved for fractional-linear transformations, so it is invariant to affine transformations. During embedding, sets of four collinear peaks are embedded in the DFT conversion coefficients. At the digital watermark extraction stage, the decoder identifies these peaks and searches for suitable sets of four collinear points.

The algorithm for embedding a digital watermark uses the "sync labels" method, which shows that before embedding a digital watermark, distortion-resistant labels are embedded in the image-container, which allow evaluating the degree of distortion made in the container during embedding, as well as compensating for them [7].

5 Conclusion

An important aspect, in our opinion, is the proposed algorithm that helps solve an important problem – copyright protection. The successful implementation of the national project "Digital economy" contributes to the creation of intellectual capital and the efficient use of intellectual property. In many industries called "creative industries", products are created through the development of creative and human capital. The contribution of creative industries is more than 3% of the world's GDP and should increase several times by 2024.

In the near future, the intellectual property market will become highly efficient and reach a new development level. Engineering and technological discoveries will be implemented on the basis of modern digital infrastructure, the development of innovative systems, methods of regulating the information and innovation economy, and the use of human and intellectual capital. It will have a huge impact on the development of industrial production, increasing competitiveness, and regional development. The authors were motivated by their choice to develop an algorithm by the multidimensional nature of this topic, which covers a wide range of issues related to the formation and development of the digital and engineering economy. All of the above problems require a synergistic approach and scientific understanding of all the structural elements of a complex system in the process of this interaction. Thus, the competitiveness and efficiency of industrial production is determined by the choice of an innovative course and development strategy aimed at the implementation in international technological systems while using their key advantages.

References

1. Evans, N., Price, J.: Human capital and information asset management behaviours in law firms. In Tsui, E., Cheung, B. (eds.) Proceedings of the 14th International Conference on Intellectual Capital, Knowledge Management & Organisational Learning (ICICKM 2017), pp. 63–71. Academic Conferences and Publishing International Limited, Sonning Common (2017)
2. Feldvari, K., Varga, M.: Young people as human capital – what type of information literacy education is required? In: Tonković, A.M. (ed.) 6th International Scientific Symposium Economy of Eastern Croatia – Vision and Growth, pp. 318–326. Ekonomski Fakultet Osijeku, Osijek (2017)
3. Gaysin, F.F.: Problem of copyright protection. Bulletin of the Mari State University. Chapter "History. Law" 3(11), 73–78 (2017)
4. Haini, H.: Internet penetration, human capital and economic growth in the ASEAN economies: evidence from a translog production function. Appl. Econ. Lett. 26(21), 1774–1778 (2019). https://doi.org/10.1080/13504851.2019.1597250
5. Huang, W., Li, R., Xu, J., Huang, Y., Hosam, O.: Intellectual property protection for FPGA designs using the public key cryptography. Adv. Mech. Eng. 11(4) (2019). https://doi.org/10.1177/1687814019836838. Accessed 09 Apr 2020
6. Isinkaye, F.O., Aroge, T.: Watermarking techniques for protecting intellectual properties in a digital environment. J. Comput. Sci. Technol. 12(1), 27–31 (2012)

7. Kur, A., Maunsbach, U.: Choice of law and intellectual property rights. Oslo Law Rev. **6**, 7 (2019)

8. Rizzo, S.G., Bertini, F., Montesi, D.: Fine-grain watermarking for intellectual property protection. EURASIP J. Inf. Secur. **10** (2019). https://doi.org/10.1186/s13635-019-0094-2. Accessed 09 Apr 2020

9. Schellekens, M.: Digital watermarks as legal evidence. Digit. Evid. Electron. Signature Law Rev. **8**, 152–165 (2012)

10. Townsend, L.G.: Should I use a digital watermark on my work? (2018). https://www.lgt-law.com/blog/2018/01/should-i-use-a-digital-watermark-on-my-work/. Accessed 09 Apr 2020

Managing an Organization's Innovative Development: How to Build a Learning Organization

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Abstract. The article is aimed at analyzing the problem of transferring decision-making and control powers to lower levels of management subsystems of organizations in the framework of their innovative development. The question is raised about the expediency of using the methodology of quality management in educational services developed by the authors, based on the delegation of feedback as a mechanism for improving the quality of education. It is concluded that the methodology of setting key performance indicators for managers and employees, which is successfully applied in a number of management situations, cannot be effectively used in the process of building control in the management of innovative development of organizations.

Keywords: Delegate feedback · Learning organization · Rationalization of management

1 Introduction

The most important aspects of working out the organization's innovative development strategy are decision-making and control, which are usually focused on the level of top management, while the development and implementation are carried out on the levels below: middle management and specialists of the management subsystem. This imbalance inevitably leads to significant time expenditures, numerous adjustments and corrections in these processes, and often significant defects in the development and implementation of innovative development strategies, in particular, in the economic and social aspects of the organization's development. In this regard, the scientific problem of transferring decision-making and control powers to lower levels of management subsystems in organizations is relevant within the framework of their innovative development. This transfer should not lead to a loss of manageability in this process.

2 Methodology

Modern management concepts describe an organization as innovative and developing one. The organization is seen not only as a *learning organization*, where each employee is a builder of a new reality that changes the company [1–4, 8], but also as a *self-learning system*, where employees influence the learning process consciously while building a corporate environment [5–7, 9, 10]. The scientific literature presents a number of features that characterize learning organizations, namely: employee's involvement in decision-making, monitoring of the internal and external environment by all participants, established intra-corporate contacts, the distributed nature of power, the network nature of interaction in the organization, etc. [1, 3, 10]. In such organizations, edges between work and learning are blurred, and management control is primarily aimed at monitoring the external environment, customer requests through personal contacts and a balanced information management system. As a result, in such (often used term "intellectual") organizations, the employees decide where to apply their knowledge, how to build corporate relationships and show their experience and talents, depending on the current situation [1, 3, 10–12]. However, it is important to note that available publications do not provide operational answers to the question: how to ensure these characteristics of organizations.

The use of the concept of a learning organization and the task of its operationalization, in our view, make it appropriate to use the previously developed methodology for quality management of educational services, based on the delegation of feedback as a mechanism for improving the quality of education. Giving an organization characteristics of a "learning", innovative company does not mean refusing the role of its top management in setting development goals. Therefore, top management and middle managers of an organization perform approximately the same role as managers and teachers in an educational organization [2–4]. Finally, to extrapolate the methodology of quality management of educational services to the concept of "learning organization" in order to operationalize the latter, it is advisable to use an information approach to the analysis of management processes [10–12], supplemented by the idea of internal activity of all managers and employees of the organization in collecting and processing information [2–4].

3 Results

In accordance with the methodology of the information approach, management can be considered as a process of collecting, processing and issuing information, and feedback as data carried out precisely by receiving and processing information about activities of a managed subsystem. As the main subjects of management can be considered the head of the organization (top management), middle managers, employees (just like in the educational sphere, the main subjects of management are the head of the organization, teachers and students). This hierarchy of the management structure allows us to consider the management of the organization as a set of ways to interact with the head (top management), with middle management and employees. At the same time, the middle management and employees should be subjects-objects of management, and therefore

active users of information. Therefore, information modeling of all subjects' activities should be built as a model of interaction of a "middle manager" as an object with two subjects: with the top management and the middle manager himself, and the latter acts as both an object and a subject of information exchange. The same can be applied to an ordinary employee.

The developed approaches allow us to describe the problems of rationalization of decision-making (with the transformation of the organization into a learning one) at all management levels, namely, the rationalization of feedbacks, i.e., their construction, in which the higher-level subject of management would minimally interfere in functioning, and would be minimally engaged in their correction. This, obviously, can be achieved by a certain delegation of authority – "delegation of feedbacks", i.e. they are temporarily or permanently redirected to lower-level entities, which are now starting to operate in the offline mode.

The problem of transforming an organization in a learning one becomes a problem of reducing the rank of the information user (in some cases with the necessary reduction in the source rank) and organizing reverse and internal links (internal feedback), which is equivalent to the transfer of internal links of the head (through which he receives the basic information for his making management decisions) into internal links of middle management. Similarly, building rational management systems at lower levels involves a similar transfer to employees. Thus, the implementation of feedback is a method of activity that is constantly implemented by all management subjects, and therefore feedback should be considered in management not so much as a way of obtaining information by a higher management subject, but as a way of influencing all lower management levels.

In other words, all subjects (and not just senior managers) should be considered both as active users of feedback channels and sources of information. Thus, it is necessary to refuse the absolute objectivity of information and the assumption of independence of processes occurring in the organization from the content, methods of obtaining, choosing sources and users of information when building feedbacks. On the contrary, in the process of collecting information, it is necessary to communicate goals to all management subjects and ensuring that they accept these goals. At the same time, the idea of the maximum objectivity and comprehensiveness of performance evaluation can be one of the declared principles for selecting evaluation parameters, and not a direct goal.

Any assessment of lower-level subjects should be considered, first of all, as a way to exert managerial influence on their activities. Moreover, the success of building an internal control system should be considered primarily in terms of its impact on certain aspects of the activity and (or) professional consciousness: the evaluation result is not to measure and evaluate, but to influence the situation. Thus, when building a system for monitoring activities of a management subsystem of the evaluation organization, it is necessary to rely on principles that provide:

– consideration of all subjects of the named subsystem as active users of information coming through the feedback channels, and at the same time its sources;

– refusal to idealize the absolute objectivity of information, as well as the indepen-
dence of decision-making processes at all levels of management from the content,
methods of obtaining, selecting sources and users of this information;
– delegation of feedbacks – their temporary or permanent redirection by the top
management to lower-level subjects whose performance is evaluated; the necessary
conditions for which are the unambiguity of requirements, evaluation parameters,
criteria, as well as the availability of technologies and evaluation methods.

Taking into account the specifics of measurements in social systems, we can say
that the measurement results and thus the interpretation of these results will be most
significantly influenced by the characteristics of decisions made by the subject of
assessment: the model of this reality fragment developed by him and the measuring
tools used by him. In this case the evaluation results are already embedded in the model
and methods of measurement in a certain sense.

The interpretation of the source data is initial in relation to the results interpretation
of measuring the quality of decisions made. In the process of evaluating the quality of
decisions, the information user is always interested only in certain properties and
relations of certain objects in the managed system. Therefore, the source data – a
specific system with many complex relations and links within it – is processed into a
model in which each object of such a system is considered as a carrier of certain
properties, not in the entire set of complex relations, but as a carrier of certain relations.
The second (formal) level of input data is the set of measurement results, when certain
mathematical values describing their properties are assigned to objects of the evaluated
system. Using various methods of analysis or evaluation criteria, the subject works with
this formal system, and in the process of final interpretation of the measurement results
makes again the transition through the model to a specific system. Therefore, the
interpretation of source data in the assessment (control) process is the formalization of a
fragment of the organization's reality that is of interest to the user (subject).

Based on any hypotheses, the subject – user of information always assumes the
presence of certain relations between the elements of the model created at the stage of
data interpretation that reflect properties of the evaluated system (even when there was
no formal modeling of these properties for the actual system). Also, the subject (user of
information) almost always assumes the uniformity of the initial data, without which it
is impossible to provide a reasonable interpretation of measurement results. This forces
us to rely on interpretation principles:

– the principle of interpretation matching, which determines the need to align the
interpretation of the analysis results with the interpretation of the source data;
– the principle of complementarity of formalism, which determines the need to to
reflect those meaningful assumptions that were not used in the interpretation of the
original data while interpreting the analysis results.

Thus, it is possible to formulate several basic requirements for the interpretation of
source data, i.e., to develop indicators and procedures for obtaining data in the process
of monitoring activities of the organization's management subsystem.

1. Compliance of the received information with the management goal. This require-
ment is equivalent to the requirement to interpret the source data. It involves

building exactly the model of reality, fixing the characteristics of a real organization that interest the subject (user), in this case, the strategy of innovative development.

2. Compliance of subjects (sources of information) and measuring tools with the management goal (the goal of influencing the quality of decisions made). This requirement means creating an algorithm for displaying elements of the evaluated organization, which allows you to guarantee the full compliance of the elements' relations in the real system and the elements' relations in the developed model. In this case, the algorithm should allow you to fully and reliably transform all the relations and properties of the elements of the evaluated system that are of interest to the user into the relations and characteristics embedded in the model.

3. Compliance of the influence produced by the measurement itself with the management goal. This requirement when building control should be implemented through "excessive" interpretation of the raw data, which helps to minimize interpretation of results by measuring the quality of decisions: the selection of indicators, indicators, methods of measurements should be made so that the evaluation grade (high or low, indicating the increase or decrease of some aspect of the decision quality) follows directly from the measurement results, and the object of the results interpretation is just a reason for these values.

4 Discussion

As it was shown above, one of the conditions for building an effective management is its rationalization, involving such a design of feedback that the parent entity of the management hierarchy would minimally interfere in functioning of the system, minimally adjusting its activities. A delegation of feedback may be considered as a way of rationalization, implying that the process of monitoring and evaluating the quality of decisions should encourage the lower subjects in the management hierarchy to improve their activities. Moreover, this improvement should be a result of the impact of the measurement procedure, and not of the subsequent direct management impact.

The fundamental point for building such a mechanism is a clear compliance of control tools with goal setting (in this case, in the field of innovative development of the organization). The more difficult creating such a tool is, the more goals are pursued and the greater the discrepancy between explicit and hidden goals is allowed. It is also important to ensure clear understanding of the innovative development goals by a subject whose performance is being evaluated, and therefore whose goals are being measured or evaluated. This is significantly facilitated by the choice of a control method. Thus, when evaluating the quality of decision-making, it is necessary: - to determine which sides or aspects of the activity could and should be effectively affected in the assessment process; to select the appropriate objects (groups of objects) and evaluation parameters, taking into account their limits; to develop appropriate measurement tools and techniques based on the need to use fairly simple, resource-intensive technologies; to identify adequate subjects (sources of information) for each object and tool used.

Therefore, in the process of developing an innovation development strategy in the organization, it is advisable for the top management to set indicators for middle management and specialists (strategy developers) related, for example, to the absence of patents in the field of innovation being developed or the presence of a certain number and quality of patents; minimum expected economic results, expected social effects, giving freedom to performers to act within these restrictions. In other words, restrictions at the first development stages should not concern the content of the strategy. At later stages of strategy development and implementation, "the leash may be shortened somewhat". However, at all stages, there should not be many restrictions, and they should not be the focus of attention: everything is allowed that is not prohibited.

5 Conclusion

Thus, the use of the concept of a learning organization, coupled with an information approach to the analysis of management processes and extrapolation of the concept of quality management of educational services to the management processes of the organization innovative development, leads to the conclusion that it is necessary to maximize the transfer of decision-making rights and control over the own activities to the lower levels of the management subsystem. The mechanism that ensures this transfer without loss of control is the delegation of feedback from top management through the most accurate recording of the principal results (in particular, economic and social effects), indicators and ways to assess their achievement. In this case, representatives of middle management and specialists can freely "create" (while learning), without going beyond the fixed principal results and effects. The organization thus becomes learning, innovative, but remains manageable. This, in particular, means that the methodology successfully applied in a number of management situations for setting key performance indicators for managers and employees (based on the idea of the most objective assessment) cannot be effectively used in the process of building control in the management of the organization's innovative development. In conclusion, it is necessary to fix a fundamental difference between developing approaches for quality management of "normal" educational services (where all the results are known in advance, standards are set), but a significant similarity with the model of modern higher education, where only the exterior frame is defined, not limiting the student (researcher), and only the master vector of self-study is defined and results often are innovative.

References

1. Annosi, M.C., Martini, A., Brunetta, F., Marchegiani, L.: Learning in an agile setting: a multilevel research study on the evolution of organizational routines. J. Bus. Res. **110**, 554–566 (2020)
2. Braham, B.J.: Creating a Learning Organisation. Elex Media Komputindo, Jakatra (2003)

3. Fishman, L.I.: Methodology and mechanisms for improving the quality of educational services based on delegating feedback. Russian Academy of Sciences, Samara Scientific Center, Samara (2009)
4. Fishman, L.I.: Specific educational services in the context management improve their quality. Samara J. Sci. **2**(3), 61–65 (2013)
5. Fishman, L.I., Sosunova, L.A., Noskov, S.V., Agafonova, V.V., Sivaks, A.N.: Conceptualization of notions and formation of quality indicators of educational services. Helix **8**(5), 3651–3660 (2018)
6. Hughes, J., Liu, J., Liu, J.: Information asymmetry, diversification, and cost of capital. Account. Rev. **82**(3), 705–729 (2007)
7. Pahurkar, R.N., Nair, J., Kolte, A.: Measuring the impact of learning organization on employee retention, competitive advantage and financial performance in the BPO industry. Int. J. Recent Technol. Eng. **8**(3S), 546–553 (2019)
8. Pedler, M., Burgoyne, J., Boydell, T.: The Learning Company: A Strategy for Sustainable Development. McGraw-Hill Book Company, London (1991)
9. Rupčić, N.: Learning-forgetting-unlearning-relearning – the learning organization's learning dynamics. Learn. Organ. **26**(5), 542–548 (2019)
10. Senge, P.M.: The Fifth Discipline: The Art & Practice of the Learning Organization. Bantam Doubleday Dell Publishing Group, New York (2004)
11. Tsvetkov, V.Ya.: Information interaction as a mechanism of semantic gap elimination. Eur. Res. **45**(4–1), 782–786 (2013)
12. Volkodavova, E.V., Zhabin, A.P., Yakovlev, G.I., Khansevyarov, R.I.: Key priorities of business activities under economy digitalization. In: Ashmarina, S.I., Vochozka, M., Mantulenko, V.V. (eds.) Digital Age: Chances, Challenges and Future. Lecture Notes in Networks and Systems, vol. 84, pp. 71–79. Springer, Cham (2019). https://doi.org/10.1007/978-3-030-27015-5_9

Transdisciplinary Strategy of Continuing Engineering Education

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Abstract. Acceleration of developments in science and technology requires a new approach to training and retraining of personnel working in real economy and first of its elite – engineering personnel. Globalization of world economy presents new claims to the quality of education of contemporary engineers. National engineers are facing a task of modernization of technology in industry, access to new markets with up-to-date knowledge-intensive products. In this connection, present-day engineering education requires comprehension of its cultural traditions, philosophical and historical framework. Starting from his college years integration of a present-day engineer into the current system of knowledge management, accumulation, storage and conveying new knowledge actualized as intellectual property becomes a key factor for the successful engineering training. This requires available modern laboratories, librarian search engines with segmentation function, system of protection and access to necessary information, interaction with the university industrial partner based on a twofold education. The prospect to partake in technology enterprise, in project work, in grant schemes, start-ups and venture funds is a popular area in engineering training. Thereupon the authors establish the development and realization of a new strategy of continuing engineering education on the grounds of transdisciplinarity and association of engineering, economic, linguistic and IT knowledge.

Keywords: Engineering and economics · Engineering education · Innovative development · Knowledge management · Transdisciplinarity · University ecosystem

1 Introduction

Engineering and economics is a field of knowledge emerged at the intersection of natural, technical and economic sciences. It considers engineering capacity to ensure competitiveness of products and services in market conditions by using economic tools. Current tasks in engineering and economics require an individual educational model [19]. To our point of view the concept of engineering and management dominating in the 19th century and which reached its top point in the beginning of the 20th century, when elements of economic science and management naturally entered engineering tuition (and we will talk about it below) is becoming relevant today again.

Tasks which contemporary engineering economy is facing today requires from engineers and managers, and they are the major actors in production operation,

transdisciplinary knowledge, comprehensive engineering and managerial training, which includes humanities, mathematical and natural sciences. Articulated priorities for the scientific and technological development of Russia set goals of technological renovation of its industry, development of knowledge-based sectors of economy and promote national innovative products to global markets [21]. Problems of engineering education in view of present-day requirements are obvious.

Transition of the economy to a new economic order sets new tasks in training and retraining of present-day engineering personnel [20]. First, it is necessary to know more than one foreign language. Today the English language is a communicator in global knowledge management system. The second foreign language is required as a key element in cross-cultural communication depending on the region selected by business goals. (In Europe – German, French, Spanish, and Italian to your choice; Chinese and Arabic in Asia). Second, a new type of computer competence for digitalization of production, procurement, sales in new reality of a "smart enterprise", "smart region", "smart country". Now this refers to harmonization of production operation, social infrastructure of all types, and services delivered by the state [9, 15, 17]. Third, the necessity to create a new economic reality creates new occupations like solar panels installer; wind turbine service operator; environmental specialist/scientist; cybersecurity specialist [4, 22]. Fourth, a new model of higher education system is taking place. The development of students' research work in higher education institutions is having a new type of infrastructure. Laboratories of a new type with levels of access and protection of information and librarian search engines are necessary for the effective participation of students in a new global knowledge system. Fifth, in this approach tutors-researchers come to the front of the stage. They involve students in their work; invite experts from certain fields of knowledge or research to the university [6]. Sixth, this model of tuition dictates the necessity of facilities for practical training where students could continue work following the results of practice and qualification tests [18]. Here arises duality of training engineers of a new type, possibility of alignment of theoretical background with practical tasks on their future work place. Seventh, here arise international aspects of engineering training. Globalization naturally brings technology transfer. However, due to the existing system of protection of national intellectual property international research projects are easier to declare than to implement. Even in countries where students go to study and intend to work later.

Therefore, the eighth, there required an up-to-date real time system of authorization of new knowledge, protection of intellectual property in a new environment where school and production enterprise are integrated into one system. Quality of solving the above tasks will determine the efficiency of the nation transition to a new economy.

2   Methodology

Methodological base for the analysis of philosophical, historical and economic aspects in engineering education and drawn conclusions served scientific content of sites of Russian and European research and educational institutions where the headlines and content has such terms like engineering and economics, engineering and economic education, transdisciplinarity, continuity, knowledge management and ecosystem of

university. We also used as a source of information views of national and international experts in engineering education on the concept of its transdisciplinarity and continuity which are available in cross references system.

3   Results

To our view transdisciplinarity is one of the important modern trends in engineering education. It is a frequently used term in scientific discourse. Boarder lines separating different fields of knowledge are becoming less tight and more permeable. Flows of information circulating despite rigid disciplinary limits are becoming powerful and acting more and more confidently. Open public discussion of important scientific information is gradually becoming a norm useful for solving vital issues of the society. There is no need today to prove that the world is complicated, multi-dimensional and changeable. It is logical that human consciousness is seeking means to reflect this complexity. Additionally to the forms of cognition, the necessity to combine meanings located outside fields of specific subjects' is becoming a condition for the development of scientific and practical knowledge.

The concept of transdisciplinarity provides broad opportunities for the interaction of heterogeneous information and knowledge environments for solving integrative problems of Nature and Society. The potential for success of the research visible on meeting edges of different substantialities, reasoned moving beyond strict scientific boundaries, new directions of research that connect previously not intersecting fields of knowledge, real achievements of complex experimental teams - all these come from transdisciplinarity. Good perspectives of this direction of development of science and practical experience are proved by the positive results of breakthrough science and technology teams and can be considered as a competitiveness factor of the engineering economy.

It is impossible today to discuss such categories like "man", "knowledge", "consciousness", "information", and "communication" within a sole substantive area especially when worldviews combine [14]. Emerging transdisciplinary theories and concepts become a solid foundation for the innovative engineering designs. The fact is that transcendent considering of strictly disciplinary knowledge roots in the very nature of practices, which are conveyed by cultural tradition, and engineering is exactly such kind of practice. Man's capacity for invention and designing is promoted not only by science. Since the earliest times community services is supported by the people's wisdom, religion, philosophy, art, technique equipment, craft and even by "professional magic". Experience of bright engineering designs in its essence is not limited to the rigid disciplinary boundaries, findings and discoveries occur due to the author's openness to different non-academic means of perception of the world. Examples of successful engineering decisions on complicated tasks implemented in transdisciplinary mode lift many methodological contradictions, which seemed insurmountable before.

We see continuity as another global trend in engineering education. Starting from the 1960s of the 20th century and up today the idea and attempts to create a concept of "continuing education" is the main ideological, organizational and sociocultural concept in many countries. Continuing education emerged to certain extend as an

alternative to the existing educational programs subordinate to the industrial tasks and preparing "specific" workers for the vacancies on labour market sees its tasks differently. It must be concerned with the universal education of people. This is the only way to develop individual's natural capabilities and use this limitless potential during all his working life to the benefit of society.

The idea and reasons of this approach are the following. Human being needs continuing realization of individual plans and undertakings, backed up by the required skills and knowledge but not a discreet dividing his life in stages - study, labour self-fulfilment, professional aging. This requires performing unbiased review and re-evaluation of the resources available in the system of education. Education has to be an active non-interrupted process within the whole lifetime of an individual, which means that it cannot be enchained and split by periodization. Knowledge is valuable if obtained in appropriate mode and in good moment, but not when released to be learnt in frame of certain period of life. This perception of the value of education calls for integrated social, political, economic and individual aspects.

French researcher Lengrand attempted to formulate conceptually the idea of continuing lifelong education at UNESCO Forum in 1965 and summarized it in the book "Introduction a l'education permanente" [11]. The world is one whole thing and all its elements are interrelated and interdependent. Human being empowered with the reason, values, strivings and interests is the centre of all world processes. The world is becoming more and more complicated since human being is not only effected by society and nature but is an active subject himself. Human capacity to make quality decisions that are adequate to challenges of time requires new contents and respective means of cognition and hence a consistent review of goals, techniques and technologies of education and tuition. In the middle of the 90 s there was published a book "Areas of Learning Basic to Lifelong Education" edited by Lengrand [12]. In this book, the authors sum up achievements of established models of engineering, economical and managerial education in Europe after the 50s of the 20th century and discuss possibilities of integration of different sciences for lifelong education. In this view a human being is seen as the main object of education and the goal is evolving capacities for self-realization interesting for him and useful for the society.

4   Discussion

We see it appropriate to discuss philosophical and historical foundations of engineering education. Logic of contemporary life patterns leaves the question of concordance between what and how is implemented in educational institutions and what and in which way is going on outside them (while formal, non-formal and informal subsystems constitute continuing engineering and managerial education) is open today but it is not new.

The idea of constant enrichment of inner world is expressed in the texts of great philosophers. In their works on the problems of cognition, they talk about tireless perfection of man. These texts prove that the idea of continuing education did not emerge in present-day technological and managerial universities. The idea of lifelong education is the result of continuing in time polylogue between heterogeneous cultures

and manifested in specific educational systems. The ideal originated in antiquity presents an individual who improves his intellectual, physical, emotional well-being by means of education. Learning is a vital necessity for human spirit in the same way as food for the body.

Sense that the idea of continuity and wholeness of education is not new comes not only after reading ancient philosophical texts. Humanitarian views of Enlightenment philosophers probably express the idea of continuing engineering education in a clearer way. Philosophers and educators see the possibility of improvement of man and society through the development of sciences. This logic looks like this: there should be an expansion of knowledge; purposeful education of man who can handle the deficiencies of the society; it is necessary to change social reality in the interest of progress and improvement of civil society; and this is only possible by pursuing knowledge, natural history, humanist ideals, the possibility to fulfil and manage the proposed changes.

Komenský the great Czech reformer said that the only true meaning in life is to set and achieve goals of cognition [7, 8]. Any age suits to open yourself to the new. These views of the genius innovator on continuing education formed the basis of a respective educational concept, which turned into a class-and-lesson conveyor – a powerful didactic machine incomparable by its influence on minds to any later ones.

We can find a fore type of lifelong education in the works of Marie Zhean Antoine Nicolas de Caritat, marquis de Condorcet - a philosopher and political figure in the period of French Revolution of 1789. In his programme of public education, described in the work "Sketch for a Historical Picture of the Progress of the Human Mind" [2], he puts forward the principle of universality that is of total education in different directions of all without any exceptions citizens. Such inclusiveness shall guarantee people the ability to maintain old knowledge and skills at suitable for their occupational activity level and acquire new knowledge and a confident look in future for their self-realization in the changing world.

To develop in future reformer a comprehensive picture of the world European tradition of training an engineer in 19th – beginning 20th century combined two approaches - scientific, technological and moral. The word "engineer" roots back to Latin "ingenium" (specifically in Petronius and Cicero works) and indicated first of all a bright mind, talent, broad outlook and not only the capability to devise and invent. Philosophy from Herder to Schleiermacher and Hegel saw "Wissenschaftliche Bildung" (academic learning) as a combination of scientific, musical, mathematical and engineering education. To the understanding of German classical philosophers, a universal, well-educated and industrious engineer is the man who is building his personality and carrying on a celestial process of Creation in history and culture. Gymnasiums and universities in Germany is quite an earthbound and a concrete implementation of the elevated idea of preparation of Maker, designer, a reformer of life and practice. "Educational province" by Goethe [3] (as a relatively enclosed system, implementing humanistic model of raising and educating young people) became a prototype of Castalia – an unreal country emerged in a few centuries after the age of "epoch of feuilletons" in industrialized Europe. For Hermann Hesse in his famous "Das Glasperlenspiel" (The Glass Bead Game) Castalia is a locality isolated from the rest of the world where intellectuals received moral education and a lifelong tuition [5].

In the 18th century, Mikhail Vasilievitch Lomonosov promoted engineering by his scientific activities, educational views and his life itself given up to science and development of education in Russia. He strongly advocated the democratization including engineering education; he considered it important to advance engineering knowledge by lectures, published materials, libraries and museums. In this period, scientific method becomes the main in higher education. The main objective of "people's school" in addition to cultivating in children love for work, teaching them proper rules of behaviour, becomes setting out the ideas about the world order and causal relations between its phenomena.

The core of Russian engineering school of 18–19 century was a profound mathematical and scientific education with a considerable humanitarian component. Graduates of higher technical institutions received deep scientific knowledge, were knowledgeable, excellently knew philosophy, world history, literature, theology, foreign languages, played musical instruments, and drew. The base part of professional competences of a civil engineer in Russia of the beginning of 20th century consisted of technical and artistic disciplines. It should be noted that Russia was not the only country in this approach: engineering activity in France and Germany was thought of and implemented at the intersection of innovative research and technological practice. Here lies the distinction from the English approach strictly focused on practical training of technicians and artisans.

Before the First World War a future engineer was not guided just to the invention but to a comprehensive realization and a completion of the project (building, ship, bridge, engine etc.). Based on the materials of the design, organization of introduction of innovation students prepared study guides and circulated useful experience. Universities fostered in their graduates sense of everyday diligent work and the desire of a constant increase of its effectiveness. It may look strange today but engineer's work was not only to invent but also to generate more economical technologies and decisions; to design while making the product cheaper, improve productivity. Moreover, an engineer did this in a strong alliance with an entrepreneur [1]. This productive cooperation of an engineer and a business person also fell apart together with the well-developed industry of pre-revolutionary Russia.

It is very important to note that higher engineering institutions in Russia trained not just good technicians, but were consistently preparing their graduates for the career of captains of industry, for military or government career, for serving Tsar and Fatherland. Mendeleev, Ipatyev, Shukhov, Krylov, Vyshnegradsky are bright researchers-engineers, leaders of industry and education and were outstanding statesmen. It is astonishing to see reading works of old school engineers how elaborate they were selecting partners, sources of financing, locations, materials, environment, safety modes in operations, costs controls, organization of transportation, personnel management on locations at construction of architectural installations. Such concentration on details, precision in calculations is easy to understand: it was a direct, first-hand conveyance of non-formal knowledge thanks to the family, dynastic tradition of education; and in addition technical curricula of engineering universities included compulsory social disciplines. It was mandatory for the lead engineering universities to have social psychology departments. Alternatively, there were engineering departments in big commercial institutes in large cities.

Economic development of Russia and the events of the 20th century amassed engineering education on the one hand and destroyed it integrity on the other. It should be noted that in the West there was also a visible movement from universality towards speciality, the development of high technologies was going in large corporations; occupation of engineer-researcher was becoming widespread [16].

USSR rejection of market based commercial production, development of sophisticated, knowledge- intensive technologies only in large state enterprises (heavy, chemical industry, military space sector) resulted in deterioration of engineer's economic and managerial proficiency.

An engineer with a core technical education could hardly count on a position of the manager of a large enterprise – controls there were handed over to the "party leaders", "academic scientists", "experienced managers". General Designers grown in old school also became directors. Old school should be commended: most of the managers of design offices were thinking on a big scale, could see things as a complete whole, understood strategic goals and could manage personnel and scientific research in high-technology enterprises.

Of course, in young big soviet country there should be a genuine training centre of professional managers. Moscow Commercial-Economic Practical Institute (State University of Management today) – is in fact the first higher engineering–economic institute. Alexander Commercial School of Moscow Stock Exchange Society founded in 1885, Nikolay Female Commercial School and Trade School after the emperor Nikolay II name united in 1918 in Moscow Commercial–Economic Practical College. In 1919, it was renamed in institute. For hundred years this higher institution prepared tens of thousands of managers for key sectors of the national industry. But they were trained specifically for the key sectors and unfortunately with the rapid decline in quality of teaching engineering disciplines.

The research process natural for the traditional higher engineering and managerial institutions was redirected into research institutes and design offices (once again per sector principle and for mostly military tasks). Negative consequences of such transformation of the 20 s became visible in fifty years after that. And today return of research in school and university as the main type of their activity is restrained by the fact that institutional framework of current research and development works is concentrated in network communication space between professionals from different fields of knowledge. Current research more and more often is carried out by small break-through aimed teams, supported by a large database with the developing possibilities of their aggregation [13].

5   Conclusion

Industrial revolution brings new requirements to human capital and thus to the educational system too. The necessity of continuing retraining of personnel and first of all engineers caused the emergence of corporate educational systems all around the world. The brightest example in Russia is probably the Academy of the state corporation Rosatom. This educational institution is training 3600 reserve personnel without

discontinuing their main professional activity and has 900 tutors, 13 of whom are from Top-30 management.

Further, we will see the development of a fusion of formal, non-formal and informal types of education, which will support a dynamic model of competences generated to technological and social requirements that has a long built constant as a base and a flexible, easily renewed variable component. Educational path of a future engineer is a good quality comprehensive engineering-managerial education and a methodical upgrade of his skills with additional professional education. Diploma, which conforms to this model, will also be of dynamic nature and will consist of the base part and a modular tuned for the specific tasks of operation, reflecting soft and hard skills of its holder [10].

As for the educational activity of higher engineering institutions it is very important in our view to develop their business ecosystem where students and tutors temporally brought together by the course named "engineering enterprise" would contact parties in engineering and business sector of the economy, officials assigned responsible for the technological development of a city, region and the country. Such multi-sided format will allow to naturally select the best engineering projects, optimize engineering decisions, promote them in professional society and media, establish socially beneficial contacts, set up work groups and breakthrough teams and develop a culture of engineering business. The current strategy of technological development of Russia formulates a new strategy of continuing education.

References

1. Beiranvand, V., Lucet, Y., Hare, W.: Best practices for comparing optimization algorithms. Optim. Eng. **18**(4), 815–848 (2017). https://doi.org/10.1007/s11081-017-9366-1
2. Condorcet, Zh.: Sketch for a Historical Picture of the Progress of the Human Mind. Librokom, Moscow (2011)
3. Goethe, I.V.: Collected works in ten volumes. Volume 8. The years of Wilhelm Meister's wanderings, or the renouncers. Fiction, Moscow (1979)
4. Hansen, D., Møller, N.: Conceptualizing dynamic capabilities in lean production: what are they and how do they develop? Eng. Manag. J. **28**(4), 194–208 (2016). https://doi.org/10.1080/10429247.2016.1238727
5. Hesse, H.: Das Glasperlenspiel. Suhrkamp Verlag, Frankfurt (2001)
6. Jeffcoat, K.L., Eveleigh, T.J., Tanju, B.: A conceptual framework for increasing innovation through improved selection of specialized professionals. Eng. Manag. J. **31**(1), 22–34 (2019). https://doi.org/10.1080/10429247.2018.1548231
7. Komenský, J.A.: Great didactics. Selected pedagogical works: in two volumes, vol. 1. Pedagogy, Moscow (1982)
8. Komenský, J.A.: The universal council about the correction of human affairs (selected chapters). Part four. Pedagogy, Moscow (1989)
9. Konstantinov, V., Sakulyeva, T., Makeeva, V.: Development of economic tools for managing regional innovation clusters. J. Entrepreneurship Educ. **22**(1S) (2019). https://www.abacademies.org/articles/development-of-economic-tools-for-managing-regional-innovation-clusters-7988.html. Accessed 20 Dec 2019

10. Kulakov, N.Y., Blaset Kastro, A.: Evaluation of nonconventional projects: GIRR and GERR vs. MIRR. Eng. Econ. **60**(3), 183–196 (2015). https://doi.org/10.1080/0013791X.2014.1002053
11. Lengrand, P.: Introduction a l'education permanente. Unesco, Paris (1970)
12. Lengrand, P.: Areas of Learning Basic to Lifelong Education. Pergamon Press, Oxford-New York (1986)
13. Ren, X., Rahman, S.: Stochastic design optimization accounting for structural and distributional design variables. Eng. Comput. **35**(8), 2654–2695 (2018). https://doi.org/10.1108/EC-10-2017-0409
14. Rozin, V.: Reflection of the bases of interdisciplinary study of sociality. Quest. Philos. **1**, 64–73 (2020). https://doi.org/10.21146/0042-8744-2020-1-64-73
15. Ryazanova, G.N., Sazanova, A.A., Sazanova, S.L.: The influence of the processes of digitalization of the economy on the activities of non-financial institutions. Management **2**, 52–56 (2018). https://doi.org/10.26425/2309-3633-2018-2-52-56
16. Savage, G., Franz, A., Wasek, J.S.: Holacratic engineering management and innovation. Eng. Manag. J. **31**(1), 8–21 (2019). https://doi.org/10.1080/10429247.2019.1565467
17. Sellitto, M.A., Hermann, F.F.: Influence of green practices on organizational competitiveness: a study of the electrical and electronics industry. Eng. Manag. J. **31**(2), 98–112 (2019). https://doi.org/10.1080/10429247.2018.1522220
18. Sergeeva, M., Shilova, V., Evdokimova, A., Arseneva, N., Degtyareva, V., Zuykov, A.: Future specialists socialization in the context of competence approach. Revista Praxis Educacional **15**(34), 571–583 (2019). https://doi.org/10.22481/praxisedu.v15i34.5796
19. Tinyakova, V.I., Morozova, N.I.: The searching vector of a new educational model in a knowledge-based economy. Account. Stat. **1**(49), 105–111 (2018)
20. Tinyakova, V.I., Morozova, N.I., Gunin, V.K.: Transformation of the system of professional training of personnel competitive under the conditions of economy, based on knowledge. Econ. Sustain. Dev. **37**(1), 242–245 (2019)
21. Yuryeva, A.A., Kuternin, M.I., Gibadullin, A.A., Romanova, Ju.A.: Formation of mechanisms for the development of innovative activity in the industrial production of the Russian Federation. In: Journal of Physics: Conference Series, vol. 1399, no. 3, p. 033099 (2019). https://doi.org/10.1088/1742-6596/1399/3/033099
22. Zimnukhova, D.I., Zubkova, G.A., Morkovkin, D.E., Stroev, P.V., Gibadullin, A.A.: Management and development of digital technologies in the electric power industry of Russia. In: Journal of Physics: Conference Series, vol. 1399, no. 3, p. 033097 (2019). https://doi.org/10.1088/1742-6596/1399/3/033097

Legal Regulation of Big Data in Industrial Systems: Problems and Development Prospects

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Abstract. The article analyzes the concept of "Big Data" in terms of semantic content and legislative regulation. It includes a comparative review of legal regulation and law application of this technology in Russia and foreign countries. In this article problems of legal regulation of the application of this technology are identified. It has been established that the most significant factor hindering further development of Big Data in Russia is, firstly, the lack of "Big Data" legal definition. Yet secondly, there is constant search for a compromise between the need of business entities to ensure the maximum possible availability of data so that the business is cost-effective,, on the one hand, and on the other hand, the urgent need to ensure the proper level of confidentiality and security, especially concerning the protection of personal data. Despite a number of existing problems, the article points to the prospects of using Big Data not just in industry, but also in other areas of society.

Keywords: Big Data · Digital economy · Judicial acts · Objects of civil rights · Profitability

1 Introduction

The introduction of such a phenomenon as Big Data into the public and economic life of Russia is undoudtedly a big step towards the development of "digital economy". In accordance with the big data market development strategy until 2024, developed by the Big Data Association (BDA) together with BCG, the overall economic effect and revenue growth of all Russian industries due the use of big data is expected to result in 1.2% up to 3% of GDP growth. Moreover, such a result will be possible due to the additional revenue of Russian companies, which they will be able to get due to the development of products, services and big data technologies [7].

Basically Big Data means not even the information itself but information and technology (as a combination of huge amounts of data processing methods from various sources). This concept (Big Data) consists of two elements. The first element includes the so-called "raw data", which will include the speed of the appearance of new data, the processing speed of this data, as well as huge physical volumes. The second element of Big Data are special developed technologies and methods that are used in the processing and application of this data for commercial purposes [1]. Sources of Big Data are various containers of information, particularly Internet,

commercial data of companies, testimonies of technical devices, databases of public authorities and much more.

It is worth noting that Big Data is a valuable economic resource, and the list of the most valuable IT companies of the world - Microsoft, Facebook, Apple, etc. are the proof of that. Many experts call Big Data "the new oil" [5]. The scope of Big Data is diverse, it is used in e-commerce and retail [2], in the field of financial sphere, telecommunications, state and corporate governance, etc. It is in this case that it is important to structure contracts between companies that accumulate Big Data and/or want to commercialize them and companies that can provide services for the technical analysis of such data. The key aspect for the parties would be to ensure the confidentiality of the data that will be submitted for analysis.

For all its perspectives and significant opportunities provided by the use of Big Data, it should be noted that the issue of legal regulation of this concept remains open to this day. From the side of business, there is an increase in suggestions on the need to reform existing legislation in order to reduce the "backlog" of law from technological progress and to promote the development of the digital economy.

2   Methodology

In the process of writing the article, the author applied various methods of scientific knowledge. The main ones are materialist dialectics, as a universal approach to objective knowledge of reality and a method of system knowledge, which allowed to consider the category of legal responsibility as a system object with its own specific manifestation, including the field of administrative law. Amongst general scientific methods used in the article, we can name: analysis and synthesis; induction and deduction. In the process of research such private-scientific methods of cognition as formal legal, comparative legal and logic were applied. So, for example, the formal legal method turned out to be quite useful in the interpretation and study of regulatory documents.

3   Results

The use of Big Data provides new levers of influence on the competitive situation in the business sphere, but at the same time rise the chances of unauthorized distribution of personal information. The digital economy and the amount of processed data, in particular, develop at an enormous rate. This clearly reflects the lag of state regulation from the realities of the sphere in question and this void is becoming increasingly noticeable. Attempts to regulate the concept of Big Data were made in 2020 by introducing the Big Data Bill. However, this bill did not reach the expected result. The provisions of the bill were criticized by business representatives and government bodies, for example, the rules on the need for user consent to Big Data processing are virtually impossible.

More significant steps are the amendments entered to the Civil Code of the Russian Federation (hereinafter referred to as the Civil Code of the Russian Federation) [10] on

"digital rights". As a result a new type of agreement was entered into the Civil Code of the Russian Federation on the provision of services for the provision of information, art. 783.1 of the Civil Code of the Russian Federation. Parties to this agreement may set the condition of confidentiality of the transmitted information, set the obligation not to take actions for the alienation of information or other actions that contribute to its disclosure to third parties during a certain period of time. These innovations are especially important in conditions of low efficiency of implementation of NDA-agreements.

The adopted amendments definitely have a significant impact on the formation of the legal regulation of Big Data, but still do not resolve most of the mentioned issues. For example, it remains unclear whether the operator should obtain the consent of each subject of information to provide data, and also inform the subject about the purpose, methods and types of information that will be collected and processed, since at present the processing of data without the consent of the subject is not legal. Thus, today the question arises of the urgent need to adopt a separate regulatory act aimed at revealing the content of concepts and detailed regulation of the use of information technology, as well as the creation of national standards for processing big data arrays.

4   Discussion

The issue of legal regulation of Big Data is one of the most important not only in Russia, but also in the global legal community [9]. Its significant economic impact on the most vital sectors of the economy requires a quick response. For example, Aeroflot, using Big Data, calculated that out of 32 million passengers, the company had only 10 million unique ones, and only 1.2 million of them provided 50% of the revenue [7]. Based on this information, the company managed to reduce advertising costs. At the same time, the legal side of Big Data allows to outline the vector of legal approach to regulating its application, and it has not been properly studied.

Since 2017 the "Digital Economy" program [7] has been running in the Russian Federation, this program is aimed at developing the country's innovative potential. According to this program, Big Data is "end-to-end technology", in other words - breakthrough digital technology. The Digital Economy program provides users with the right to receive remuneration for the collection and use of data, as well as its exclusion from circulation in the event of failure. Business representatives proposed the concept of the Big Data bill that aimed to attract special intermediary companies that have information about finding Big Data from data operators and transmit the required information for a certain monetary reward. I think this proposal is not advisable, firstly, from an economic point of view, since it leads to a rise in price, secondly, it introduces the risk of market monopolies and loss of pricing flexibility, and thirdly, it creates the risk of losing control of subjects of rights over their personal data, causing harm to both operators and Big Data entities.

It is worth noting that Big Data was also mentioned in the Strategy of the information technology industry for 2014–2020. However, in these programs, as well as in the legislative act that attempts to regulate the use of Big Data, Federal Law of July 27, 2006 No 149-FZ "On Information, Information Technologies and the Protection of

Information" [3] does not even contain a legal definition of the concept of Big Data Based on an analysis of the latest revisions of specialized laws, it can be concluded that the Russian legislator regulates Big Data as personal data and goes in the direction of localizing user data, significantly limiting cross-border data transfer. This position contributes to the withdrawal of European companies from the Russian market and damages the Russian economy.

Of course, the Russian approach has a right to exist. But it raises a lot of controversial issues. In conditions of legal uncertainty and discussion of coherence between the concepts of Big Data and personal data, as a guide, you can turn to the two most striking approaches to the search for an adequate balance between personal rights and business interests in the world - American and European.

The basis of the American approach is the understanding of "big user data" as an asset that brings profit to the business. Such ratio is highly bias to the profitability of the business, providing the maximum availability of information. And issues of confidentiality and data security are actually referred to the competence of the consumer and depend solely on his "cleanliness" in the transmission of data. I would especially like to draw attention to the fact that in the United States there is no single regulatory act aimed at the right regulation of the collection, storage and protection of both personal data and Big Data. The rules governing the above issues are dispersed in various industry and state acts [11].

Unlike the American model, on May 25, 2018, the European Union member states adopted the Pan-European Regulation on Personal Data Protection or the General Data Protection Regulation (hereinafter - GDPR, the "Regulation") [4]. As the main principles of data processing, it indicates legality, fairness, transparency, data minimization, goal limitation, accuracy, storage limitation.

When adopting the Regulation, the provisions of many international legal acts on the fundamental rights and freedoms of man and citizen were accounted for. This consequentially influenced the fact that the Regulation governs big data from the position of priority of the rights and interests of the individual, and not as a digital asset. As a disadvantage of GDPR, it should be noted that Big Data is not consolidated into a separate category. But at the same time, the Regulation reveals the concept of Big Data as a large array of information, the source of which is various channels with a high transmission rate. The data itself can be created by humans or generated by computers." The Regulation also significantly expanded the concept of "Personal Data", namely, personal data refers to any information relating an identified or identifiable person (data subject), by which it can be directly or indirectly determined. Such information includes, but not limited to, the last name and first name, location information, online identifier, factors specific to the physical, physiological, genetic, mental, economic, cultural or social identity of this individual, even IP addresses can be classified as personal data. Thus, Big Data is perceived as personal data in a broader sense. The GDPR has attempted to establish legal grounds for data processing. Processing is considered legal if the data subject has given consent to the processing of his personal data, or if it is necessary to fulfill a contract to which the data subject is a party. The latter wording is thought to be not entirely successful and enables companies to process personal data for no reason at all. But at the same time, enormous fines are

imposed on companies for misuse of data (the size of the fine can reach 20 million euros) [6].

In general, the Regulation of the European Union is very logical and harmonious in terms of the regulation of primary data collection, its processing, depersonalization, use and destruction. GDPR basically has a number of legal decisions that can be borrowed to improve domestic regulation in this area. For example, the norms on the requirement for companies to publish information on leaks, payment of compensation and large fines are of great interest. It is believed that only such measures contribute to the responsibility of business and government bodies for the security of personal data.

5 Conclusion

Summing up, we can conclude that the EU approach to Big Data as an object of legal regulation is characterized by centrality, the priority of human rights and freedoms, such as the right to privacy, the right of access to information, etc. The US approach is to provide greater legislative power to individual territories (states). Big data is considered solely as a profitable asset.

If we talk about Russia, it is not yet clear which way the domestic legislator shall take on. Yet one thing is clear, partial reform of legislation in the field of personal data and information technologies regulation drawn by making small amendments and clarifications regarding Big Data does not solve the problem of their legal regulation. Obviously, due to their specificity, economic and social value, Big Data needs special regulation in a separate regulatory act. At the same time, it is important that such act accounts all the pressing issues of using Big Data: data collection, the ability to quickly extract useful information from their large volume and variety, data leakage, the liability of Big Data storage entities.

Russia is currently trying to build its own model of Big Data regulation, focused on total centralized control over its processing and use [8]. But as world experience and legal analysis of the GDPR rules show we should follow by the harmonization of the norms of Russian legislation with the rules of the Regulation. This would certainly serve to increase the level of the rights and legitimate interests of personal data subjects protection and at the same time increase entrepreneurial activity in terms of working with Big Data.

References

1. Celesti, A., Galletta, A., Fazio, M., Villari, M.: Towards hybrid multi-cloud storage systems: understanding how to perform data transfer. Big Data Res. **16**, 1–17 (2019)
2. Elshawi, R., Sakr, S., Talia, D., Trunfio, P.: Big data systems meet machine learning challenges: towards big data science as a service. Big Data Res. **14**, 1–11 (2018)
3. Federal Law of July 27, 2006 No. 149-FZ (as amended on April 3, 2020) "On Information, Information Technologies and the Protection of Information" (2020). http://www.consultant.ru/document/cons_doc_LAW_61798/. Accessed 24 Apr 2020

4. Habr: GDPR – New rules for the processing of personal data in Europe for the international IT market (2017). https://habr.com/company/digitalrightscenter/blog/344064/. Accessed 24 Apr 2020

5. Heuberger-Götsch, O.: The value of data from a legal perspective using the example of profiling. In: Fasel, D., Meier, A. (eds.) Big Data, pp. 83–105. Springer, Cham (2016)

6. Pearce, H.: Big data and the reform of the European data protection framework: an overview of potential concerns associated with proposals for risk management-based approaches to the concept of personal data. Inf. Commun. Technol. Law **26**(3), 312–335 (2017). https://doi.org/10.1080/13600834.2017.1375237

7. Portal of the National Project "Digital Economy": Regulation of big data (2020). https://digital.ac.gov.ru/opinions/4284/. Accessed 24 Apr 2020

8. Savelyev, A.: Russia's new personal data localization regulations: a step forward or a self-imposed sanction? Comput. Law Secur. Rev. **32**(1), 128–145 (2016)

9. Tao, H., Bhuiyan, Z.A., Rahmanc, M.A., Wang, G., Wang, T., Manjur, M.A., Li, J.: Economic perspective analysis of protecting big data security and privacy. Future Gener. Comput. Syst. **98**, 660–671 (2019)

10. The Civil Code of the Russian Federation (part one) from 30.11.1994 № 51-FZ (as amended on 03.07.2016) (1994). http://www.consultant.ru/document/cons_doc_LAW_5142/. Accessed 24 Apr 2020

11. Tucker, D.S., Wellford, H.: Big mistakes regarding big data. American Bar Association (2015). http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2549044. Accessed 24 Feb 2020

Stochastic Models of Energy Audit Organization in Agrarian Enterprises

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Abstract. There is a strong need in searching optimal decisions concerning the members of energy audit organizations as well as their possibilities in processing of the maximal number of contracts for carrying of the procedure of energy survey. Using the Waiting Theory the needed quality characteristics for energy audit organization could be derived. So, with the basic intensity of getting and processing of the contracts ($\lambda = 0{,}01$ h–1; $\mu = 0{,}002$ h–1) there is a possibility for an audit organization to process 19 contracts for energy survey during one year. Mentioned contracts had been waiting for in the queuing system around 790 h, or 0.4 year.

Keywords: Audit · Energy auditor · Energy saving · Management · Queue system

1 Introduction

High level of the competition in the world on items and services demands to look for ways of decrease in product cost. One of such ways is reduction of consumption of energy resources. For rational implementation of this process it is necessary to carry out an energy audit. The energy audit, or power inspection of the enterprises and organizations assumes assessment of communication of activity of the enterprise with costs of fuel, energy (different types) and resources. The energy audit purpose – to estimate efficiency of use of fuel and energy resources and to develop effective measures for cost reduction of the enterprise. In Russia a number of documents [2, 4, 5] which also formalized separate stages were developed for systematization of this process. However specifics of the enterprises, climatic conditions, regional policy, qualification of auditors enter the amendments into the procedure of an energy audit [3]. These and similar features are noted also in other countries [1, 9, 10].

In Russia the lowest rates of carrying out power inspections were observed in agriculture. It is necessary to analyse this situation as we pass to the second stage of energy saving – assessment of efficiency of the actions specified in the power passport and to updating of this document the next five years. A certain rate of carrying out an energy audit is connected with difficulties as in farms and at power accountants. It is necessary to carry to the main problems: a difficult financial condition of a number of the agricultural enterprises of edge that forces heads to postpone the decision on energy saving and certification for uncertain terms; the enterprises of edge are included into various concerns, associations and holdings that slows down signing of the contracts on

inspection with each firm separately; there are no developed and approved methods of filling of the power passport of the agricultural consumer of fuel and energy resources; the territorial dissociation of the agrarian and industrial complex enterprises, availability of several technological lines, lack of design technical documentation considerably complicate the procedure of power inspection. The first experience of carrying out power inspections of the agricultural enterprises revealed the following: low qualification of the persons responsible for energy saving at the enterprises; lack of motivation of personnel of assistance to power accountants; lack of interest of heads of farms in search of energy saving potential; in a row a case completely is absent or design and technical and contractual documentation is incorrectly issued that complicates definition of balance accessory of power supply networks, water supply systems and wells; use of the unaccounted energy resources complicating calculation of real indicators of energy consumption; presence of the subsubscribers who aren't equipped with metering devices of energy resources. All this results in need of search of optimal solutions on the structure of personnel of power audit organizations, their opportunities on the maximum quantity of the signed contracts for power inspection.

2 Methodology

From a position of modeling of process of mass service of a situation at an energy audit, it can be presented as follows. Having come to the serving system, the requirement joins turn of earlier arrived applications. The channel of service chooses the requirement from being in turn to start its service which already lasts from 2 to 4 months [6, 8]. After completion of the procedure of service of the next requirement the channel starts processing of the following requirement if that is available in the expectation block. The total amount of works on power inspection is meant by service: tool assessment, analytical processing of the obtained data, filling of tables of the energetic passport, development of recommendations about energy saving drawing up the technical report. The cycle of functioning of a system of mass service of this sort is repeated repeatedly. Our system can be two main types: the system with refusals in which the application which came to a system at the moment when all channels are occupied is refused and at once leaves turn; the system with expectation (turn) in which the application which came to the moment when all channels of service are occupied stands in line and waits won't be released one of channels yet.

The simplest single-channel model with indicative distribution of both dlitelnost of intervals between receipts of requirements, and dlitelnost of service is QS (queuing system) with one power accountant. As flows of applications and service protozoa, distribution density of dlitelnost of intervals between receipts of requirements and distribution density of dlitelnost of service will be following [7, 11]:

$$f_1(x) = \lambda \cdot e^{-\lambda \cdot t}; \quad f_2(x) = \mu \cdot e^{-\mu \cdot t} \tag{1}$$

where λ – intensity of receipt of contracts in a system; μ – intensity of information processing and carrying out energy audit.

Let's present the system of mass service in the form of the count which has two states: 0 – the auditor is free (expectation); 1 – the auditor is busy (there is a service of

the application – the contract). On a state graph the system of the differential equations of Kolmogorov is worked out. The solution of such system looks as follows:

$$P_0(t) = \frac{\mu}{\lambda + \mu} + \frac{\lambda}{\lambda + \mu} \exp[-(\mu + \lambda)t] \tag{2}$$

For single-channel QS with refusals the probability of P(t) 0is the relative capacity of system q, that is P(t) 0 = q.

Let's determine probabilities for steady state (t = ∞):

$$q = P_0 = \frac{\mu}{\lambda + \mu} = \frac{1}{1 + \frac{\lambda}{\mu}}, P_{otk} = P_1 = 1 - \frac{\mu}{\lambda + \mu} = \frac{\lambda}{\lambda + \mu} = \frac{1}{1 + \frac{\mu}{\lambda}} \tag{3}$$

Knowing relative capacity, it is possible to find absolute. Absolute capacity (A) – average of applications (contracts) which the system of mass service in unit of time can serve:

$$A = \lambda \cdot q = \frac{\lambda \cdot \mu}{\lambda + \mu} = \frac{1}{\frac{1}{\mu} + \frac{1}{\lambda}}. \tag{4}$$

Size $P_{\text{Quality Department}}$ represents an average share of unserved applications among submitted to a system.

Let's determine absolute capacity, taking into account basic intensivnost of receipt of applications and service:

$$A = \lambda \cdot q = 0,005 \cdot 0,17 = 0,85 \cdot 10^{-3}\,\text{h}^{-1} \tag{5}$$

at 8 h working day and 5 day working week (in a year of 248 working days, 1956 working hours) the value A will be:

$$A = 1956 \cdot 0,85 \cdot 10^{-3} = 1,66\ year^{-1} \tag{6}$$

It means that the system with one auditor is capable to carry out on average 1.66 services of contracts a year.

We will determine the probability of refusal by a formula:

$$P_{otk} = 1 - q = 1 - 0,17 = 0,83 \tag{7}$$

Therefore, about 83% of the arriving contracts will be refused in service that is inadmissible.

Let's determine the nominal capacity of a system:

$$A_{nom} = \frac{1}{t_{obsl}} = \mu = 0,001\,\text{h}^{-1}$$

or

$$A_{nom} = 0,001 \cdot 1956 = 1,96\, year^{-1} \tag{8}$$

Thus, A_{number} is 1.18 times more, than the actual capacity determined taking into account the accidental nature of a flow of applications and holding time. The analysis also shows that at basic intensity of receipt of applications ($\lambda = 0,005$ h^{-1}) for increase in relative capacity it is necessary to carry out search of ways of increase in intensity of service. It should be noted that at reduction of intensity of submission of documents from the enterprises, for example at $\lambda = 0,0025$ h^{-1}, relative capacity increases, but the total number of the processed contracts (absolute capacity) decreases.

Let's consider this system with one power accountant and with a possibility of creation of turn. Let's assume that irrespective of how many contracts arrive on a system entrance (turn + the served clients) can't contain more N-of contracts, t.e. the clients who didn't get to expectation are forced to be served at other auditors. This system can be in the following states: 0 – the auditor is free (expectation); 1 – the auditor is busy (there is no turn); 2 – the auditor is engaged (one contract in turn); n – the auditor is engaged (n − 1 of contracts in turn); N – the auditor is engaged (N − 1 of contracts in turn).

In the stationary mode this system will be described by the following algebraic equations [9–11]:

$$\begin{cases} P_1 - \psi \cdot P_0 = 0, & n = 0 \\ \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \\ P_{n+1} + \psi \cdot P_{n-1} - (1 - \psi)P_n = 0, & 0 \leq n \angle N \\ \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \\ \psi \cdot P_{N-1} - P_N = 0, & n = N \end{cases} \tag{9}$$

where $\psi = \frac{\lambda}{\mu}$ – the given intensity of an entrance flow of contracts, n – number of a state.

The solution of a system of the Eq. (9) for our QS model will have an appearance:

$$P_n = \begin{cases} P_0 \cdot \psi^n, & \psi \neq 1, \quad n = 0, 1, 2 \dots N \\ \frac{1}{N+1}, & \psi = 1 \end{cases}, \quad \frac{1 - \psi}{1 - \psi^{N+1}} = P_0 \tag{10}$$

Relative capacity of a system will look as follows:

$$q = 1 - P_{omk} = \begin{cases} 1 - \frac{1-\psi}{1-\psi^{N+1}} \cdot \psi^N, & \psi \neq 1, \quad n = 0, 1, 2 \dots N \\ 1 - \frac{1}{N+1}, & \psi = 1 \end{cases} \tag{11}$$

Absolute capacity is calculated on a formula:

$$A = \lambda \cdot q = \begin{cases} \lambda - \frac{\lambda(1-\psi)}{1-\psi^{N+1}} \cdot \psi^N, & \psi \neq 1, \quad n = 0, 1, 2 \dots N \\ \lambda - \frac{\lambda}{N+1}, & \psi = 1 \end{cases} \tag{12}$$

Let's define average of the contracts which are in a system:

$$L_S = \sum_{n=0}^{N} n \cdot P_n = \begin{cases} \frac{\psi \cdot \left[1-(N+1)\cdot\psi^N + N\cdot\psi^{N+1}\right]}{(1-\psi^{N+1})\cdot(1-\psi)}, & \psi \neq 1 \\ \frac{N}{2}, & \psi = 1 \end{cases} \tag{13}$$

For determination of average time of stay of the contract in a system it is possible to use a formula:

$$T_S = \frac{L_S}{\lambda(1 - P_N)} \tag{14}$$

The average duration of stay of the contract in turn will be:

$$T_q = T_S - \frac{1}{\mu} \tag{15}$$

Average of contracts in turn (turn length):

$$L_q = \lambda(1 - P_N) \cdot T_q \tag{16}$$

Let's consider QS with one auditor and with a possibility of the organization of turn on the basis of basic intensity of receipt of contracts and their processing. Let's introduce the following restrictions: the number of intermediate places for the arrived contracts expecting carrying out processing is limited and equal 4, [(N − 1) = 4]. If all places are taken – in turn there are already three contracts, then the next contract which arrived to processing on service doesn't stand in line.

Let's define the given intensity of an entrance flow of contracts:

$$\psi = \frac{\lambda}{\mu} = \frac{0,005}{0,001} = 5 \tag{17}$$

Calculate probabilities of finding of a system in separate states on formulas (11–13):

$$P_0 = \frac{1 - \psi}{1 - \psi^{N+1}} = \frac{1 - 5}{1 - 5^6} = 0,00026,$$

$$P_1 = \psi \cdot P_0 = 5 \cdot 0,00026 = 0,00128,$$

$$P_2 = \psi^2 \cdot P_0 = 25 \cdot 0,00026 = 0,0064,$$

$$P_3 = \psi^3 \cdot P_0 = 125 \cdot 0,00026 = 0,032, \tag{18}$$

$$P_4 = \psi^4 \cdot P_0 = 625 \cdot 0,00026 = 0,16,$$

$$P_5 = \psi^5 \cdot P_0 = 3125 \cdot 0,00026 = 0,8$$

Refusal probability in processing of the contract will be $P_{otk} = P_5 = 0,8$.
Let's determine the relative capacity of a power auditor system:

$$q = 1 - P_{otk} = 1 - 0,8 = 0,2 \tag{19}$$

Apparently relative capacity increased from 0.17 up to 0.2 (in comparison with a system without turn).

Absolute capacity of a power auditor system will be defined:

$$A = \lambda \cdot q = 0,005 \cdot 0,2 = 0,001 \text{ h}^{-1} = 1,96 \ year^{-1} \tag{20}$$

In comparison with the previous system absolute capacity reached rated value.
Average of the contracts which are on service and in turn:

$$L_S = \frac{\psi \cdot \left[1 - (N+1) \cdot \psi^N + N \cdot \psi^{N+1}\right]}{(1 - \psi^{N+1}) \cdot (1 - \psi)} = \frac{5\left[1 - (5+1) \cdot 5^5 + 5 \cdot 5^{5+1}\right]}{(1 - 5^{5+1}) \cdot (1 - 5)} = 4,75 \tag{21}$$

Let's determine the average time of stay of the contract in a system:

$$T_S = \frac{L_S}{\lambda(1 - P_N)} = \frac{4,75}{0,005 \cdot (1 - 0,8)} = 4750 \ \text{ч} = 2,43 \ year \tag{22}$$

The average duration of stay of the contract in waiting list for service will be:

$$T_q = T_S - \frac{1}{\mu} = 4750 - 1000 = 3750 \text{ h}^{-1} = 1,9 \ year \tag{23}$$

The average of contracts in turn (turn length) will be defined:

$$L_q = \lambda(1 - P_N) \cdot T_q = 0,005(1 - 0,8) \cdot 3750 = 3,75 \tag{24}$$

Work of such system or the auditor can be accepted unsatisfactory as, despite increase in capacity, the contract stays in turn nearly two years, and the customer will receive ready documents in 2.43. In that case most of customers will refuse services of the auditor.

In most cases the systems of mass service are multichannel (n > 1), i.e. for our case in power audit organization several auditors work. The ultimate goal of use of n in parallel of the working channels consists in increase in speed of service of applications (contracts) due to processing at the same time of n of client contracts. The system can is in the following states: 0 – all auditors are free; 1 – one auditor is busy, the others are free; 2 – 2 auditors are busy, the others are free; k – k of auditors are occupied, the others are free; n – all n of auditors are occupied.

After receiving the equations of Kolmogorov and using formulas of the Erlang [10, 11] it is possible to receive probabilities of states:

$$P_1 = \frac{\psi}{1!} \cdot P_0 = 5 \cdot P_0, P_2 = \frac{\psi^2}{2!} \cdot P_0 = 12, 5 \cdot P_0, P_3 = \frac{\psi^3}{3!} \cdot P_0 = 20, 8 \cdot P_0,$$

$$P_4 = \frac{\psi^4}{4!} \cdot P_0 = 26, 04 \cdot P_0, P_5 = \frac{\psi^5}{5!} \cdot P_0 = 26, 04 \cdot P_0, P_6 = \frac{\psi^6}{6!} \cdot P_0 = 21, 7 \cdot P_0$$

$$P_0 = \frac{1}{\sum_{k=0}^{6} \frac{\psi^k}{k!}} = \frac{1}{1 + 5 + 12, 5 + 20, 8 + 26, 04 + 26, 04 + 21, 7} = 0,009 \qquad (25)$$

$$P_1 = 5 \cdot 0,009 = 0,045; P_2 = 12, 5 \cdot 0,009 = 0, 11; P_3 = 20, 8 \cdot 0,009 = 0, 19;$$
$$P_4 = 26, 04 \cdot 0,009 = 0, 23 = P_5; P_6 = 21, 7 \cdot 0,009 = 0, 20$$
$$(26)$$

Refusal probability in service of the application will be equal to stay probability in the 6th state:

$$P_{otk} = P_6 = 0, 2 \qquad (27)$$

It is much higher, than in earlier considered options.
Relative and absolute capacities respectively will be defined:

$$A = \lambda \cdot q = 0,005 \cdot 0,8 = 0,004 \ \text{ч}^{-1} = 7,8 \ year^{-1} \qquad (28)$$

Average of busy auditors:

$$\bar{k} = \psi \cdot (1 - P_{omк}) = 5 \cdot 0, 8 = 4 \qquad (29)$$

Thus, at the set QS operating mode 4 auditors from 6 on average will be busy. It is not a really good indicator.

3   Results

On the basis of the received mathematical expressions we will define the necessary number of auditors for decrease in probability of refusal to value less than 10% (Table 1).

Table 1. Values of probabilities of refusal depending on the number of power accountants

n	6	7	8	9
P_0	0.009	0.008	0.007	0.007
$P_{Quality\ Department}$	0.2	0.12	0.07	0.04

Source: authors.

Table 2. Indicators of efficiency of various QS

Indicators	The QS type with basic intensivnost, the Part-1: λ = 0.005; μ = 0.001					New receipts of intensity and service, Part-1					
						λ = 0.005; μ = 0.002; QS type			λ = 0.01; μ = 0.002; QS type		
	1 lecture hall with quality department	1 lecture hall with очеред	6 lecture halls with quality department	8 lecture halls with quality department	6 lecture halls with очеред	1 lecture hall with quality department	1 lecture hall with очеред	6 lecture halls with очеред	1 lecture hall with quality department	1 lecture hall with очеред	6 lecture halls with очеред
q	0.17	0.2	0.8	0.93	0.98	0.29	0.39	0.99	0.17	0.2	0.98
$P_{Quality\ Department}$	0.83	0.8	0.2	0.07	0.03	0.71	0.61	0.01	0.83	0.8	0.03
And, year-1	1.66	1.96	7.8	9.1	9.5	2.8	3.8	9.7	3.3	3.3	19
ψ	–	5	5	5	5	–	2.5	2.5	–	5	5
T_s, h	1200	4753	1200	1200	1588	700	900	744	600	2347	790
T_q, h	–	3716	–	–	588	–	1389	244	–	1878	290
L_s, piece	–	4.75	–	–	7.9	–	1.75	6.22	–	4.75	7.9
L_q, piece		3.75			2.9		2.78	1.22		3.75	2.9
N_{audit}	1	1	4	4.65	6	1	1	6	1	1	6

Source: authors.

From Table 1 it is visible that 8 auditors will reduce refusal probability to 0.007. At the same time relative capacity will increase to 0.93, and absolute – to 9.1 contracts a year. In this case 4.65 auditors will be on average busy that speaks about their part-time employment. Let's consider the multichannel system of mass service with expectation in turn. The system has S auditors for service. In the set mode multichannel QS with expectation and unlimited turn can be described also by means of the algebraic equations similar to the previous case without turn.

The analysis of functioning of QS shows that the most highly productive are systems with several auditors and with a possibility of the organization of turn. Let's analyze this type of QS regarding influence of intensity of streams of receipt and processing of contracts for system performance. Let's say that due to application of the software and increase in number of measuring devices, it was succeeded to reduce twice a processing time of contracts [9]. The same effect can be gained if the enterprise has less points of measurement or smaller volume of consumption of energy resources or there are no own boiler houses and transformer substations.

In Table 2 indicators of various QS at the basic and changed intensity of receipt and processing of contracts for audit are given. From the table it is visible that the most effective is QS with 6 auditors, a possibility of the organization of turn and with intensity of receipt and processing respectively $\lambda = 0.01$ the Part-1; $\mu = 0.002$ the Part-1 as this system has an opportunity to process within a year of 19 contracts which will be in QS about 790 h or 0.4 years.

QS depending on their type are submitted. From these drawings it is visually visible that QS of the last type (with 6 auditors, a possibility of the organization of turn and with intensity of receipt and processing respectively $\lambda = 0.01$ the Part-1; $\mu = 0.002$ the Part-1) is the most effective.

4   Discussion

In Russia, after the adoption of the Federal Law No. 261 (on mandatory energy audits), a large number of energy audit companies have emerged that are faced with the problem of efficient operation and maximum profit [4]. Registration of energy passports showed a low pace of conducting surveys, which is associated with difficulties both in the enterprises themselves and in energy auditors. Particularly great difficulties arose during the energy audit of agricultural enterprises. The problems of these enterprises include: the difficult financial condition of a number of farmers, which forces managers to postpone decisions on energy conservation and certification for an indefinite period; individual farms are included in various concerns, associations and holdings, which slows down the conclusion of inspection contracts with each firm separately; there are no developed and approved methods for filling out the energy passport of an agricultural consumer of fuel and energy resources; design-technical and contractual documentation is missing or incorrectly drawn up, which makes it difficult to determine the balance sheet ownership of electric networks, the presence of sub-subscribers not equipped with energy metering devices. All this greatly complicates the energy inspection procedure and ultimately leads to the need to find optimal solutions for the composition of energy audit organizations, their capabilities for the maximum number of energy inspection agreements concluded.

To search for the optimal composition of the energy auditing organization (as well as other audit companies), one can apply the queuing theory. From the position of modeling the process of mass servicing the situation during an energy audit, this process can be represented as follows. Initially, an energy audit organization (EAO) sends out questionnaires to potential customers. These sheets are filled out and sent back to the EAO. After assessing the cost and agreeing on the price of services, energy inspection contracts are concluded, and the final document is the receipt of an energy passport. We will not consider this preliminary stage, since it is very small in time in comparison with other stages of work. After concluding a contract for an energy audit, the EAO issues to the enterprise energy passport tables, which must be filled in by leading experts. This period of time usually already takes from 20 to 60 working days, and it depends on many factors: the availability of data at the enterprise, the qualifications of specialists and their employment, the size of the enterprise, etc. Completed tables and data can come in several stages. We will consider this process as a stream of input requirements to the queuing system. Use of a mathematical apparatus of systems of mass service allows to describe processes of functioning of the power auditor companies and to define the directions of improvement of their work. The developed models of systems of mass service with one auditor showed what increase in frequency of submission of applications (to force the enterprises to process quicker data) doesn't lead to increase in relative capacity, and on the contrary – to reduction. For increase in relative capacity it is necessary to reduce holding time.

5   Conclusion

The analysis of systems of mass service with one auditor and refusals showed that at basic intensivnost of receipt of contracts and their processing ($\lambda = 0,005$ h^{-1}, $\mu = 0,001$ h^{-1}) for increase in relative capacity it is necessary to look for ways of increase in intensity of service. It is also possible to note that at reduction of intensity of submission of documents from the enterprises (increase in time of filling of tables with services of the enterprise), for example at $\lambda = 0,0025$ h^{-1}, relative capacity increases, but the total number of the processed contracts (absolute capacity) decreases.

As a result of the analysis of systems of mass service with one auditor it is established that transition from model with refusals to model with turn increases the annual number of the processed contracts from 1.66 to 1.96; refusal probability in service decreases from 0.17 to 0.2.

The developed models of systems of mass service with several auditors who showed higher efficiency of service. For model with refusals increase from 6 auditors to 8 will reduce refusal probability to 0.007. At the same time relative capacity will increase from 0.8 to 0.93, and absolute – from 7.8 to 9.1 contracts a year. In this case 4.65 auditors will be on average busy that speaks about their part-time employment. The schedule of dependence of number of the served contracts on the number of the working auditors and the line of a trend is received. According to this schedule it is visible that further increase in number of auditors won't lead to significant increase in the served contracts.

The developed model of systems of mass service with 6 auditors and a possibility of the organization of turn showed that the number of the served contracts, in comparison with model with refusals increases from 7.8 to 9.5 and relative capacity increases from 0.8 to 0.98. However the time spent of the contract for service also increases from 1000 to 1660 o'clock.

For model with 6 auditors and a possibility of the organization of turn the given intensity of a flow of contracts has no impact on the relative capacity of audit organization. This indicator has the main impact on length of turn and time of stay of the contract at auditors. Reduction of a processing time of contracts doesn't increase the absolute capacity of a system twice, but reduces the time spent in audit organization twice. Reduction of a processing time of tables of the power passport by the enterprise leads to double increase in absolute capacity by audit organization twice at preservation of the time spent of the contract for auditors. This system at basic intensity of receipt and processing of contracts ($\lambda = 0.01$ the Part-1; $\mu = 0.002$ the Part-1) an opportunity to process within a year of 19 contracts for power inspection which will be in QS about 790 h or 0.4 years has.

References

1. Bo, S., Price, L., Lu, H.: Energy audit practices in China: national and local experiences and issues. Energy Policy **46**, 346–358 (2012)
2. Decree of the Russian President No. 889 of 04.06.2008 "About some measures for increase power and ecology efficiency of the Russian economy" (2008). https://minenergo.gov.ru/node/5195. Accessed 29 Apr 2020
3. Dubinsky, M.Yu.: Energy audit of the industrial enterprises. Energy Secur. Energy Saving **3**, 14–18 (2010)
4. Federal law No. 261-FZ "About energy saving and about increase in power efficiency and about introduction of amendments to separate acts of the Russian Federation" of 23.11.2009 (2009). http://base.garant.ru/12171109/. Accessed 29 Apr 2020
5. GOST P 51379-99. Energy saving. Power passport of the industrial consumer of fuel energy resources. Basic provisions. Standard forms (2018). https://internet-law.ru/gosts/gost/8919/. Accessed 29 Apr 2020
6. Illarionov, E.M.: How to distinguish the professional power accountant from the beginning power accountant. Power Light **2**(27), 47–50 (2013)
7. Ivchenko, G.I., Kashtanov, V.A., Kovalenko, I.N.: Theory of Mass Service. HSE, Moscow (1982)
8. Oskin, S.V., Gromyko, D.V.: Mathematical models of power audit organization during the work with the agricultural enterprises. Works Kuban State Agric. Univ. **3**(42), 156–165 (2013)
9. Singh, M., Singh, G., Singh, H.: Energy audit: case study to reduce lighting cost. Asian J. Comput. Sci. Inf. Technol. **2**(5), 119–122 (2012)
10. Wood, E.: Zero touch energy audit: Will it change the game? (2011). https://www.energy-xprt.com/articles/zero-touch-energy-audit-will-it-change-the-game-265181. Accessed 29 Apr 2020
11. Zaytsev, M.G., Varyukhin, S.E.: Methods of Optimization of Management and Decision-Making: Examples, Tasks, Cases. Delo, Moscow (2008)

Derivatives Trading: Digital Transformation

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Abstract. Qualitative changes in functioning principles and structure of the derivatives market, as well as its instruments in the context of digitalization, have a significant impact on processes associated with investment activities around the world. Therefore, we need to study the practice of using derivatives, as well as the dynamics of the derivatives market and its instruments. This study considers the functioning of the derivatives market and the process of applying its instruments as a method for reducing investment risks. In the process of studying the dynamics of the derivatives market, based on the analysis of statistical data and factual materials, the main development trends of both the Russian and international derivatives markets are shown. Based on historical and statistical information, the authors simulated the process of analysis, development and implementation of a hedging strategy that reveals the content of the hedging procedure with derivative financial instruments in the context of digital transformation of the economic system.

Keywords: Digital technology · Financial risks · Futures contracts · Hedging · Stock exchange

1 Introduction

In the modern economy, the securities market is one of the main financial markets. Many different subjects of economic activity, as well as the economic system as a whole, depend on its condition. An important element in the structure of the securities market is the derivatives market, in which specific financial instruments, called derivatives, are traded. The main feature of derivative financial instruments is that their existence is based on the circulation of other primary instruments. Consequently, the properties of derivatives directly depend on the qualitative and quantitative characteristics of primary financial instruments. Based on the specifics of derivative financial instruments, their circulation is usually carried out in order to achieve one of two specific effects. One of these effects is hedging of risks, that is, minimization and management of risks associated with economic activities in financial markets. Another is that derivatives are used to carry out speculative operations aimed at economic benefits from changes in the value of the underlying asset [3]. Derivative financial

instruments enable various business entities to more actively use highly risky financial instruments while controlling risks and deriving additional economic benefits from this.

Due to high technologies used by exchanges and post-marketing infrastructures, investments are becoming closer, more accessible and more understandable to people, opening up new opportunities. There are more and more convenient and safe mobile banks, applications for investments, personal finance planning. All this contributes to the fact that exchange trading is rapidly developing, improving in software and hardware [6]. This process is especially illustrated in the urgent section, where a high level of informatization helps maximize revenues and minimize risks of players.

2 Methodology

Along with classical tools of formal and dialectical logic, among which we can emphasize the method of abstraction, analysis and synthesis, deduction and induction, the unity of logical and historical, the authors widely used tools of mathematical and statistical analysis, which made it possible to more clearly see the functioning of derivative financial instruments in the context of digital transformation, show the mechanism of minimizing risks when concluding transactions in the derivatives market. The key method used in the study is the system method. It is a systematic approach to the analysis of the derivatives market that allows us to identify its main patterns, show the interaction of its key elements, while reflecting the mechanism of their mutual influence.

3 Results

The derivatives market is a complex system of economic relations that arise when concluding derivatives contracts between market participants; this is a segment where very complex financial instruments are traded. In modern interpretation, a financial instrument can be defined as a contract, at the conclusion of which a financial asset arises for the first organization, and an equity instrument or financial liability - for the second organization at the same time. Thus, a financial instrument refers to any asset, for example, a security or a financial liability, the sale of which ensures cash. A derivative financial instrument is a fixed-term contract under which the parties obtain the right to take certain actions with respect to the underlying asset. It can be concluded that despite the fact that derivative instruments are mainly derivatives contracts that are traded mainly within the securities market, their scope is not limited to a separate sector of the financial market [8]. Various economic entities actively use derivatives as auxiliary instruments in carrying out economic activities in various areas of the economy.

The derivatives market has its own internal structure, which can be classified according to various criteria. Using the general approach, this market can be divided into primary and secondary, exchange and over-the-counter. It is worth noting that the derivatives market has a structure similar to the securities market, however, the stock market is both primary and secondary for derivative financial instruments, while for the securities market this market is primarily secondary. This feature of the derivatives market determines unlimited possibilities for narrowing and expanding the volume of

the market, which enables market participants to respond flexibly to changes in the economic situation, which is especially important in the context of the digital transformation of the economic system [4, 14].

The basic principles of circulation of instruments in the derivatives market are similar to the principles the securities market as a whole. However, in addition to new opportunities for speculative operations, the derivatives market offers the investor the opportunity to directly control his own investment risks using derivative financial instruments. The implementation of certain operations aimed at minimizing investment risks is called the hedging process. There are a wide variety of derivative financial instruments. However, at the heart of all this diversity there are several standard and generally accepted contracts. The main exchange derivatives used for hedging are futures contracts and options; forwards and swaps are traded on the OTC market [13].

Carrying out the hedging process in the derivatives market, the investor uses a set of specific derivative financial instruments that activate the mechanisms described above. Thus, the investor, using a set of derivative instruments in a certain sequence, forms his hedging strategy. The effectiveness of the strategy depends on the ability of the investor to predict changes in the economic situation, which, undoubtedly, can be helped by digital technologies, for example, robots, electronic advisers.

Let us analyze the dynamics of the derivatives market in the Russian Federation over the past ten years. Currently, Russia does not publish consolidated statements on the state of the derivatives market. The Bank of Russia periodically publishes reports only on certain types of derivative financial instruments, while detailed reports on derivative financial instruments are not published at all. Information on derivative financial instruments can be found on the exchange website, the largest of which is the Moscow Exchange. Therefore, further analysis of the development of the Russian derivatives market will be based on data from the Moscow Exchange [9].

Considering development features of the Russian derivatives market, first of all, it is necessary to determine the dynamics of the total volume of trade and the place of the derivatives market in the structure of exchange trading. Over the past ten years, the total trading volume on the exchange has grown by almost 4.5 times (from 191,904 billion rubles in 2009 to 860,861 billion rubles in 2018). For almost the entire period, the indicator had an increasing growth trend, especially rapid growth was observed from 2011 to 2016, but then the growth rate decreased significantly, the trend weakened, and at the end of 2018, the growth rate assumed a negative value.

For the period from 2009 to 2018, the share of the derivatives market in the total trading volume of the Moscow Exchange ranged from 7.74% to 19.1%. The peak value was in 2011, and later on the indicator ranged from 10% to 13%. For the period from 2009 to 2018, the volume of the derivatives market grew 6 times (from 14 857 billion rubles to 89 263 billion rubles in 2018). The rapid growth in the derivatives market from 2009 to 2011 (from 14 857 billion rubles to 56 791 billion rubles) was followed by a fall in the next two years (to 48 605 billion rubles in 2013). In the period from 2014 to 2016, there was a rapid growth in the derivatives market (from 48 605 billion rubles to 115 271 billion rubles). Over the next two years, the indicator decreased by 26.7% (to 84,497 billion rubles) in 2017, and an increase of 5.64% was observed (to 89,263 billion rubles) at the end of 2018. We will analyze each of these conditional periods in detail.

The period from 2009 to 2011 can be described as the formation period of the Russian derivatives market. The main volumes of trading in fixed assets and derivatives were concentrated on the MICEX and PTC exchanges, which were merged in 2011 into the Moscow Exchange holding. This fact, together with the transition of the derivatives market from the stage of origin to the stage of formation, predetermined the rapid growth of the derivatives market. If we consider the structure during this period, more than 90% of the derivatives market was occupied by futures contracts, most of which were supplied to currency instruments and indices. At the same time, the greatest demand among options was observed for index option contracts. In the period from 2012 to 2013, two events influenced the development of the Russian derivatives market.

Firstly, on September 17, 2012, the integration of FORTS and MICEX Derivatives Markets was completed. Changes in the organization and functioning of the new platform compared to the integrated ones, as well as the change in the list of traded instruments, quite naturally caused fluctuations in trading volumes in the market because market participants were adapting to the new rules.

Secondly, the consequences of the global economic crisis of 2008 reached Russia and had a strong influence on the decrease in investor interest in stock market instruments, and, as a consequence, financial instruments derived from them. This contributed to the active use of instruments of monetary and foreign exchange markets [11, 12]. Significant changes in the ratio of futures and option contracts in cash terms did not occur. The share of currency futures in the structure of exchange trading on the derivatives market more than doubled (from 14.82% in 2011 to 31.83% in 2013), while the share of index futures decreased (from 67.13% in 2011 to 49.47% in 2013), which is directly related to the decrease in the entire derivatives market in this period.

The period from 2014 to 2016 was under the currency crisis in Russia, which provoked the collapse of the ruble. The strengthening of the previously formed trend towards the transfer of investor resources from the stock section to the currency and money has finally strengthened, and as a result, the devaluation of the ruble against the dollar caused increased interest of market participants in foreign exchange derivatives contracts, which were actively acquired both for hedging and speculation in conditions of market uncertainty. In addition, fluctuations in oil prices attracted the attention of investors to commodity futures. Thus, the volume of trading in currency futures more than doubled over this period (from 29,404 billion rubles in 2014 to 64,561 billion rubles in 2016), and the share of trade in commodity futures in the structure of the derivatives market grew from 1.51% in 2014 to 13.32% in 2016, index futures, on the contrary, reduced their share to 22.68% in 2016.

The period from 2016 to 2018 can be described as stabilization. The currency crisis in Russia ended, and oil prices stabilized due to OPEC intervention, which in aggregate significantly reduced the interest of speculators and hedgers in futures for foreign exchange instruments. This provoked a decrease in the derivatives market and changes in its structure. Thus, the share of currency futures in the structure of the derivatives market decreased from 56% in 2016 to 42.42% in 2018, while the share of commodity futures, on the contrary, increased from 12.32% in 2016 to 23.43% in 2018. The ratio of option contracts to futures in cash terms remained stable rather low.

Trading volume on the derivatives market in 2018 amounted to only 10.37% (89,263 billion rubles) of total exchange trading. The structure of trading on the derivatives market is dominated by futures (92.3% or 82.397 billion rubles), most of which are based on currency, (42.42%) index (21.47%) and commodity (23.43%) instruments. The share of index futures for the first ten years of the analyzed period has significantly decreased and over the past five years it has been steadily fluctuating around 20%, and interest-bearing derivatives are not at all popular on the Russian derivatives market.

As for the dynamics and structure of the stock exchange and the OTC international derivatives market, the following can be noted. The dynamics of the OTC market volumes are quite contradictory. So, from 2009 to 2014, the OTC international derivatives market was actively expanding. In the first half of 2009, the nominal value of unfinished contracts amounted to $ 594,596 billion, and in the first half of 2014 it amounted to $ 691,114 billion, but then the trend weakened, and the nominal value gradually decreased to $ 482,421 billion by the second half of 2016. Over the next two years, the OTC market tended to grow, and by the beginning of 2019, the total nominal value of open positions in the OTC market was $ 640,441 billion [1]. The high volatility of the OTC derivatives market is explained by the fact that in recent decades, state and international organizations have been trying with varying degrees of success to tighten the regulation of the OTC derivatives market, trying to reduce the volume of OTC trading. This is done by standardizing and adapting some OTC derivatives contracts for subsequent circulation on the exchange market, as well as by tightening legislation in this area and introducing various restrictions that impede speculative activity. If we consider the structure of the OTC international derivatives market, we can conclude that over the past ten years, most of the market in monetary terms has consistently been occupied by interest rate and currency derivatives. This fact, together with a decrease in the share of credit derivatives in the market, indicates the restoration of the international derivatives market to its main function, namely, hedging of commercial and financial risks.

The dynamics in the volume of the international derivatives market is structurally similar to the OTC international derivatives market, as the tendency to decrease in market volumes is successively replaced by growth trends. So, for the period from 2009 to 2012, the total nominal value of positions opened on the exchange derivatives market decreased from 73,125 billion dollars in the second half of 2009 to 54,122 billion dollars in the second half of 2012. However, then it subsequently increased to 70,223 billion dollars in 2015. Subsequently, a steady upward trend was formed, and the total nominal value of open positions in currency and interest rate of derivatives alone amounted to $ 68,096 billion by the end of 2018 [1]. The structure of the exchange market is generally similar to the structure of the OTC international derivatives market. However, in the total market for exchange-traded derivative financial instruments, interest-bearing derivatives and derivatives on securities have the greatest weight [10].

The weakest segment of the Russian derivatives market is interest-bearing derivatives, while on the international derivatives market they have the largest share in the market. In addition, it should be noted that such low volumes of transactions under option contracts in comparison with futures are not typical for the international

derivatives market. These facts, combined with a high share of foreign exchange derivatives in the Russian derivatives market, suggest that instruments in this market are used primarily for speculative operations, rather than hedging risks. It can be concluded that the fully-formed derivatives market in the Russian Federation still remains structurally underdeveloped.

4 Discussion

Derivative instruments are behind the over-the-counter ones if direct delivery of the underlying asset is required. Such a situation may arise if one of the parties to the contract is the manufacturer, which needs to fix the cost of his products. In addition, the combination of foreign exchange and commodity delivery forwards significantly reduces commercial risks. The flexibility of OTC derivatives contracts is also an advantage. However, the use of OTC derivative instruments is associated with credit risk in relation to the counterparty [2].

The stock derivatives market is much more suitable for active financial investors, since they are most often exposed to stock risk. Exchange contracts have high liquidity and performance guarantees, which makes it possible to quickly and efficiently adapt investment and hedging strategies to changes in market conditions. However, standardization of exchange contracts can impede the full hedging of an asset and as a result only partial hedging occurs [5]. In addition, only foreign exchange and interest-bearing OTC derivatives contracts can be so effective in hedging currency and interest rate risks.

Over-the-counter hedging strategies are in many respects opposed to exchange-based hedging strategies [7]. Unlike exchange-traded instruments, over-the-counter derivative instruments, due to their flexibility, make it possible for the investor to provide full hedging of the asset. The low turnover of forwards, combined with the difficulties of entering the OTC market, predetermines the low adaptability of over-the-counter hedging strategies to changes in the market. Therefore, investors usually use separate over-the-counter derivative instruments to protect themselves from currency and interest rate risks. While most of operations they carry out on the regulated exchange market. This market enables the investor to quickly respond to changes in market conditions and implement the fixed-term contract that has become irrelevant for him. Not always the investor can find a standard exchange contract that fully meets his requirements. Therefore, for the most effective hedging of risks in various situations, strategies have been developed that allow maximum protection of the asset at minimum cost. Modeling the process of reducing investment risks using derivative financial instruments is associated with the development and implementation of the hedging strategy in specific given conditions by the investor. This requires the most complete information about the investment portfolio, the market situation, as well as derivative financial instruments.

5   Conclusion

Investors in the Russian derivatives market can get, not as voluminous as internationally, a fairly wide selection of exchange and OTC derivative instruments to implement a variety of risk hedging strategies. As can be seen from the study, the growth dynamics of the derivatives market is unstable in the Russian Federation, as it is directly related to macroevents occurring in the entire financial market as a whole. The distinctive features of the Russian derivatives market, identified as a result of the analysis, include: 1) high volumes of futures trading in comparison with options; 2) the high interest of market participants in currency futures and its absence in relation to interest-rate derivatives; 3) stable index future contracts in the structure of the Russian derivatives market over last five years.

It can be concluded that in many respects macroeconomic problems that impede the normal functioning and development of the entire economic and financial system of the Russian Federation hinder the development of the Russian derivatives market. However, specific institutional factors are also important. Thus, the imperfection of the legislation in relation to the securities market and derivatives market determines the ambiguity of legal interpretations when concluding contracts, which ultimately leads to legal conflicts. In addition, the lack of practice in regulating relations in the derivatives market directly affects the transparency and efficient protection of bona fide market participants. Only the solution of macroeconomic problems, the development of legislation in the field of derivative financial instruments, as well as increasing market transparency through the use of digital technologies can ensure sustainable development of the Russian derivatives market in the future.

References

1. BIS Statistics: OTC derivatives outstanding (2019). https://www.bis.org/statistics/index.htm. Accessed 25 Dec 2019
2. Chatzis, S.P., Siakoulis, V., Petropoulos, A., Stavroulakis, E., Vlachogiannakis, N.: Forecasting stock market crisis events using deep and statistical machine learning techniques. Expert Syst. Appl. **1121**, 353–371 (2018). https://doi.org/10.1016/j.eswa.2018.06.032
3. Gratton, S., Soualmi, N., Vicente, L.N.: An indicator for the switch from derivative-free to derivative-based optimization. Oper. Res. Lett. **45**(4), 353–361 (2017). https://doi.org/10.1016/j.orl.2017.05.003
4. Hinings, B., Gegenhuber, T., Greenwood, R.: Digital innovation and transformation: an institutional perspective. Inf. Organ. **28**(1), 52–61 (2018). https://doi.org/10.1016/j.infoandorg.2018.02.004
5. Huang, P., Kabir, M.H., Zhang, Y.: Does corporate derivative use reduce stock price exposure? Evidence from UK Firms. Q. Rev. Econ. Finance **65**, 128–136 (2017). https://doi.org/10.1016/j.qref.2017.02.004
6. Kang, S.H., Lee, J.W.: The network connectedness of volatility spillovers across global futures markets. Physica A **52615**, 120756 (2019). https://doi.org/10.1016/j.physa.2019.03.121
7. Lau, C.K.: How corporate derivatives use impact firm performance? Pacific-Basin Finance J. **40**(A), 102–114 (2016). https://doi.org/10.1016/j.pacfin.2016.10.001

8. Mi, H., Xu, L.: Optimal investment with derivatives and pricing in an incomplete market. J. Comput. Appl. Math. **368**, 112522 (2020). https://doi.org/10.1016/j.cam.2019.112522

9. Moscow Exchange: Monthly trading volumes: Annual statistics (2019). https://www.moex.com/en/ir/interactive-analysis.aspx. Accessed 25 Oct 2019

10. Nikitopoulos, C.S., Squires, M., Thorp, S., Yeung, D.: Determinants of the crude oil futures curve: inventory, consumption and volatility. J. Bank. Finance **84**, 53–67 (2017). https://doi.org/10.1016/j.jbankfin.2017.07.006

11. Puchinin, N., Zakharov, A.: Financial and economic crises of recent decades and their impact on the Russian economy. Prime (2019). https://1prime.ru/sience/20190402/829858467.html. Accessed 23 Dec 2019

12. Santana-Gallego, M., Pérez-Rodríguez, J.V.: International trade, exchange rate regimes, and financial crises. North Am. J. Econ. Finance **47**, 85–95 (2019). https://doi.org/10.1016/j.najef.2018.11.009

13. Vervoort, J.M.: New frontiers in futures games: leveraging game sector developments. Futures **105**, 174–186 (2019). https://doi.org/10.1016/j.futures.2018.10.005

14. Vial, G.: Understanding digital transformation: a review and a research agenda. J. Strateg. Inf. Syst. **28**(2), 118–144 (2019). https://doi.org/10.1016/j.jsis.2019.01.003

Digital Assets in the United States: Legal Aspects

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Abstract. This research investigates specific features of theoretical comprehension and legal regulation of digital assets in the USA. The main objectives are: to study the scientific discussion development and lawmaking process in the field of legal regulation of digital assets in the USA, to analyze topical issues of allocation of competences among US financial regulators (SEC, CFTC, IRS, FINRA, FinCEN) exercised in respect to digital assets (virtual currency), to develop a position on the possibility of adopting the US experience in regulation of a new asset class for the purposes of development of the Russian civil law. The author analyzes approaches to the taxonomy of digital assets, presents a classification of tokens, distinguishes between digital and digitized assets. Special attention is paid to new forms of activities in the crypto-market that require specific legal regulation. On the basis of the analysis of draft laws and theoretical discussion statements, some problematic aspects of the civil regulation of digital assets are identified, peculiarities of allocation of competences among the US financial regulators are highlighted.

Keywords: Cryptoassets · Custody · Digital assets · Digitized assets · Token · Virtual currencies

1 Introduction

The institutional model of regulation of the US financial market is characterized by a complex segmentation of the regulatory field, resulting in a large number of supervisory agencies that have their own part of the competence. This leads to more complex rules for compliance of market participants' activities with the federal legislation and problems of the corporate compliance adjustment. Regulators have to issue multiple individual and joint documents that clarify for market participants their responsibilities to each of the regulators. At the same time, such documents are often difficult to classify as legal acts, but they are important as acts of interpretation or acts of "soft law" that affect administrative and judicial law enforcement.

These features of the prudential supervision model are overlaid with specific features of the American federalism and its manifestations in the legal system. While at the federal level, legal regulation is primarily aimed at minimizing public risks (such as fraud, risks of legalization (laundering) of proceeds from crime and financing of terrorism, consumer rights violations, etc.), at the states' level, more stimulating

legislation is being adopted that creates "windows of opportunities" for innovative activities of market participants.

Among the main regulators that extend their competence to the sphere of digital assets circulation are the U.S. Securities and Exchange Commission (SEC), the U.S. Commodity Futures Trading Commission (CFTC), the Financial Industry Regulatory Authority (FINRA) as a division of the SEC. These agencies, with the task of hedging public risks, also address issues of a private legal nature.

The Financial Crimes Enforcement Network (FinCEN) and the Internal Revenue Service (IRS) also belong to the regulation architecture of the U.S. crypto market as agencies with emphasized public legal competence. Regardless of the federal regulator type, all financial institutions that operate digital assets fall under the legal definition of a security and have to comply with the federal Securities Act (SEA). In addition, the main legal framework supporting the CFTC's competence in the financial market is the Commodity Exchange Act (CEA), and FinCEN relies primarily on the Bank Secrecy Act (BSA).

2 Methodology

The methodology of the study comprises comparative, formal-legal, functional methods, systemic approach. The results of the study of problematic issues of digital assets' regulation in the United States form the ground for creating a position on the opportunities to adopt the U.S. experience in the Russian Federation for facilitating the development of the Russian civil law. The findings of this research can be applied for developing models for legal regulation of digital assets in foreign countries as well as using positive aspects of the considered experience to the Russian legal system.

3 Results

Let's consider the specifics of implementing the competence of the most interesting regulators (SEC, CFTC, FINRA) in the U.S. financial market.

The *SEC*'s statutory mission is to protect investors and maintain fair, orderly and efficient markets. The SEC oversees key participants in the securities market, some of which may be involved in digital asset activities. Key participants in the securities markets include national securities exchanges, securities brokers and dealers, investment consultants, and investment companies.

The *CFTC*'s mission is to promote the integrity, sustainability, and dynamism of the U.S. derivatives markets through prudential regulation. In fulfilling this mission, the CFTC regulates key participants in the derivatives market, including trading advisors, futures commission traders, brokers, swap dealers, large swaps participants, retail currency dealers, commodity pool operators, and commodity trading consultants in accordance with the Commodity Exchange Act (CEA).

FINRA strives to protect investors and ensure the market integrity in a way that encourages the dynamic development of the capital market. Among the key activities related to digital assets that are of interest to FINRA are: purchase, sale or execution of

transactions with digital assets; purchase, sale or execution of transactions in a joint fund that invests in digital assets; creation, management or provision of advisory services for a joint fund related to digital assets; purchase, sale or execution of transactions with derivatives (for example, futures, options) linked to digital assets; participation in the primary or secondary placement of digital assets (for example, ICO, pre-ICO); creation or management of a platform for secondary trading of digital assets [11].

Public organizations, such as the Chamber of Digital Commerce and the American Bar Association, play an important role in shaping the expert position and influencing the law enforcement in the United States.

We will highlight *the main aspects* of civil law issues of digital assets turnover in the U.S. financial market:

1. Problems of taxonomy and typology of digital assets.

Here we can highlight the following aspects. *First, the key content issues are a special nature of new digital entities and a need to find for them a separate place among the known objects of civil rights*. So, in American studies, it is suggested that the token is not just a new way of selling assets, but a new type of asset (new asset class) [13], and the CFTC points out that virtual currencies are not like any product that the CFTC has dealt with in the past [4]. At the same time, the SEC uses as the main one the approach according to which most digital assets are similar to securities and they can be subject to the securities legislation.

Second, the issue of terminology is debatable – how to name a new class of objects. American regulators and the crypto community are very pluralistic about naming new digital entities. In particular, the terms "convertible virtual currencies" (FinCEN terminology), "virtual currencies" (IRS and CFTC terminology), "digital assets" (the terminology of the SEC and primarily of the American expert community), and "cryptocurrency" (IRS terminology) are used in parallel.

Since 2015, the CFTC has relied on the IRS definition to provide a "general idea" of what is meant by "virtual currency": a digital representation of a value that functions as a medium of exchange, unit of account, and/or savings and that does not have the status of a legal means of payment [4]. This definition has also been used by the CFTC in lawsuits and other regulatory documents [5].

In 2013, FinCEN released a guide describing virtual currency as a medium of exchange that works as a currency in some environments, but does not have all the attributes of a real currency. In particular, virtual currency does not have the status of a legal tender in any jurisdiction [10].

In the 2019, in a joint document, CFTC, FinCEN and SEC use the most universal term in the American expert community "digital assets": digital assets include instruments that can be qualified under the current U.S. law as securities, commodities, or security- or commodity-based instruments, such as futures or swaps [15].

It is definitely worth recognizing that the vocabulary of international and national financial regulators has migrated from the concepts of "cryptocurrency" and "virtual currency" to a broader class – "assets" ("digital", "crypto", "virtual"). The Cambridge Center for Alternative Finance also draws attention to this trend in its report [3].

With all this variety of terms, it is worth noting that their unification is not so important and fundamental in the American legal model, as American regulators use an approach focused on the meaning, content of the operation, and not on formal features. This is an expansive approach that requires independent reflection by market participants and thorough legal compliance.

So in the above-mentioned joint statement, the heads of the CFTC, FinCEN and the SEC urge companies not to forget about the rules of law governing banking and other financial services, regardless of how they call their digital assets – cryptocurrencies or tokens. Regulators indicate that market participants operate digital assets using a variety of different "labels", but these "labels" may not coincide with how this asset, activity or service is defined by the laws or regulations of the CFTC and SEC. Regulators emphasize that regardless of the labels or terminology that market participants may use, by the asset classification we should take into account the economic nature of the asset, application practices, and underlying technology.

In other words, the nature of the digital asset-related activity that a person is involved in is a key factor in determining whether and how that person should be registered by the CFTC, FinCEN, or SEC. For example, some commodity-related activities may involve registration and other obligations under the Commodity Exchange Act (CEA), while some activities may involve registration and other obligations under the Securities Act (SEA). If a person falls under the definition of "financial institution", his/her activities will be monitored for purposes of the Bank Secrecy Act (BSA) by one or more regulators. For example, in the sphere of countering the legalization (laundering) of proceeds from crime and financing of terrorism, the CFTC, FinCEN, and the National Futures Association (NFA) will monitor activities of the futures commission merchant; the money services business (MSB) companies will be monitored by the FinCEN [15].

Certain obligations under the BSA that apply to a securities broker-dealer, mutual fund, futures commission seller, or introducing broker, for example when developing an AML program or reporting a suspicious activity, apply very widely and regardless of whether the particular transaction includes "securities" or "commodities" as these terms are defined in the federal laws.

Third, the issues of classification of digital assets are legally significant, since such classification allows regulators to customize tools of legal regulation to the specifics of digital assets. The basic classification in both the United States and Europe is that of *payment tokens*, *security tokens*, and *utility tokens*. At the same time, the greatest attention of regulators is paid to security tokens.

Complex issues of classification that have practical legal significance, are:

– differentiation of tokens into digital and digitized ones,
– combination of security tokens and non-security tokens in a single transaction,
– problems of hybrid tokens.

The division of tokens into digital (digital assets) and digitized (digitized assets) is supported by the majority of the American crypto community. Thus, in his fundamental work "Digital and Digitized Assets: Federal and State Jurisdictional Issues" experts point out that a "digital asset" is an electronic record in which an individual has a right or interest. The term does not include the underlying asset or liability, unless the asset

or liability itself is an electronic record. In other words, the digital asset itself is just a code. In this case, a "digitized asset" is an asset (which can be a security or a physical asset), the ownership of which is represented in an electronic record. An example of a digitized asset is an electronic record of ownership of real estate stored in a distributed registry [1].

American experts also conduct a deeper classification of tokens.

For example, in their reports [16, 17], experts from the U.S. Chamber of Digital Commerce draw attention to combinations of different types of tokens carried out in a single transaction. In this regard, they distinguish three specific types of tokens.

1. Tokens substitute (*placeholder tokens*).

The token issuer may offer a non-tokenized instrument, the most common of which is the "Simple Agreement for Future Tokens" (SAFT), which refers to service tokens. However, instead of an agreement, the token issuer can provide buyers with a substitute token that will perform the same functions as a SAFT or other non-token contract or instrument. In any case, such a pre-functional document is a security and subject to the provisions of the Securities Act.

2. Changeable tokens (*mutable tokens*).

Instead of providing a substitute token that is later replaced with a service token, the token issuer can choose to sell the pre-functionality token as a security, and then develop a system where the already service token will eventually work and, after deploying the system, allow token holders to use the same token in the system and extract its consumer value in the Blockchain application.

3. Tokens that ensure the payment of dividends (*dividend-paying tokens*).

A tokenized security (a security token) may provide dividends to its holder in the form of a second token, and this second token may be a non-security token (for example, stablecoins).

Hybrid tokens are a separate legal issue. For example, for a security token that is also a payment token, regulators and courts may provide different types of legal regulation, such as:

– integrated: a hybrid token should comply with both securities and payment laws,
– hierarchical: a hybrid token should meet the stricter requirements of the securities law or payment legislation (depending on its prevailing functionality).

The American Bar Association draws attention to hybrid tokens, citing the example of service tokens that can simultaneously act as a means of payment (for example, Ether) [1]. There are also theoretical questions about *payment tokens*, which experts divide into account-based systems and token-based payment systems. A separate legal issue in the United States is *security tokens*, which determine *whether to extend existing legislation to a new class of objects or adopt a new one*.

The SEC's authority to regulate digital assets relies on the approach that these assets are covered by the definition of a security. However, this definition includes a wide range of instruments, largely reducing to the universal concept of "investment contract". Since the Securities Act and the Commodity Exchange Act do not explicitly

apply to the circulation of digital assets, whether a digital asset will be within the scope of the "security" concept will depend on whether it can meet the criteria of an "investment contract".

In July 2017, the SEC outlined its legal position regarding the public sale of tokens in the report on the case "The DAO" [14], which implies that the U.S. securities legislation applies to certain operations with cryptocurrencies, including the issue of tokens as part of an ICO (initial coin offering), as well as operations for their exchange. Now all participants in the crypto economy, from issuers to exchanges, as well as other persons involved in any way in the offer and sale of tokens that fall under the definition of securities, and have to comply with the requirements of the U.S. securities laws.

On April 3, 2019, the SEC published a guidance on cryptocurrencies, digital tokens, and similar investments (each of which is a "digital asset") [15], intended to help issuers and others to determine whether the applicable digital asset is a security according to federal securities laws. This guide is a long-awaited document in the field of crypto business in the United States, as well as especially important for those who want to register a company under ICO in the United States and get a license for crypto activity. The guidance also confirms the SEC's position, hinted at by public statements from late 2017, that digital assets are in many (if not most) cases securities. The SEC's guidance focuses on elements of the so-called "Howey test", which is taken from the U.S. Supreme Court case (SEC vs. Howey), and is used by courts to assess whether a transaction or financial instrument is an "investment contract" – a security [15].

While the Howie test consists of three elements, the guide focuses on what is usually seen as a key question for analyzing digital assets: whether investors in a digital asset have a "reasonable expectation of profit derived from the efforts of others." In accordance with the guidelines, the SEC has taken a position that this element is performed in a variety of cases, including when the issuer of a digital asset or any other group: has assumed responsibility for the development, improvement, operation or promotion of a network associated with the digital asset; or supported the market or the price of a digital asset.

Under the SEC's guidance, many (if not most) digital assets issued over the past few years should be treated as securities. Thus, individuals who have already registered ICO firms in the United States and are engaged in issuing tokens had to register their offers or ensure that their offers were eligible for an exemption from the registration. Issuers that have not taken these steps may be subject to the SEC enforcement actions and claims from investors.

American lawyers recommend that if a digital token does not claim to be a security, avoid using terminology related to securities in official documents and marketing materials that may confuse readers about the token nature. Examples of such "unsuccessful" turns: "token holders will own" or "profit" from the Blockchain or distributed network; "token holders will receive interest" or "dividends" on their tokens. It is also not recommended to give references to the "market capitalization", "initial coin offering" (ICO).

So, in December 2018, members of the House of Representatives, Congressmen Warren Davidson and Darren Soto introduced the long-awaited Token Taxonomy Act [7], according to which tokens are excluded from the category of "securities" despite recent bans and fines from the SEC. And the Wyoming Blockchain Coalition in March

2018 promoted the passage of five laws removing "consumer tokens" ("consumptive tokens") from the scope of federal securities laws under the justification of them as a "new asset class".

A separate regulation in the USA is assigned to the segment of derivative financial instruments. The CFTC allows new virtual currency derivatives contracts to be listed and details their regulation [6]. In a statement dated May 21, 2018, the regulator indicates it necessary to encourage innovation stemming from virtual assets, but assumes to do so within the framework of the basic trade principles of the Commodity Futures Trading Commission's LabCFTC [5].

The CFTC document corresponds with a document of the British Financial Conduct Authority (FCA) [9] published on July 3, 2019, the FCA announced that it will begin a consultation process to ban the sale, advertising and distribution to retail consumers of derivatives and exchange-traded bonds (ETN) that mention certain types of crypto assets. The document sets out a number of justifications for the proposed ban on the sale of cryptoasset derivatives to retail customers.

2. Problems of legalization of new types of intermediaries.

A separate issue is the issue of specialized regulation of new (or modernized) *activities* in relation to digital assets.

On the one hand, existing regulations may sometimes apply directly to new intermediaries that perform tasks similar to traditional financial activities. On the other hand, some services on the crypto market may require additional regulation. Experts of the Cambridge Center for Alternative Finance consider only a relatively small number of mediation types in the crypto market to be absolutely new (for example, the issue and placement of tokens, P2P services, crypto exchanges, and blockchain analytics) [3]. Recently, the consulting company Financial Integrity Network recommended the U.S. Congress to create a new category of financial institutions in accordance with the Bank Secrecy Act to regulate activities of cryptocurrency companies [12].

4   Discussion

A separate interest of the expert community is drawn to the specifics of digital asset storage services (custodial activities) [2]. Since crypto assets do not have a physical appearance (they exist solely as digital records in a virtual distributed registry), any movement of the crypto asset (for example, the transfer of rights to it) requires permission in the form of a cryptographically signed message from the initiator. Using a private key enables the transaction to be made. In the context of crypto assets, storage is thus no longer related to direct ownership of assets, but to the secure storage of encryption keys.

On July 8, 2019, the SEC's trade and markets department and FINRA's office of general counsel issued a joint statement on the custody of digital assets-securities by broker-dealers [8], which discusses certain provisions of federal securities laws applicable to registered broker-dealers that may be affected when such individuals hold digital asset securities. The document explains the content of this term. Since digital assets may not be securities, the term "digital assets securities" is used for those digital assets that are securities.

The joint statement implies that digital assets securities and related innovative technologies raise new and complex issues related to the regulation and compliance. It also notes that there are many significant differences in the mechanics and risks associated with storing traditional securities and digital assets securities. The joint statement then discusses a number of risks and regulatory requirements for broker-dealers seeking to maintain custody of digital asset securities, as well as those whose business models do not imply any storage.

For broker-dealers whose business models include storing securities with digital assets, the joint statement specifically focuses on the requirements of the SEC's client protection rule, which imposes various requirements on broker-dealers to ensure that clients' securities and cash are easily available for return to clients. The joint statement also discusses some of the unique challenges that may arise when using distributed ledger technology in the context of the SEC's rules in relation to books, documentation and financial reporting.

5   Conclusion

Thus, in order to optimally configure legal tools, experts recommend to recognize that "digital assets" is not a homogeneous, but a generalizing concept that describes many types of tokens; use an approach based on actual data on the activities of crypto market entities to develop detailed understanding of the tokens types, their functions, basic infrastructure and other key features; create a typology based on the nature and functional specific features of tokens; identify potential harm to financial markets, investors and consumers from the unregulated token circulation, as well as cooperate with crypto market entities in order to better understand the specifics of their activities.

References

1. American Bar Association: Derivatives and Futures Law Committee, Innovative Digital Products and Processes Subcommittee, Jurisdiction Working Group: Digital and digitized assets: Federal and state jurisdictional issues (2019). https://www.americanbar.org/content/dam/aba/administrative/business_law/buslaw/committees/CL620000pub/digital_assets.pdf. Accessed 01 Dec 2019
2. Baris, J.G.: The custody of digital assets global legal insights (2019). https://www.globallegalinsights.com/practice-areas/blockchain-laws-and-regulations/06-the-custody-of-digital-assets-2020. Accessed 01 Dec 2019
3. Blandin, A., Cloots, A.S., Hussain, H., Rauchs, M., Saleuddin, R., Allen, J.G., Zhang, B., Cloud, K.: The Global Cryptoasset Regulatory Landscape Study. Cambridge Centre for Alternative Finance, Cambridge (2019)
4. CFTC: A CFTC primer on virtual currencies (2017). https://www.cftc.gov/sites/default/files/idc/groups/public/documents/file/labcftc_primercurrencies100417.pdf. Accessed 01 Dec 2019
5. CFTC: An Introduction to virtual currency (2018). https://www.cftc.gov/sites/default/files/idc/groups/public/@customerprotection/documents/file/oceo_aivc0218.pdf. Accessed 01 Dec 2019

6. CFTC: Staff advisory No. 18–14. Division of market oversight, division of clearing and risk (2018). https://www.cftc.gov/csl/18-14/download. Accessed 01 Dec 2019

7. Davidson, W., Soto, D.: Token taxonomy act of 2018 (2018). https://ru.scribd.com/document/396096529/Token-Taxonomy-Act-of-2018. Accessed 01 Dec 2019

8. Division of Trading and Markets, & Office of General Counsel: Joint staff statement on broker-dealer custody of digital asset securities (2019). https://www.sec.gov/news/public-statement/joint-staff-statement-broker-dealer-custody-digital-asset-securities. Accessed 01 Dec 2019

9. FCA: Prohibiting the sale to retail clients of investment products that reference cryptoassets (2019). https://www.fca.org.uk/publication/consultation/cp19-22.pdf. Accessed 01 Dec 2019

10. FinCEN: Application of FinCEN's regulations to persons administering, exchanging, or using virtual currencies (FIN-2013-G001) (2013). https://www.fincen.gov/resources/statutes-regulations/guidance/applicationfincens-regulations-persons-administering. Accessed 01 Dec 2019

11. FINRA: Regulatory Notice 19–24 FINRA encourages firms to Notify FINRA if they engage in activities related to digital assets (2019). https://www.finra.org/rules-guidance/notices/19-24. Accessed 01 Dec 2019

12. Khatri, Y.: Advisory firm suggests US Congress to regulate crypto sector under the bank secrecy act (2019). https://www.theblockcrypto.com/linked/38191/advisory-firm-suggests-us-congress-to-regulate-crypto-sector-under-the-bank-secrecy-act. Accessed 01 Dec 2019

13. Klayman, J.A.: Mutually assured disruption: the rise of the security token. In: Dewey, J. (ed.) Blockchain & Cryptocurrency Regulation, pp. 60–89. Global Legal Group Ltd., London (2019)

14. Report of Investigation Pursuant to Section 21(a) of the Securities Exchange Act of 1934: The DAO, no. 81207, 25 July 2017. https://www.sec.gov/litigation/investreport/34-81207.pdf. Accessed 01 Dec 2019

15. Tarbert, H., Blanco, K.A., Clayton, J.: Leaders of CFTC, FinCEN, and SEC issue joint statement on activities involving digital assets (2019). https://www.sec.gov/news/public-statement/cftc-fincen-secjointstatementdigitalassets. Accessed 01 Dec 2019

16. Token Alliance: Legal landscapes governing digital tokens in the United States (2018). https://digitalchamber.org/wp-content/uploads/2019/08/CHD-19003-16-06-D1-White-Paper-Countries-United-States.pdf. Accessed 01 Dec 2019

17. Token Alliance: Considerations and guidelines for securities and non-securities tokens (2019). https://digitalchamber.org/wp-content/uploads/2019/08/Security-Non-Security-Tokens.pdf. Accessed 01 Dec 2019

Adaptability and Flexibility of Law
in the Context of Digitalization

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Abstract. The paper investigates current issues of legal transformation in the context of digitalization. The main attention is paid to directions and stages of adaptation, determination of the legal status of digital technologies, their protection capacity and delinquency. Based on expert assessments, key parameters of legal regulation of digital technologies and their products are determined and the need to supplement civil, financial and information law with new categories and institutions is justified. It is concluded that approaches to assessing the legal nature of digital objects are contradictory and there is insufficient consideration of technical aspects of digital technologies, as well as a need to develop a unified legal strategy for the civil and intellectual rights of digital technologies at the international level. Among the priorities and directions of this strategy, there should be the development of issues on the legal personality of digital technologies and the main mechanisms for protecting products of this technology application. The conclusions formulated in the article have important practical and methodological significance and can be taken into account when reforming the current legislation.

Keywords: Copyright and related rights · Digital economy · Digitalization · Legal reforms · Legislation · Legal relations

1 Introduction

In the context of rapid development of the digital economy, there is a need to develop a science-based approach to the legal regulation of digital technologies and the legitimation of new tangible and intangible assets. The problem, however, is that while declaring the importance of legal transformation, scientists mostly ignore the question in what should be expressed the digital transformation of law, and whether modern legislation has the necessary internal resources for adaptation. In fact, the question of digital transformation of law depends on the question of its readiness to adapt to modern digital challenges and realities. Adaptability in most scientific theories is considered as a property of organic and inorganic systems that determine the success of their existence in a changing environment. Unfortunately, in the theory of law, this

term is not widely used because of the obvious reluctance of legal scholars to recognize the fact that the law, being aimed at regulating public relations, often does not keep pace with their development. Meanwhile, it is the adaptability of law that is the key parameter in identifying the relationship between the law adaptation degree to regulated relations and the degree of its autonomy as a regulator and controller of the development of these relations.

Speaking about the adaptability of law to the digital economy, it is important to identify key tasks of adaptability – resolving contradictions in the process of implementing digital technologies, stimulating positive development of the digital economy and minimizing digitalization risks. When solving these tasks at the initial stage, the legislation does not regulate relations but adapts to them. The results of this process are development of law, its self-actualization and self-realization. Considering the adaptation of law in the conditions of digitalization as an inevitable process of its development, we can conditionally distinguish its constituent elements: heuristic (the ability to design and find solutions based on a detailed study of digital processes and phenomena that require regulation); communication (active interaction with participants of new legal relations, search for consensus between new needs and traditional legal institutions); axiological (compliance of new digital challenges with the fundamental principles of law); empirical (search for the most acceptable models of regulation through the formation of a new legal practice).

The ideal adaptation is based on 4 elements at the same time. In this case, it allows not only to solve particular problems of regulation, but also to present them in a systematic unity with the main ideas, principles and structures of law. While recognizing the importance of developing a unified concept of digital law, legal science nevertheless ignores the issue of a development strategy for the law. Because of the lack of a theoretical framework for digital law, experts prefer to address applied issues of regulation for individual digital technologies. In particular, the issues of legal regulation of artificial intelligence (hereinafter – AI) are considered within the scope of its use in certain areas of the legal activity [28]; changes in modern delinquency and contract legislation [15], etc. The legal regulation of the use of drones and other breakthrough technologies is analyzed in the context of reforming special legislation (medical [20], informational [26]), etc. Great importance in the scientific literature is given to the regulation of smart contracts in the context of securities turnover [32], the will of the parties [14], the correct legal formalization of smart contracts [17, 23]. Attention is also paid to the regulation of crypto assets. Most of the works are devoted to the basic principles of financial legislation [12], taxation and regulation of the digital payment instruments market [8, 16]. The legal status of Big Data, its use in legal activities [13], models of legal control [22] and legal risks of using Big Data [17, 24] are also discussed.

2 Methodology

This research work is based on general scientific and private scientific methods. Mainly general logical (analysis, synthesis, induction, deduction, abstraction and classification) and general theoretical methods were used. A large role in the research is given to

methods of abstract, analog and simulation modeling, which allow building a construct of legal features of new digital phenomena on the basis of traditional legal institutions. These methods of scientific knowledge were supplemented by empirical methods: statistical (statistical observation, summary and grouping, statistical analysis), sociological (study of documents, surveys in the form of questionnaires and interviews, observation) and socio-psychological (testing). The use of these approaches, together with general theoretical methods, made it possible to conduct a comprehensive study of the development of digital law.

3 Results

The authors of this research identified the main approaches to defining legal characteristics of digital technology, evaluated proposals for restructuring of law under modern conditions, delineated boundaries of the legal formalization of digital phenomena and perspectives of the development of international standards for digital rights. A critical analysis of these aspects allowed the authors to formulate a number of recommendations aimed at the legislation development both in terms of sustainability of the digital economy and in terms of minimization of digitalization risks.

Unfortunately, modern science does not address the question of what parameters should be used to assess the adaptability of law in the era of digitalization. Without claiming to be an indisputable position, we consider it possible to assess the adaptive capabilities of the modern law through two groups of factors:

– legal categories and institutions that set the general tone for the digital transformation of law: the legal nature of digital technologies as objects of civil rights, their "protectability" and delinquency,
– particular issues of regulation of individual technologies: the Internet of things, AI, Big Data, machine learning, unmanned aerial objects, robots, etc., as well as a number of previously identified general issues that are gaining a new meaning in relation to some technologies.

The solution of the first block of questions involves the use of heuristic and axiological tools of adaptation, while the second block is focused on the use of communication and empirical tools. The first reference point for assessing the adaptive capabilities of law in the context of digitalization is the protection capacity of digital technologies and their products. Under the protection capacity of digital technologies is understood their ability to act as an object of civil and intellectual rights. In this regard, the important question is whether emancipation (separation) of real and copyright law from traditional legal institutions is permissible.

Opponents of emancipation insist that artificial intelligence and machine learning cannot be used as the basis of law, and they cannot replace the fundamental principles of law, since these principles themselves have been developed for centuries in a way that is called "anchoring learning" in the field of AI, and human behavior is basically too irrational and inconsistent [10]. Proponents, on the contrary, see emancipation as a natural conflict of public and private interests in the digital world and consider a

possibility of recognizing digital technologies as legal entities if they have functional independence, acquire value and utility in the economic sense [19].

In the current Russian legislation, digital rights are considered as objects of civil rights, together with things and other property. They are a type of property rights and are mentioned along with intellectual rights. That gives reason for some researchers to deny the possibility of attributing digital objects to objects of copyright protection. They are defined as binding and other rights, the implementation, disposal and restriction of which are possible only in the information system (Article 141.1 of the Civil Code of the Russian Federation), and therefore have a very limited application [6].

As a result, a whole set of issues related to the use of these rights outside the digital environment remains outside the legal framework, namely, the use of the results of the exercise of rights (generalization and analysis of Big Data, machine learning results, etc.). While in the Russian law, the starting point for regulating digital rights is their connection with the information system, in the Anglo-Saxon law, the "protectability" of digital objects is associated with their relation to property [31]. From these positions, digital technologies acquire a status of objects of civil law, as well as products created based on the use of these technologies.

Thus, in the Anglo-Saxon law, it is much easier to answer questions about: 1) Who owns the new code of the self-learning program, which embodies its "experience" of executing commands; 2) Who has rights to works created by such programs and robots; 3) Who bears property and other responsibility for the negative consequences of the use of digital technologies or their products.

However, the experience of individual countries is not sufficient for the progressive and successful development of digital economy. It is important to develop a unified universal approach to recognizing digital technologies, products and rights as objects of civil legal relations.

We believe that this approach should be based on the following methodological provisions:

– recognition of a digital product or phenomenon as an object of civil rights should not be based on establishing its material nature or economic value. As a rule, digital objects have a complex legal nature, and can be considered simultaneously from the position of intellectual and real (property) rights,
– the assessment of digital technologies should be based on a legal model that is as close as possible to the legal essence of relations and can ensure a balance of private and public interests in digital turnover,
– in developing a universal approach to the regulation of digital technologies as an object of civil rights, it is necessary to proceed from the objective emancipation of digital law from traditional legal institutions. In other words, the adaptive capabilities of traditional law in relation to digital technologies are very limited due to the multifunctional nature of objects, technical saturation, uncertainty of regulatory tasks and possible risks of their introduction into civil circulation.

Copyright Protection Ability. Speaking about the development of intellectual property rights in the digital sphere, it is important to note that one of the most relevant is the choice between granting the right to the results of the digital technologies use to

individuals and recognizing them as a public domain. This fundamental question leads to a number of additional issues related to 1) the protection of objects created using digital technologies, 2) the definition of the digital form of existence of a virtual work; 3) the qualification of the content of digital platforms, 4) the possibility of changing the nature of the disposal of the exclusive right to a protected object due to its existence in the digital environment, 5) the joint use of exclusive rights in crowdsourcing, etc. But whatever the decision is, it is obvious that it cannot be made before the legal nature of the rights to the products of digital technologies and, in particular, AI is determined.

Difficulties are also associated with objective characteristics of digital products: a high degree of repeatability obtained from the use of these technologies results, the low contribution of the creative human labor, automation of certain processes, the inability to distinguish between creative and non-creative component, the complexity of differentiation of rights of the author and rights of the originator etc. First of all, this applies to digital platforms and platform solutions, databases, data processing algorithms created in the process of machine learning, etc. The digital economy raises a question of how the protection of intellectual property results should be built and interests of creators, users and investors should be fully respected.

4   Discussion

In science and practice, there are three possible models for the protection of rights to results of intellectual activity:

1. Consideration of digital technology products through the prism of copyright. This approach is based on the European Union Directive 96/9/EC [7] in cases where digital objects meet originality criteria for data selection and processing. But this approach negates the difference between the author and the owner of the technology. In addition, it may be difficult to distinguish authorship in cases where, for example, a digital solution (digital platform, blockchain registry, cloud technology) of one author creates a product of another author, as well as in cases of transferring part of the data from one author's system to another without the consent of the manufacturer of the first database. Besides, the proposed solution contradicts one of the main principles of copyright – the protection of a work that has an original, unchangeable and singular form. Digital solutions, as a rule, have a plurality of presentation formats, coding ways and methods, and this excludes the possibility of considering them as an indivisible original work.
2. Regulation of digital technologies in the format of related rights. This approach is more typical for the Russian law, where the activity of manufacturers of databases or other digital products is defined as organizational and technical one [25]. In this case, creators and developers of a database architecture acquire the exclusive right to results of their intellectual work in general. But in this case, boundaries of related rights are blurred and the risk of infringement of the users' rights of digital products is created.

3. The introduction of an independent institute of intellectual rights to digital objects, which would combine both property and non-property rights, as well as reflect technological specifics of protected objects [9, 19]. The development of a fundamentally new mechanism will allow us to build a correct model for regulating relations in the sphere of using digital technology products (works created by robots, codes of self-learning programs, etc.).

The next important issue is to give digital technologies *a property of legal subjects* (legal personality). This proposal has already gone beyond the theory. It is already suggested to recognize robots and objects of robotics as subjects of obligations and consider them as agents when concluding contracts with third parties who act on behalf of their owner and on their own behalf [29]. In particular, in the Arizona law, robot couriers were granted all the rights and obligations of pedestrians, with the exception of the obligation to give way to pedestrians [1, 21].

In traditional law, legal personality is a combination of legal capacity, capacity and delinquency. Today, there are three types of legal capacity: individuals, corporations, and public legal entities. At the same time, the expansion of this list was carried out gradually as it became necessary to introduce new participants in the turnover. In particular, giving legal personality to legal entities required changing approaches to understanding the will, interest, motives the subject. In this regard, it is hardly appropriate to deny the legal personality of digital technologies because of their lack of a strong-willed component [30].

It is much more important to evaluate technologies through the prism of corporate legal personality, namely, from the perspective of their autonomy and ability to make independent decisions. To these properties, we can also add the ability to self-learn and the ability to change the algorithm of actions on its own. It should be noted, however, that modern digital technologies have different degrees of independence. Can the same rules of legal personality be applied to them, or should they be differentiated? In the modern law, this issue has not found its solution yet. If the legal personality of AI and other digital technologies is recognized, it will also be important to resolve such issues as civil liability insurance, criteria for determining the possible danger of robot activity, establish rules for the delinquency of digital technologies, and determine the procedure for accounting and registration of new legal entities.

In general, the idea of legal personality of digital technology is reasonable, but it should not be equated to the legal personality of individuals, and the legal status of corporations. According to experts, the recognition of legal personality in robots is possible, since the legal personality of international associations, in particular, the UNO, has already been recognized. It is also important to consider the autonomy of digital objects. The degree to which the technology depends on a person will determine its delinquency.

Speaking about the law transformation in the context of digitalization, we should also mention the importance of a narrow approach, when experts eventually come to the solution of general theoretical problems of the law adaptation through the solution of particular regulation issues on individual technologies. In particular, issues related to the use of AI need to be addressed. It is difficult to determine who is responsible for errors made by digital devices. Experts have widely discussed the responsibility of

IBM's Watson AI, which diagnoses cancer in South Korea. They conclude that responsibility should be borne by the creators of "Watson" and its associated medical staff [5]. In addition to regulation issues, there is a wide discussion of creating legal guarantees for the safety of AI and robots. In particular C. Chessman raise the question of applying animals treatment rules to robots, up to the establishment of responsibility for cruelty to robots or AI similar to living creatures, since the contemplation of this abuse can cause mental harm to a person [4].

In connection with the active implementation of AI and machine learning, the task of determining possible boundaries of the use of technology in legal activities arises. As most experts note, legal decision-making cannot be automated due to the fact that there are too many value judgments in it, norms are designed to be applied based on intuition and taking into account the context, as well as justice itself in any form [33].

This approach is seen as extremely categorical, especially taking into account that digital technologies have long been used in the activities of lawyers. The question is how this participation should be framed and how the measure of machine responsibility for the final decision can be allocated. According to R. Catterwell, machine learning and AI can be used for automated interpretation of contracts. However, while some provisions may well be interpreted by the machine, others may not. There are two main limitations: 1) some provisions are relative, intuitive and rather "a matter of impression"; 2) some provisions can only be interpreted in accordance with views of the parties and their circumstances. Therefore, machine learning can only help lawyers, but not replace them when interpreting contracts [2]. In this regard, the separation of human and machine powers in terms of decision-making seems reasonable. AI can take a function of data processing and analysis, and a person can make a decision based on a critical analysis of the information prepared by the AI.

Many questions arise when using the Internet of things. Lawyers emphasize insufficient protection of personal data of users of "smart" things, because devices often collect and exchange information without the owners' knowledge, can exchange information in a cross-border manner, etc. [27]. The problem is that provisions of current legislation, and in particular the EU General Data Protection Regulation (GDPR), do not take into account the use of the Internet of things and smart homes, and the literal application of the rules in some cases may impose an unreasonably high responsibility on the creators of devices, and in other cases – create cybersecurity risks [3]. The issue of personal data protection also arises in connection with the use of cloud technologies. Even the most modern and strict General Data Protection Regulation (GDPR) is not applicable in practice to processing of personal data by cloud technologies, in particular, because it may be impossible to identify data controllers and providers, and, moreover, the very fact of data collection by the program may remain secret from everyone [11].

The exchange of data stored in a cloud storage is no less problematic. Currently, many types of data, including those that may be needed during a criminal investigation in country 1, may be controlled in country 2. Modern international treaties on mutual legal assistance, however, cannot help country 1 to obtain data from the cloud of country 2, and simple international courtesy leaves too much discretion, as evidenced by court practice in the cases of *Microsoft Ireland* or *Yahoo! Belgium*. Therefore,

experts suggest that countries start negotiations on the conclusion of international agreements on the exchange of information [34].

Speaking about the legal regulation of digital technologies, we cannot say nothing about the applied aspects of the use of unmanned aerial vehicles (UAVs or drones). Although the legislation of many countries, including Russia, has already introduced regulations restricting the use of drones, the issue of protecting personal life remains open. In particular, no country in the world provides land owners with adequate legal protection against malicious actions of drone owners who may use drones to invade someone else's territory and interfere with their privacy [15]. The issue of information collected by drones and the possibility of its use by owners has not been resolved [18].

5   Conclusion

Summing up this research, it is important to emphasize that modern legislation begins the first stage of adaptation, when only the regularities and challenges of digitalization are being investigated. In fact, a layer of axiological and heuristic tasks is formed through the choice of a law development strategy: stimulating the digital economy development (a strategy of progressive development) or minimizing the risks of its use (a security strategy). Without denying the importance of this direction, however, we should note the need for a more consistent and systematic approach to the development of digital law by addressing two fundamental issues: 1) Can traditional legal structures be adapted to realities of digital economy, or is it necessary to develop fundamentally new laws? 2) How can a model of the law universalization of transnational technologies be built?

The solution of the first question directly depends on how modern jurisprudence will assess the legal personality and protection capacity of digital technologies. According to the study, the marginalization of traditional law in the light of the development of digital technologies is evident, and therefore the use of old structures can only lead to mosaic regulation without reserves for further adaptation.

The progressive development of the digital economy is impossible without the development and adoption of fundamentally new legal structures with a margin of safety for the future. In particular, the issue of legal personality of technologies, copyright and related rights, machine liability and insurance needs to be radically revised. It is also important to note that the development of these models should be conducted not at the level of individual states, but at the level of international community to ensure the universalization of rights.

References

1. An act amending sections 28 101 And 28 627, Arizona Revised Statutes; Amending Title 28, Chapter 3, Article 15, Arizona Revised Statutes, By Adding Section 28 913; Amending Sections 28 2153 And 28 4132, Arizona Revised Statutes; Relating To Transportation Devices. https://www.azleg.gov/legtext/53leg/2R/bills/HB2422P.htm. Accessed 20 Apr 2020

2. Catterwell, R.: Automation in contract interpretation. Law Innov. Technol. **81** (2020). https://ssrn.com/abstract=3542549. Accessed 20 Apr 2020

3. Chen, J., Edwards, L., Urquhart, L., McAuley, D.: Who is responsible for data processing in smart homes? Reconsidering Joint Controllership and the Household Exemption (2019). https://ssrn.com/abstract=3483511. Accessed 20 Apr 2020

4. Chessman, C.: Not quite human: artificial intelligence, animals, and the regulation of sentient property (2018). https://ssrn.com/abstract=3200802. Accessed 20 Apr 2020

5. Chung, J., Zink, A.: Hey Watson, can I sue you for malpractice? Examining the liability of artificial intelligence in medicine. Asia-Pac. J. Health Law Policy Ethics (2017). https://ssrn.com/abstract=3076576. Accessed 20 Apr 2020

6. Civil Code of the Russian Federation dated 30.11.1994 N 51-FZ. http://www.consultant.ru/document/cons_doc_LAW_5142/. Accessed 20 Apr 2020

7. Directive N 96/9/EC of the European Parliament and of the Council of 11 March 1996 On the legal protection of databases. OJ L 77, 27 Mar 1996. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A31996L0009. Accessed 20 Apr 2020

8. Edwards, F.R., Hanley, K., Litan, R., Weil, R.L.: Crypto assets require better regulation: statement of the financial economists roundtable on crypto assets. Financ. Anal. J. **75**(2), 14–19 (2019)

9. Entin, V.L.: Copyright in Virtual Reality. New Opportunities and Challenges in Digital Age. Statut, Moscow (2017)

10. Fernández-Villaverde, J.: Simple rules for a complex world with artificial intelligence. PIER Working Paper 20-010 (2020). https://ssrn.com/abstract=3559378. Accessed 20 Apr 2020

11. Fosch Villaronga, E., Millard, C.: Cloud robotics law and regulation (2018). https://ssrn.com/abstract=3305353. Accessed 20 Apr 2020

12. Giudici, G., Milne, A., Vinogradov, D.: Cryptocurrencies: market analysis and perspectives. J. Ind. Bus. Econ. **47**, 1–18 (2020)

13. Goanta, C.: Big law, big data. Forthcoming, law and method (2017). https://ssrn.com/abstract=3166290. Accessed 20 Apr 2020

14. Gomes, S.: Smart contracts: legal frontiers and insertion into the creative economy. Braz. J. Oper. Prod. Manag. **15**, 376–385 (2018)

15. Hacker, P., Krestel, R., Grundmann, S., Naumann, F.: Explainable AI under contract and tort law: legal incentives and technical challenges. Artif. Intell. Law. (2020). https://doi.org/10.1007/s10506-020-09260-6

16. Huang, R.H., Yang, D., Loo, F.F.Y.: The development and regulation of cryptoassets: Hong Kong experiences and a comparative analysis. Eur. Bus. Organ. Law Rev. **21**, 319–347 (2020)

17. Ivantsov, S.V., Sidorenko, E.L., Spasennikov, B.A., Berezkin, Y.M., Sukhodolov, Y.A.: Cryptocurrency-related crimes: key criminological trends. Russ. J. Criminol. **13**(1), 85–93 (2019). https://doi.org/10.17150/2500-4255.2019.13(1).85-93

18. Kaminski, M.E.: Robots in the home: what will we have agreed to? Ohio State Public Law Working Paper No. 292 (2015). https://ssrn.com/abstract=2592500. Accessed 20 Apr 2020

19. Kharitonova, Yu.S.: The legal regime of the results of artificial intelligence. In: Louts, E.B. (ed.) Modern Information Technology and Law: Monograph, pp. 68–83. Statute, Moscow (2019)

20. Konert, A., Smereka, J., Szarpak, Ł.: The use of drones in emergency medicine: practical and legal aspects. Emerg. Med. Int., 3589792 (2019)

21. Lapastora, C.: Arizona law gives delivery robots same rights as pedestrians – but they must abide by same rules (2018). https://www.foxnews.com/tech/arizona-law-gives-delivery-robots-same-rights-as-pedestrians-but-they-must-abide-by-same-rules. Accessed 20 Apr 2020

22. Lei, C.: Legal control over big data criminal investigation. Soc. Sci. China **40**, 189–204 (2019)
23. Liu, Y., Huang, J.: Legal creation of smart contracts and the legal effects. J. Phys: Conf. Ser. **1345**, 042033 (2019)
24. Low, K.F.K., Mik, E.: Pause the blockchain legal revolution. Int. Comp. Law Q. **69**(1), 135–175 (2019)
25. Maggon, H.: Legal protection of databases: an Indian perspective. J. Intellect. Property Rights **11**, 140–144 (2006)
26. Marquès, M.C.: Recreational drones: legal framework, civil liability and data protection. Revista de Derecho Civil **6**, 297–333 (2019)
27. Mohamed, S., Zulhuda, S.: The concept of internet of things and its challenges to privacy. South East Asia J. Contemp. Bus. Econ. Law **8**(4), 1–6 (2015)
28. Mowbray, A., Chung, P., Greenleaf, G.: Utilising AI in the legal assistance sector – testing a role for legal information institutes (2019). https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3379441. Accessed 20 Apr 2020
29. Neznamov, A.V., Naumov, V.B.: Strategy for the regulation of robotics and cyberphysical systems. Law **2**, 69–89 (2018)
30. Ponkin, I.V., Redkina, A.I.: Artificial intelligence from a legal viewpoint. Peoples' Friendsh. Univ. Russ. Bull. Ser.: Jurid. Sci. **22**(1), 91–109 (2018)
31. Rahmatian, A.: Originality in UK copyright law: the old "skill and labour" doctrine under pressure. Int. Rev. Intellect. Property Compet. Law **44**, 4–34 (2013)
32. Sidorenko, E.L.: Stablecoin as a new financial instrument. In: Ashmarina, S.I., Vochozka, M., Mantulenko, V.V. (eds.) Digital Age: Chances, Challenges and Future. Lecture Notes in Network and System, vol. 84, pp. 630–638. Springer, Cham (2020)
33. Wachter, S., Mittelstadt, B., Russell, C.: Why fairness cannot be automated: bridging the gap between EU non-discrimination law and AI (2020). https://ssrn.com/abstract=3547922. Accessed 20 Apr 2020
34. Yunquera, R.: One cloud in the sky and conflicting laws on the ground: Regulating Law enforcement access to e-evidence in cloud computing in the European Union and the United States. Mayer Brown Legal Business Prize (2018). https://ssrn.com/abstract=3271580. Accessed 20 Apr 2020

Relevant Issues of Service Secret: Theoretical and Legal Aspects

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Abstract. Information has always been a valuable facility. Millions of people use information resources. In the digital society, it has acquired new qualities. Now it is not only an informative resource, but also a strategic, administrative and economic one. These resources now largely determine the scientific and technical potential of the country, the level of development of its national economy, the way of life and human activity. Information plays a significant role in the activities of any modern commercial enterprise and public authority. This is especially true for information that is subject to official secrecy. That is why the relevance of forming effective means of its protection is currently increasing. Service secret as a type of confidential information is its own type. Its legal regulation has developed relatively recently. As an independent species, it began to stand out only in the twentieth century. The content and level of protection of official secrets differ from one state to another. This is due to historical legal traditions.

Keywords: Access to information · Confidential information · Secret · Service information · Trade secret

1 Introduction

In the contemporary world, information is defined differently. Undoubtedly, information is wealth [1]. It is generally accepted that information is related to economic resources [15]. Today, information is the object of criminal actions [3]. The global circulation of information has created a number of problems in the collection, dissemination and access to information [20]. Human culture is progressively becoming digital. A good deal of attention is paid to the confidentiality of information [4]. This raises questions about the relationship between ethical norms and the dissemination of information [5]. A clear definition of the confidentiality regime and how to disclose information will help to resolve these issues correctly. The attitude to official secrets is different. According to Graeber the concept of "service secret" is a specific invention of the bureaucracy [13]. Therefore, it fanatically protects its offspring. Russian scientists

consider official secrets as the result of a special legal regime, as a type of confidential information, as an element of trade secrets. Official secrets as a category have almost no precise definition in Russian legislation. However, legal liability is provided for its disclosure. This creates a lot of problems in law enforcement and administrative work.

2 Methodology

The authors used the synthesis method to study the problems of service secrets. The research methodology consists of approaches and principles used for conducting general scientific and juridical research. It is based on dialectical and formal-logical methods. The way of analysis and others were also used. The combination of methods made it possible to fully consider the problematic aspects of service information with a confidentiality regime.

3 Results

Today, the legislation of most countries prohibits employees from disclosing information that has become known to them in connection with their service. Over the past few decades, the principle of public administration openness has become increasingly important in most countries, and consequently, employees are increasingly charged with an opposing duty to ensure access to public documents. This is why the problem of establishing boundaries between official secrets and socially important information is urgent in modern society. Its resolution is not possible without establishing clear boundaries between them and improving the legal regulation in this subject matter. Russian legislation is not perfect. The definition of "service secret" is not fixed in Russian legislation. Only the list of information that cannot be covered by such a regime is fixed. There is no federal law regulating this type of information. Today, the "service secret" regime, the basis for its dissemination and responsibility for violation are regulated by a large number of departmental acts. This contradicts the norms of the Constitution of the Russian Federation and leads to problems in law enforcement and management activities. First of all, it is necessary to adopt a Federal law regulating official secrets. The definition of "official secret" will be fixed, which should be understood as confidential, legally protected information received by a person in the course of professional activities related to the management and organizational and legal foundations of the organization.

4 Discussion

In modern Russian legislation, the concept of "service secret" is not fixed. Nevertheless, this mode of data confidentiality is regulated by a number of legal acts. Thus, in the third paragraph of the Decree of the President of the Russian Federation of 06.03.1997 No. 188 "On approval of the list of confidential information", service secrets are defined as: "official information, access to which is restricted by state

authorities in accordance with the Civil Code of the Russian Federation and federal laws" [6, p. 3]. It should be noted that such information is not part of trade or professional secrets.

Until 2008, proprietary and trade secret, are governed by article 139 of the Civil Code of the Russian Federation (Part II) of 30.11.1994 No.51-FZ. According to this document, information is an official or trade secret in case when the information has actual or potential commercial value owing to uncertainty to its third parties, it has no free access on lawful basis [20]. Today, these rules are excluded from the civil code of the Russian Federation.

In the Federal law of 27.07.2006 No.149-FZ "On information, information technologies and information protection", service secrets are mentioned in the third paragraph of the first part of the eighth article and the fourth part of the ninth article [9]. The legislator in this normative legal act did not fix the definition of "service secret", did not define its scope and content. But it contains an important rule: the conditions for the extension of the service secret regime to information and responsibility for its violation can be established exclusively by federal law (the fourth part of the ninth article). However so far, the federal law regulating the regime of service secrets in Russia has not been adopted.

In 2004, the Draft Federal Law No. 124871-4 "On Service Secrets" was developed and submitted for consideration to the state Duma of the Russian Federation. The second article of the draft contained a list of information classified as service secret which included: "confidential information generated in the course of administrative activity of the organ or organization, the distribution of which obstructs the authority or organization of the powers granted to him or otherwise adversely affect their implementation" [8, p. 2]. Confidential information was included in this list obtained by the organ or organization in accordance with their competence in accordance with legislation. Here, the service secret regime was defined as: "a set of legal, organizational, technical and other measures taken by authorized officials of public authorities and organizations that provide restrictions on the dissemination of information constituting official secrets, and on access to this information" [8, p. 2].

Nowadays, the "service secret" regime is regulated by the Decree of the Government of the Russian Federation of 03.11.1994 No. 1233 "On Approval of the Regulation on the Procedure for Handling Limited-Service Official Information in the Federal Executive Bodies, an Authorized Atomic Energy Management Body and an Authorized Space Agency" [7, p. 4]. According to this document, official information of limited distribution is "unclassified information related to the activities of organizations, restrictions on the distribution of which are dictated by official necessity, as well as unclassified information received by organizations, access to which is restricted in accordance with federal laws" [7]. The list of information that cannot be covered by this confidentiality regime is also fixed. According to the resolution, documents containing information classified as service secrets must be marked "for official use" (p. 1.4). The decision to classify individual information as an official secret is made at the discretion of the head of the federal executive posts, the competent authority for managing the use of atomic energy, and the relevant authority for space activities within its competence [7]. This goes against the constitutional right of citizens to access information.

Service secrets are also mentioned in a number of other legal acts. For example, the second part of the fourth article of the Act of the Russian Federation of 20.08.1993 No. 5663-1 "On space activities" [2] establishes the obligation to carry out such activities in compliance with the rules for protecting service secrets. According to the seventh article of the Federal law of 27.07.2004 No. 79-FZ "On the State Civil Service of the Russian Federation", employees are prohibited from disclosing or using official information obtained during the performance of official duties for purposes not related to the civil service [10]. Nonetheless, the concept of "proprietary information" is not disclosed, and the distinction between "confidential information and "proprietary information" is not justified.

In addition, today there are a large number of departmental acts regulating the grounds for the dissemination of the "service secret" regime, the procedure for working with such information, and responsibility for violating this mode. For example, the regulation of the judicial Department under the supreme court of the Russian Federation of February 22, 2007 No. 25 States: "Official information of limited distribution includes unclassified information related to the activities of the judicial Department, restrictions on the distribution of which are dictated by official necessity" [16, p. 12]. The regulation also contains a list of information that cannot be classified as official secrets.

Working with tax authorities with restricted access information is regulated by the federal tax service of 31.12.2009 No. MM-7-6/728. In accordance with this document, confidential information is recognized as: "unclassified information concerning the activities of tax authorities, restrictions on the distribution of which are dictated by official necessity" [17, p. 13]. The rules of this provision may not apply to information that is a state or tax secret. Therefore, information that is recognized as a tax secret is not included in the information with the "service secret" mode.

The seventeenth of the Federal Law of 30.12.2004 No. 218-FZ "On credit histories" obliges employees of the central bank of Russia to keep official secrets of credit history bureaus, sources of credit history formation, subjects of credit histories and users of credit histories [11]. However, employees of the central Bank of the Russian Federation are not government employees. They can be recognized as subjects of official secrecy on the basis of the third article of the Federal Law of 10.07.2002 No. 86-FZ "On the Central Bank of the Russian Federation (bank of Russia)" because they directly participate in the implementation of the unified state monetary policy [12].

The question of defining the concept of "service secret", its scope and content is also debatable in the scientific community. So far, scientists have not come to a consensus on these issues. It is proposed to understand service secret as information created or received by a state or local government body, access to which is restricted by federal law in the interests of other people [18]. The exception will be information constituting a state secret. Kamalova specifies: "the official secret is the legal regime of information entered and protected to ensure the confidentiality of official information obtained or developed by state or municipal authorities, public-law organizations on a legal basis" [14, p. 87]. Restriction of access to such information is introduced for the effective implementation of state functions and ensuring information security of the activities of state administration bodies.

5 Conclusion

A large number of voids and collisions characterizes Russian legislation regulating the circulation of confidential information. This also applies to the regulation of official secrets. The relevance of resolving these issues increases due to the widespread use of artificial intelligence in professional and official activities [19]. Service secrets or information with restricted access are regulated by a large number of laws, regulations, and departmental regulations. However, none of them fully reveals its essence. There is also no clear definition of the term "official secret". To properly regulate this type of information, it is necessary to determine its specific characteristics. Such data has the following specific features: information has no commercial value; does not satisfy private interests; is subject to protection by state agencies and municipal authorities; the restricted use regime is established by officials who are personally responsible for making such a decision; such information can be obtained only in the performance of job description by officials. In the conditions of universal digitalization, the question of the ratio of professional and official secrets becomes particularly relevant.

References

1. Adlakadi, R.: Information Is Wealth. Booksclinic Publishing, Chhattisgarh (2020)
2. Act of the Russian Federation of 20.08.1993 No.5663-1 (as amended on 15.04.2019) "On space activities" (2019). http://www.consultant.ru/cons/cgi/online.cgi?req=doc&base=LAW&n=322588&fld=134&dst=1000000001,0&rnd=0.4562585409763176#04663205344311909. Accessed 11 Apr 2020
3. Bolgova, V.V, Cherevichenko, T.S., Azarkhin, A.V., Sidorova, A.V., Efremova, E.A.: Internet offenses of young population. In: Popkova, E. (eds.) Growth Poles of the Global Economy: Emergence, Changes and Future Perspectives. Lecture Notes in Networks and Systems, vol. 73, pp. 667–675. Springer, Cham (2020)
4. Cariolato, S.: World Without History? Digital Information is Volatile: With It Our Culture Can Disappear but Its Preservation Can Save Us. Youcanprint, Bartolini (2019)
5. Carroll, J.M.: Confidential Information Sources: Public and Private. Elsevier, Amsterdam (2014)
6. Decree of the President of the Russian Federation of 06.03.1997 No. 188 (ed. from 13.07.2015) "On approval of the list of confidential information" (2015). http://www.consultant.ru/cons/cgi/online.cgi?req=doc&base=LAW&n=182734&fld=134&dst=1000000001,0&rnd=0.10986309365482638#040199190553240194. Accessed 11 Apr 2020
7. Decree of the Government of the Russian Federation of 03.11.1994 No. 1233 (as amended on 18.03.2016) "On Approval of the Regulation on the Procedure for Handling Limited-Service Official Information in the Federal Executive Bodies, an Authorized Atomic Energy Management Body and an Authorized Space Agency" (1994). http://www.consultant.ru/cons/cgi/online.cgi?req=doc&base=LAW&n=195608&fld=134&dst=1000000001,0&rnd=0.3063160621801002#03415806630465419. Accessed 11 Apr 2020
8. Draft Federal Law No.124871-4 "On Service Secrets" (2004). http://www.consultant.ru/cons/cgi/online.cgi?req=doc;base=PRJ;n=39972#02334193309286694. Accessed 11 Apr 2020

9. Federal law of 27.07.2006 No. 149-FZ (as amended on 02.12.2019) "On information, information technologies and information protection" (2019). http://www.consultant.ru/cons/cgi/online.cgi?req=doc&base=LAW&n=339396&fld=134&dst=1000000001,0&rnd=0.5068544565616508#0851124464299816. Accessed 11 Apr 2020

10. Federal law of 27.07.2004 No. 79-FZ (as amended on 01.05.2019) "On the State Civil Service of the Russian Federation" (2019). http://www.consultant.ru/cons/cgi/online.cgi?req=doc&base=LAW&n=340367&fld=134&dst=1000000001,0&rnd=0.47113947222427344#022587680661012932. Accessed 11 Apr 2020

11. Federal law of 30.12.2004 No.218- FZ (as amended on 01.05.2019) "On credit histories" (2019).   http://www.consultant.ru/cons/cgi/online.cgi?req=doc&base=LAW&n=349448&fld=134&dst=1000000001,0&rnd=0.7979839807468578#0553053609190844. Accessed 11 Apr 2020

12. Federal law of 10.07.2002 No. 86- FZ (as amended on 02.08.2019) "On the Central Bank of the Russian Federation (Bank of Russia)" (2019). http://www.consultant.ru/cons/cgi/online.cgi?req=doc&base=LAW&n=349172&fld=134&dst=1000000001,0&rnd=0.22474775504210842#09694457069318365. Accessed 11 Apr 2020

13. Graeber, D.: The Utopia of Rules: On Technology, Stupidity, and the Secret Joys of Bureaucracy. Melville House, Brooklyn (2015)

14. Kamalova, G.G.: Ratio of legal regimes of official and professional secrets. Bull. South Ural State Univ. Ser. Law **4**, 87–94 (2016) https://doi.org/10.14529/law160415.s.87-88

15. Matveeva, L.G., Nikitaeva, A.Y., Chernova, O.A.: Information as a strategic resource for regional. Terra Economicus **1**, 134–145 (2018)

16. Order of the Judicial Department attached to the Supreme Court of the Russian Federation of February 22, 2007 No.25 "On approval of the Regulation on the procedure for handling limited-service official information in the apparatus of the Judicial Department under the Supreme Court of the Russian Federation and in the departments (divisions) of the Judicial Department in the constituent entities of the Russian Federation" (2007). http://www.consultant.ru/cons/cgi/online.cgi?req=doc&base=EXP&n=398975#02075996907882376. Accessed 11 Apr 2020

17. Order of the Federal Tax Service of Russia of 31.12.2009 № MM-7-6/728@ (as amended on 21.07.2011) "On approval of the Regulation on the procedure for handling restricted official information with the tax authorities" (2011). http://www.consultant.ru/cons/cgi/online.cgi?req=doc&base=LAW&n=315645&fld=134&dst=1000000001,0&rnd=0.5195774155331949#02870330514406234. Accessed 11 Apr 2020

18. Pavlov, I.Y.: Modern problems of legal regulation of state and professional secrecy in Russia. Leningrad Law J. **1**(31), 29–37 (2013)

19. Sidorova, A.V.: Subject structure of the offense in artificial intelligence (AI) and robotics. In: Ashmarina, S.I., Vochozka, M., Mantulenko, V.V. (eds.) Digital Age: Chances, Challenges and Future. Lecture Notes in Networks and Systems, vol. 84, pp. 541–547. Springer, Cham (2020)

20. The Civil Code of the Russian Federation (part II) of 30.11.1994 No.51- FZ (as amended on 26.06.2007) (2007). http://www.consultant.ru/cons/cgi/online.cgi?req=doc&n=69407&base=LAW&from=340325-0&rnd=0.47508663527192585#0027100471325111286. Accessed 11 Apr 2020

Digital Assistants in Managing Customer Relationships in Modern Companies

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Abstract. The paper aims to determine the impact of digital transformation on the functionality of CRM solutions as digital assistants to managers, as well as the role of CRM systems in business processes of modern business entities. The concept of "CRM (Customer Relationships Management)" implies a business strategy based on using business rules and processes that are designed to engage consumers in a dialogue in order to obtain mutual benefits in trusting and transparent business environment. The authors developed the scheme "How to interest the customer", in which an attempt is made to determine the distinctive features of the business process of customer service in companies that use CRM systems. The results obtained in this scientific study can be useful for developers of CRM systems who want to fully meet the needs of customers.

Keywords: Artificial intelligence · Business processes · Company · Customer needs · Manager · System

1 Introduction

In traditional enterprise resource management methods, the company's client is not considered as an element served by the system. This arrangement of the company's planning and management systems is explained by the fact that attention is focused on optimizing only the internal activities of the company itself. This method is now considered significantly outdated. The lack of a unified approach to working with clients in the company's divisions and offices negatively affects the effectiveness of their work: the company loses opportunities to increase sales and increase customer loyalty. The consumer has become more independent, more educated, more sophisticated. And he wants to manage all aspects of his life. It becomes increasingly difficult to understand the needs and opportunities of the buyer, to try to find a product in the aspect that it will attract the consumer because the modern market is full of various offers, and this is the first obstacle to the realization of a sufficient volume of production and customer loyalty in the current market conditions [4].

The second obstacle is the lack of time that customers are willing to spend searching for a company that can meet their individual request. These problems are the reason for the need to create new modern methods of company management. At the moment, digital technologies have become the priority methods of managing business

processes of companies. But this approach involves not only installing modern hardware or software at the enterprise. Today, for many companies, the most urgent tasks are to reduce costs, plan accurately, attract customers, work actively with existing customers and retain them. Not having a unified database of customers, the company is losing significant amounts of money due to inefficient work of the departments of marketing, sales and service. Digital technologies make fundamental changes in approaches to management, corporate culture of the enterprise, become full-fledged assistants on the way of building long-term and most importantly - high-value communications with the consumer [3]. As a result, the productivity of the company's personnel increases, the level of customer satisfaction increases, and the company gains a reputation as a progressive and modern organization, which ultimately ensures the company's profitability.

2   Methodology

The methodological basis for identifying key trends in the development of customer-oriented solutions for modern companies using digital tools is the methods of empirical research: observation method, comparative analysis method, descriptive research method, as well as methods of theoretical research-analysis, synthesis and deduction with which the following tasks are solved: 1) evaluate the role of digitalization in modern business processes of business entities; 2) determine the impact of digital transformation on the functionality of CRM solutions as digital assistant managers; 3) identify the specifics of customer base management systems with artificial intelligence elements.

Digitalization is directly related to the digital economy, the implementation of key aspects of which is carried out using special end-to-end technologies [8]. Among these technologies at the moment, the leading ones are: Artificial intelligence, Robotics, Virtual and augmented reality, Big Data, Quantum technologies, Distributed registry systems, New production technologies, Wireless communication technologies, and Industrial internet [5].

Leading experts in the field of digitalization tend to believe that the digital economy includes markets and industries (Public administration, Smart city, Digital healthcare, Education); platforms and technologies (Research and Development); environment (Legislative sphere, Personnel, Infrastructure, Information security, Digital technologies). The leading digital assistants of modern companies are Big Data and predictive analytics – 68%; Chat bots – 51%; Robotization – 50%; Optical character recognition – 36%; AI-technologies – 28%; Internet of things – 24%; Virtual reality – 21%; Blockchain – 19% [5].

According to the data provided in the article by E. Chernysheva, "Business will be enriched with artificial intelligence" [2], Artificial Intelligence (AI) can have the greatest impact on customer relationship management systems (so-called CRM systems). The data allowed us to assess the expected economic effect of this impact: Customer service – 43%; Client support (calculations, logistics) – 41%; Managing relationships with partners – 41%; Creating customer-oriented products and services – 40%; Electronic commerce – 40%; Corporate marketing, branding and advertising –

39%; Product marketing or service marketing – 39%; Field marketing – 39%; Pricing of goods and services – 39%; The study of consumer behavior – 38% [2].

As you can see, CRM technologies play an important role in the era of "numbers". However, it is logical to ask whether these are the same CRM systems that appeared more than 20 years ago, or a new generation of products that have nothing in common with previously used solutions. We will try to deal with this issue. If we consider the historical aspects of the development and formation of customer-oriented solutions, we can identify three key stages: CRM birth, CRM boom, stagnation, and rebranding. It should be noted that in terms of dates the situation in the West and in Russia is different. In Russia, CRM solutions appeared about 10 years later in relation to the Western market (early 2000s). The most interesting period in the development of customer-oriented solutions is, of course, the CRM boom (in Russia, approximately dates back to 2002–2007). This time period accounts for the largest number of implementations (and, as statistics has shown, the largest number of failures) [1].

The key reasons for the failure of most CRM projects at that time was the misconception that an IT product of this class would be a "pill for all diseases" for the company. Undoubtedly, the client-oriented solution had a useful functionality for representatives of the business environment at that time. In this regard, it should be mentioned that depending on the tasks and functions, there are three classes of CRM systems. These include: operational, analytical, and joint CRM systems. The operational class of client-oriented solutions assumes minimal functionality, which consists of collecting, organizing and storing the history of communications with clients. As for analytical solutions, they have become the most popular all over the world at the moment, since they are focused on extracting data that is practically useful for companies from a large array of data. Joint CRM products combine the capabilities of the first two classes (Table 1).

Table 1. Classes of CRM systems

Type of CRM system	Functionality
Operational	Collection, systematization, centralized storage of data about the customer and the history of interaction with them, automation of the sales, marketing and after-sales service process
Analytical	Analysis of the customer base in accordance with certain criteria, segmentation, evaluation of value for the company
Joint	Interaction and transactions between companies within the B2B (Business to Business) segment, when several enterprises jointly implement the creation of a product/service

Source: authors.

The authors of the study suggest a new type of CRM solutions that arose under the influence of digitalization on the process of interaction with customers. We are talking about Artificial Intelligence CRM products that are focused on supporting decision-making within the framework of communication with the customer and take on part of the Manager's tasks (Table 2).

Table 2. Artificial Intelligence CRM systems (AI CRM systems)

Intellectual	Analysis of the work of sales Department employees, determination of the most effective models of working behavior and sales strategy; analysis of customer behavior; forecast of customer outflow; formation of personalized recommendations for developing a policy of interaction with customers; forecast of changes in the company's revenue

Source: authors.

The goal of Artificial Intelligence is to improve technological processes in various fields of knowledge Artificial intelligence (AI) allows you to change almost every socially significant aspect of human life. With the help of Artificial Intelligence, decisions are made faster, and natural errors caused by the human factor are eliminated, which are considered inexcusable from the client's point of view. Thus, Artificial Intelligence is gradually turning to the sphere of customer and company relationship management, where it creates a more convenient customer service system, while the service process is not depersonalized, but solutions are better and faster going beyond their actual limitations. We can say that Artificial Intelligence has begun to solve the daily problems and difficulties faced by employees [7].

For example, customer service departments are often overloaded with a huge amount of customer information. This information includes not only the purchase history, but also socio-economic and demographic data of customers, and employees should take this data into account. Therefore, using AI will provide a better and more efficient way to store and conveniently use a huge amount of information. AI is becoming incredibly useful in managing "Big Data" and rationalizing labor-intensive activities [9]. Therefore, the work of a CRM system with Artificial Intelligence is more functional than a traditional CRM system, and provides companies with great advantages – the use of modern high-tech methods to improve the relationship between the company and the client allows you to increase the level of customer satisfaction [6].

3   Results

In this paper, the authors proposed the descriptive scheme "How to interest the customer" in which an attempt is made to determine the distinctive features of the business process of customer service in the companies which use technological systems for creating relationships between the company and customers. This scheme "How to interest the customer" describes the business process "As it is" and the business process "As It Should Be".

In the business process "As it is", staff interacts directly with the traditional CRM system, where the sales department is the most important link. On the basis of the system the following happens:

1. Sequential processing of information about the interest of a potential client.
2. The CRM system receives information about the interest of a potential client.
3. The CRM system determines whether the client or this interest exists in the database of the system.

4. The manager from the sales department enters information about the client and checks the information entered in duplicates.
5. The CRM-system generates a notification to the validator in the form of the task "Check the entered record".
6. The validator receives the task.
7. The validator gives a positive conclusion about the entered record.
8. The CRM-system generates a notification to the manager about the decision on validation
9. The manager from the sales department fills in the customer's card.
10. The CRM-system generates a completed customer's card with personal data and contacts.
11. The CRM-system records and register the presale activity.
12. The sales manager according to the recorded data organizes telephone calls or generates reminders.
13. The manager registers interest in the system.
14. The CRM system qualifies the interest.

However technology development gives the move to natural expansion of companies needs and automation of business processes. So the next descriptive scheme "How to interest the customer" describes the business process "As It Should Be". The presented business process is focused on close interaction of personnel with the CRM system, but unlike the business process "As it is", the main role is played by the Artificial Intelligence CRM system (AI CRM system). On the basis of the system there are two ways of interaction.

The first is:

1. The AI CRM system informs the decision manager about the interest of a potential client.
2. The AI CRM system searches for this contact in the database.
3. The client is new.
4. The AI CRM system generates a client card.
5. The AI CRM system checks the entered record (without the participation of the validator).
6. The AI CRM system enters the client card into the database.
7. The AI CRM system searches for customer interest in the database of system interests.
8. If the interest is not known to the AI CRM system the task of registering the interest in the system is transferred to the sales department.
9. After registering the interest in the AI CRM system, the sales manager monitors information about the potential customer's interest.
10. The sales manager receives information about the potential customer's interest.
11. The sales manager sends information about the potential customer's interest to the AI CRM system for qualification.

12. The AI CRM system qualifies information about the potential customer's interest.
13. The AI CRM system selects the answer to the potential customer's interest.
14. The AI CRM system sends the answer to the sales manager.
15. The sales manager sends the answer to the customer.
16. The customer receives the answer.

The second is:

1. The AI CRM system informs the decision manager about the interest of a potential client.
2. The AI CRM system searches for this contact in the database.
3. The client is listed in the existing database of the AI CRM system.
4. The AI CRM system searches for the interest of the potential customer in the database of interests.
5. The AI CRM system selects the answer to the interest. of the potential customer.
6. The AI CRM system informs the sales department about the need to inform the client by means of reminders or telephone calls.
7. The sales manager receives the task of informing the customer.
8. The sales manager contacts the customer using the communication channels offered by the AI CRM system.
9. The customer receives the answer.

4   Discussion

Successful business activity is determined by the company ability to efficiently handle huge amounts of information. The level of modern technological development opens great opportunities to simplify all business processes at any company from small and medium enterprises to large conglomerates. AI technologies are developing and becoming incredibly useful in managing big data and streamlining time consuming activities. AI CRM-systems are efficient due to the following points: specialization - the transition from the development of general purpose tools to problem/subject-specific specialized tools, which ensures a reduction in time development, increases the efficiency of using tools, simplifies and accelerates the work of experts; integration, namely, Artificial Intelligence tools integrate more easily with other information technologies and tools (with computer-aided software engineering (CASE), database management system (DBMS); openness and portability - development is carried out in compliance with standards that ensure these characteristics; client/server architecture - the development of an information system in this architecture allows you to reduce the cost of equipment used in the application, decentralize applications, increase reliability and overall performance, because the amount of information sent between computers is reduced, and each application module is run on adequate equipment.

When using AI CRM-systems the manager can evaluate the degree of involvement of each client in e-mail communication, thereby identify typical consumer groups by analyzing user behavior. AI CRM-systems help the manager find the reasons that influence the level of sales and then he can take measures to improve merchandising

and store planning. However, there are certain problems with using AI CRM-systems. Even though many solutions can be automated, not all company managers entirely trust AI recommendations. Managers sometimes adjust the results of Artificial Intelligence decisions [10]. There is often lack of a unified system for organizing the company's activities, which also requires specific methods in using AI CRM-systems [3]. Such method is proposed in the scheme "How to interest the customer" with the use of AI CRM-systems.

5   Conclusion

Thus, we can conclude that the proposed scheme "How to interest the customer" on the basis of the AI CRM-system is efficient due to the following points: it enables enterprises to provide a predictable assessment of potential customers, which further helps employees focus on working with a more profitable customer. It performs an analytical assessment of the opportunities that the company can offer to the client, for example, the company informs the user about the trend of the transaction. This method also allows to register the activity of websites and e-mail in order to analyze the data obtained, to analyze further accounting and forecasting; to use a database of ready-made responses to solve a typical customer problem, and this database reduces the time spent working with the application and increases customer satisfaction. It also makes the process of recommending products to customers personal and thus offers better services that can meet customers' expectations. So the method of the proposed in this article scheme "How to interest the customer" on the basis of the AI CRM-system can be appropriate for a lot of companies.

References

1. Biktimirov, M.R., Yelizarov, A.M., Shcherbakov, A.Y.: Trends in the development of big data processing technologies and tools for storing multiformat data and analytics. Russ. Digit. Libr. J. **19**(5), 390–407 (2016)
2. Chernysheva, E.: Business will be enriched with artificial intelligence. Kommersant (2017). https://www.kommersant.ru/doc/3329890. Accessed 26 Apr 2020
3. Dufva, T., Dufva, M.: Grasping the future of the digital society. Futures **107**, 17–28 (2019). https://doi.org/10.1016/j.futures.2018.11.001
4. Hoyer, J.: War for the Client. Loyalty Once and for All. Poppury, Moscow (2010)
5. KPMG: Digital technologies in Russian companies (2019). https://assets.kpmg/content/dam/kpmg/ru/pdf/2019/01/ru-ru-digital-technologies-in-russian-companies.pdf. Accessed 26 Apr 2020
6. Lammi, M., Pantzar, M.: The data economy: how technological change has altered the role of the citizen-consumer. Technol. Soc. **59**, 101157 (2019). https://doi.org/10.1016/j.techsoc.2019.101157. Accessed 26 Apr 2020
7. Medini, K., Andersen, A.L., Wuest, T., Christensen, B., Wiesner, S., Romero, D., Liu, A., Tao, F.: Highlights in customer-driven operations management research. Procedia CIRP **86**, 12–19 (2019). https://doi.org/10.1016/j.procir.2020.01.026

8. Mitin, V.: Seven definitions of the digital economy (2017). https://www.crn.ru/news/detail. php?ID=116780. Accessed 26 Apr 2020

9. Silahtaroğlu, G., Alayoglu, N.: Using or not using business intelligence and big data for strategic management: an empirical study based on interviews with executives in various sectors. Procedia – Soc. Behav. Sci. **235**, 208–215 (2016). https://doi.org/10.1016/j.sbspro. 2016.11.016

10. Syntetos, A.A., Kholidasari, I., Naim, M.M.: The effects of integrating management judgement into OUT levels: in or out of context? Eur. J. Oper. Res. **249**(3), 853–863 (2016). https://doi.org/10.1016/j.ejor.2015.07.021

Russian Food Security on the Market of Milk and Dairy Products

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Abstract. The paper deals with the issues of country's food security that is the most important indicator of national security of the state. The authors justified the fact that food security governance is a priority direction of the Russian state policy. The dynamics of the total production of dairy products in Russia was characterized, and the indicators of product exports and imports were analyzed. The level of actual per caput consumption of milk and dairy products was evaluated. The dynamics of the level of use of average annual productive capacity of the companies that produce particular types of dairy products and milk production in the context of farm categories was studied.

Keywords: Dairy industry · Food security · Imports of milk · Milk production · National security

1 Introduction

Food security governance remains one of the most important issues not only for a particular country, but also for the whole world. It is possible to solve this global problem, or rather to reduce its manifestation, but this requires not only the efforts of international organizations and specialized agencies, but also an active participation of the entire world community. A large role here is assigned to agriculture, which is designed to provide food to the population of a country. If we compare Russia in terms of food security with a number of foreign countries, our food security index (GFSI) is 42 points from possible 100. The leaders here are Singapore (87.5), Ireland (84), and the United States (83.7). We have a negative trade balance, with agricultural exports amounting to $21.9 million and imports amounting to $21.9 million. This is caused by the lack of the own production, low labor productivity, inflated cost of production, lack of a distribution network. Today, solutions to all these problems are being worked out at the legislative level.

2   Methodology

The following key methods were used in this research: monographic, comparative analysis, economic, statistical, and abstract-logical ones. The research was based on official statistics from the Federal State Statistics Service, regulatory acts of the Government of the Russian Federation, and official data from the Federal Customs Service. The analysis was based on information from the Ministry of Agriculture of the Russian Federation, publications of scientists and practitioners, as well as information from Internet portals dedicated to agro-industrial topics. These methods and resources allowed to establish and characterize the state of the Russian milk market, determine trends of its development, offer and justify measures that are aimed at improving the food security of the Russian Federation in the context of milk and dairy products.

3   Results

Food security governance is a priority area of the state policy, as it covers a wide range of national, economic, social, demographic, and environmental factors [8]. It should be noted that the goal to reduce imports in the agricultural sector was set in 2010, long before the implementation of sanctions, which enabled national producers to develop quickly.

In accordance with the Decree of the President of the Russian Federation No. 20 of January 21, 2020 "On approval of the food security Doctrine of the Russian Federation", food independence is defined as the level of self-sufficiency in percentage terms, and it is calculated as the ratio of domestic production of agricultural products, raw materials, and food to the volume of their domestic consumption [3]. Food independence has threshold requirements: at least 85% of meat and meat products (meat in equivalent), 90% of milk and dairy products (milk in equivalent), 95% of potatoes, and 90% of vegetables and gourds.

According to the Federal State Statistics Service, the self-sufficiency level of basic food in 2018 was the following: 95.7% meat and meat products, 83.9% milk and dairy products, 95.3% potatoes, and 87.2% vegetables and gourds [4]. Based on the above, we can notice that the balance in milk and dairy products provision is more disrupted than in other food groups, and this fact demonstrates the relevance of the research.

Let us analyze the general dynamics of production, imports, and exports of dairy products in Russia.

Table 1. Dynamics of production, imports, and exports of dairy products in Russia, mln tons

Indicator	2000	2005	2010	2015	2016	2017	2018	2019
Production	32.3	30.8	31.8	30.8	30.8	30.2	30.6	31.3
Imports	4.7	7.1	8.2	7.9	7.5	7.0	6.5	6.4
Exports	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6

Source: authors based on [4]

According to Table 1, the total production of Russian dairy products in 2019 decreased slightly and amounted up to 96.9% compared to 2000. During the period 2000–2019, the production mostly decreased, but the decline was insignificant.

Owing to the governmental policy of import substitution industrialization, the trade balance of food is steadily improving, and the share of imported food on retail markets is decreasing [15]. It should be noted that according to the data in Table 1, the total imports of milk and dairy products in 2019 increased by 36.2% (or 1.7 mln tons) compared to 2000, and it decreased by 22% (or 1.8 mln tons) compared to 2010. Despite the decrease in imports volumes, its level is still very high, and it does not allow to have the proper level of food security. Summarizing the results of 2019, the imports volume in milk equivalent amounted to about 6.4 mln tons (the minimum for the last 16 years).

Cheese and curd, which makes more than 1/3 of the imports of dairy products, ranks first in the structure of dairy product imports in Russia. About 20% of butter, fats, and oils derived from milk, dairy spread, milk and condensed cream ranks second. About 10% of milk and concentrated cream ranks third. The main suppliers of milk and concentrated cream to Russia in 2017–2018 were Belarus, Kazakhstan, and Finland [11].

The reduction in dairy import volumes in 2018 was primarily due to the introduction of temporary restrictions to dairy products supplies from Belarusian enterprises, as well as to reduction in external supplies from non-CIS countries, as a result of high stock levels and decrease in import attractiveness due to the devaluation of the ruble. The dairy products supply from Belarus (the main external supplier of dairy products to Russia) declined by 10–15%. Consequently, the volume of imports from Belarus became the lowest over the last 15 years.

Despite the growth, exports of dairy products from Russia is very low due to the fact that the national production of milk is not enough for domestic consumption, and only limited volumes of the product may be exported. These are mainly whole-milk and fermented-milk products, ice cream, cheese, and analogue cheese.

Russia exports about 90% of dairy products to the Customs Union and CIS countries [13]. This is a traditional consumer for Russian exporters, which has clear preferences and requirements, and historically built logistics. The growth of demand for Russian products in Southeast Asia (especially in China) and Africa can develop a significant market, and Russian milk producers have the opportunity to take advantage and increase exports significantly [1].

In order to evaluate the Russian self-sufficiency level on the dairy market, it is necessary to analyze the amount of milk and dairy products produced.

In 2018, annual per caput consumption of domestic dairy products accounted to 209 kg that is 46.7% less than the balanced rate of consumption, which is 392 kg [6]. The economic accessibility plays a significant role in the aspect of food security [9].

According to Federal State Statistic Service, the annual per caput consumption of milk and dairy products was 229 kg in 2018. Since domestic producers cannot provide a sufficient production level at this stage, Russia has to import foreign products [4] (Table 2).

Russia has recently known a noticeable increase in dairy products production. This is largely due to the release of a significant market share after import deliveries decrease. Milk production in Russia is concentrated in three categories of farms:

agricultural organizations, households' farms, and peasant farms. The main share of milk production is concentrated in agricultural organizations and households' farms (Table 3).

Table 2. Level of self-sufficiency in milk and dairy products in the Russian Federation, %

Indicators	2014	2015	2016	2017	2018
Level of self-sufficiency in milk and dairy products, %	78.1	79.9	80.7	82.3	83.9
Annual per caput consumption of milk and dairy products, kg	239	233	231	230	229

Source: authors based on [4].

Table 3. Dynamics of the structure of milk production in the Russian Federation by farm categories, %

Farm category	2000	2005	2010	2015	2016	2017	2018
Agricultural organizations	47.3	45.1	44.9	49.3	50.6	51.9	53.0
Households' farms	50.9	51.8	50.4	44.0	42.1	40.2	38.9
Peasant farms and self-employed entrepreneurs	1.8	3.1	4.7	6.7	7.3	7.9	8.1

Source: authors based on [4].

The total cow population in Russian farms of all categories contained 7,942,600 animal units in 2018. The cow population decreased by 5.8% over 5 years (488,300 animal units), by 12.3% (1,117,700 animal units) over 10 years, and by 41% (5,530,600 animal units) over 20 years.

Despite the fact that the cow population in private farm holdings slightly exceeds the indicators in the agricultural organizations, the productivity of cows and milk production in agricultural organizations is higher than in other farm categories. The merchantability level is around 90%, which is significantly higher than in agricultural holdings, and it is not comparable with the merchantability level in households' farms where milk is consumed mainly for personal needs.

According to Table 3, milk production by agricultural organizations was 53% of the total production in 2018, which is 5.7 points higher than in 2000, due to the increase in cow productivity over the studied period of time.

The cow population in agricultural organizations in 2000–2018 decreased by 49.4% and amounted to 3,283,000 animal units, and the productivity of animals increased by more than 2.5 times and amounted to 5,945 kg. The cow population decreased by 44% and amounted to 3,360,800 animal units in the households' farms, while the productivity of cows increased by 28.9% and amounted to 3,463 kg.

As a result, milk production in households' farms in 2018 compared to 2000 decreased by 27.4% or 4,505,300 tons. The significant positive dynamics in milk production was observed in peasant farms (by 4.4 times or 1,925,600 tons) and in agricultural organizations (by 6.3% or 960,000 tons).

TOP-5 the regions that produced milk in 2017 included the Republic of Tatarstan (the volume of milk production is 1,823,800 tons, and the share in total milk output in Russia is 5.8%), the Republic of Bashkortostan (1,718,400 tons and 5.5%, respectively), the Altai Territory (1,401,900 tons and 4,5%), the Krasnodar Territory (1,380,900 tons and 4.4%), and the Rostov Region (1,091,100 tons and 3.5%) [13].

The foreclosure of national market of agricultural products including milk and dairy products by the countries that imposed sanctions against Russia has had a positive impact on Russian agricultural development and increase in uncooked milk production. State investment programs also contribute to production development.

Due to the fact that uncooked milk is not the final product, any increase in its production depends on the possibility of further processing including the product-line expansion dairy products: capacity to process whole milk products or to produce cheese, milk powder, and ice cream [7] (Table 4).

Table 4. The level of use of the average annual production capacity by organizations that produced particular types of products in 1990–2017, %

Type of products	1990	1995	2000	2005	2010	2015	2016	2017
Whole-milk products (in milk equivalent)	76	24	32	48	57	61	59	50
Butter	76	35	25	27	28	36	35	38
Cheese	86	51	49	61	63	66	64	48
Concentrated milk products	79	48	55	61	58	60	59	68

Source: authors based on [4].

The analysis of the dynamics of the use of particular production capacities to produce dairy products shows that Russian capacities, taking into account new construction activity, modernization, and reconstruction, have a prospect for growth. Further increase in both uncooked milk production and its industrial processing will depend on the rate of population's solvency increase, the governmental actions in the Russian Federation to further restrict imported products and expand export markets, and the measures of the state support for the dairy industry as a whole.

4   Discussion

Due to the special significance of the topic, a large number of publications of domestic and foreign scientists are devoted to food security issues. So, Nazarenko believes that the concept of food security includes two main aspects. First, it is the level of food self-sufficiency and the availability of reserves that ensure the stability and independence of the state from changes in the global market and weather conditions. Secondly, this researcher refers to the availability of food for all groups of the population, including its poorest part, considering food to be the most important and integral factor of survival and existence of people [12]. Another domestic economist, Larionov, argues that the

country's food security can only be ensured within the framework of an integrated approach, while its basic components should be fixed at the legislative level [10].

Kiselev, Strokov, Zhorova, Belugin believe that the leading Western governments treat the food security problem as the opportunity to provide all the population with food in sufficient quantity and quality, while Russia treats food security as the opportunity to provide food self-sufficiency and import substitution industrialization [9]. Foreign researchers pay attention to the fact that food security depends on the policies of different countries [2]. International experience in ensuring national food security is based on three main approaches: protectionistic approach (Japan, Norway) that protects domestic production, intermediate approach (EU countries) that ensures food security within the EU, and export-oriented approach (USA) that subsidizes exports provided that the domestic market is saturated with products. If there is high-level food security, there is economic growth and human well-being [16]. If there is no food security, demographic changes and urbanization become evident [1].

We should take into account the best of each approach in our policy. We should not forget that the new doctrine was adopted in the context of increasing exports [14]. Therefore, we should increase overall production to provide food for both national and international needs. The issue cannot be resolved only by the state programs. In our opinion, it is much more important to create conditions for attracting private business resources to finance research projects on production programs on long-term and mutually beneficial base. This will allow to introduce modern management and marketing approaches to Russian business.

5   Conclusion

Today, food security is an important criterion of national security, especially in the context of the global crisis and turbulence in the world economy [5]. At the same time, it is important to increase the competitiveness of domestic products on the world market. The authors analyzed the dependence of production of milk and dairy products on imports, and they revealed that milk production decreased, and at the same time the volume of imports increased in 2000–2019 in Russia. Cheese and curd, which makes 1/3 of the imports of dairy products, ranks first in the structure of Russian imports of dairy products. About 20% of butter, fats, and oils rank second. The analysis of the dynamics of use of particular production capacities to produce dairy products shows that Russian capacities have a prospect for growth, which will be the technical basis to increase production. The level of Russian self-sufficiency in milk and dairy products increased from 78.1 to 83.9 over the past five years, but on the other hand, the actual per caput consumption of milk and dairy products decreased by 4.2% and amounted to 229 kg per year in 2018. According to the adopted Food Security Doctrine of the Russian Federation, which takes into account the aspects of socio-economic development of the country, it is necessary to expand access to basic food types for the population. Today, we need to focus on meeting the following conditions: improving production efficiency, reducing production costs, increasing competitiveness at all stages, as well as developing exports and stimulating domestic consumption of dairy products.

References

1. AfterShock: Russian market of milk and dairy products. Agrovestnik (2019). https://agrovesti.net/lib/industries/dairy-farming/rossijskij-rynok-moloka-i-molochnykh-produktov.html. Accessed 27 Apr 2020
2. Bureau, J.-C., Swinnen, J.: EU policies and global food security. Global Food Secur. **16**, 106–115 (2018)
3. Decree of the President of the Russian Federation No. 20 of January 21, 2020 "On approval of the food security Doctrine of the Russian Federation" (2020). https://www.garant.ru/products/ipo/prime/doc/73338425/. Accessed 27 Apr 2020
4. Federal State Statistics Service: Indicators that characterize import substitution in Russia (2020). http://www.gks.ru/folder/11188. Accessed 27 Apr 2020
5. Glinskiy, V., Serga, L., Alekseev, M., Samotoy, N., Simonova, E.: The development of the food industry as a condition for improving Russia's national security. Procedia Manuf. **21**, 838–845 (2018)
6. Gusakova, E.P., Malina, A.B., Myasnikova, V.M.: Regional food self-sufficiency assessment as a factor of national food safety. In: Ashmarina, S.I., Mantulenko, V.V. (eds.) Proceedings of the 2nd International Scientific Conference GCPMED 2019 - Global Challenges and Prospects of the Modern Economic Development. European Proceedings of Social and Behavioural Sciences, vol. 79, pp. 1400–1407. European Proceedings, London (2020)
7. Gusakova, E.P., Shchutskaya, A.V., Afanaseva, E.P.: Innovative development management in agribusiness. In: Mantulenko, V.V. (ed.) Proceedings of the 18th International Scientific Conference "Problems of Enterprise Development: Theory and Practice". European Proceedings of Social and Behavioural Sciences, vol 82, pp. 861–868. European Proceedings, London (2020)
8. Hatab, A.A., Cavinato, M.E.R., Lindemer, A., Lagerkvist, C.-J.: Urban sprawl, food security and agricultural systems in developing countries: a systematic review of the literature. Cities **94**, 129–142 (2019)
9. Kiselev, S., Strokov, A., Zhorova, M., Belugin, A.: Agro-industrial complex of Russia under the conditions of sanctions and the need to ensure food security. AIC: Econ. Manag. **2**, 12–18 (2015)
10. Larionov, V.G.: Food security in Russia. Prodovolstvennaya Politika i Bezopasnost **2**(1), 47–58 (2015)
11. MilkNew:s Review: 5 years under sanctions for the Russian dairy industry (2019). https://milknews.ru/analitika-rinka-moloka/rinok-moloka-v-Rossii/5-let-sankcii.html. Accessed 27 Apr 2020
12. Nazarenko, V.I.: Food security (In the world and in Russia). Monuments of Historical Thought, Moscow (2011)
13. Russian Federal Service for Veterinary and Phytosanitary Surveillance: Import. Export. Transit (2017). http://www.fsvps.ru/fsvps/importExport. Accessed 27 Apr 2020
14. Union "Eastern Chamber of Commerce of the Moscow Region": Food Security 2020 (2020). https://vomo.tpprf.ru/ru/news/349446/. Accessed 27 Apr 2020
15. Uzun, V., Shagaida, N., Lerman, Z.: Russian agriculture: growth and institutional challenges. Land Use Policy **83**, 475–487 (2019)
16. Xu, X., Hu, H., Tan, Y., Yang, G., Jiang, B.: Quantifying the impacts of climate variability and human interventions on crop production and food security in the Yangtze River Basin, China, 1990–2015. Sci. Total Environ. **665**, 379–389 (2019)

Statistical Research of the Economy Informatization in the Russian Federation

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Abstract. The paper examines the issues of the economy informatization in the Russian Federation. "The Strategy for the Development of the Information Society in the Russian Federation for 2017–2030" adopted by the Government of the Russian Federation confirms the relevance of the topic. The study aims at a comprehensive analysis of the economy informatization in the Russian Federation. The methodological framework applied in the study included time series analysis, cluster analysis, and structural shift analysis. The findings that emerged from the study indicate the consistency in the structure of expenditures for information and communication technologies. The positive trend for major economic indicators was observed. A multidimensional grouping of Russian regions based on cluster analysis has revealed that the number of regions with a low level of informatization has significantly decreased compared to 2010. The results of the study define the level of informatization in the economy a positive one. In terms of achieving the goals defined in "The Strategy" those findings are of quite a noticeable significance.

Keywords: Statistics · Digital economy · Region · Economy informatization

1 Introduction

The conceptual design of modern world has been internationally changed by the introduction and development of information and communication technologies (ICTs) Digitalization has permeated the entire sphere of human life and government. Mobile devices, computers, and the Internet allow the instantaneous exchange of information among different sources and let people be at the forefront of everything that happens in the world. Despite the accompanying difficulties and risks, informatization brings positive changes in the economy, as it minimizes costs, reduces barriers to entry to the market, and, ultimately, increases labor productivity.

At the same time, there is a need to analyze trends in the informatization of the economy, so that the state has the necessary information for rapid response and management decision-making. The role of national statistical services is important in this regard. Their statistical indicators that characterize the development of the ICT sector can be considered as one of the most important constituents for monitoring the development of the modern information society.

"The Strategy for the Development of the Information Society in the Russian Federation for 2017–2030" [11] reflects the importance of the research topic.

This document identifies the aspects of using ICTs aimed at the development of the information society and the formation of the national digital economy, and also defines target indicators, and normative values of statistical indicators that have to be achieved.

The purpose of this study is to analyze statistically the informatization of the economy in the Russian Federation. The primary data for this study were collected using the Federal State Statistic Service database.

To date, the problem has received scant attention in the research literature. The studies are either limited to the analysis of informatization for one territory [7, 10], or are of a sociological nature [1]. The most interesting study from the statistical point of view is [4], which analyzes the use of ICT by the Russian population. Our research focuses on the use of ICT in the country's enterprises.

2   Methodology

The study was conducted in the form of a mixed methodology based on the following statistical methods.

1. The method of time series analysis.

To analyze the dynamics, the corresponding traditional analytical indicators are used, such as growth rates. Their calculation is based on a comparison of levels. Statistically, the trend is represented as an indicator of the average growth rate. Based on the extrapolation, the forecast was made for 2020–2021.

2. The method of cluster analysis.

Cluster analysis includes the classification of multidimensional observations, which are used to determine the distances of objects and to obtain homogeneous groups or clusters. It also allows examining, analyzing, and classifying large information arrays.

Two cluster analysis procedures were applied in this paper. Euclidean distance was used for proximity measure, and k-means method was used as a clustering algorithm.

3. The method of structural changes analysis.

The Ryabtsev index was used as an indicator in this study. It evaluates the measure of differences in structural shifts in the economy and takes values from 0 to 1. The closer the index value is to 1, the more the differences among the structures are. The "0" value means that the structures are identical.

3   Results

Not only is the state of the economy crucial for the informatization development. Also it depends on the financial and technological support of enterprises, on their involvement in the use of modern software and digital solutions. Statistics is intended to provide a quantitative assessment of the informatization state. Statistics applies the system of indicators to describe its individual aspects, identify trends, and form an information basis for making management decisions.

ICT costs indicator is seen as the basic one in this paper. It is measured in monetary units and in terms of inflation tends to grow linearly. Therefore, it is important to analyze changes in the cost structure by the type rather than by their volume. It should be noted that since 2014, the Federal State Statistic Service has introduced a new classification of costs, which makes it impossible to compare structural changes with the previous periods (Table 1).

Table 1. The structure of costs for information and communication technologies in Russia for 2014–2018 (%)

| Costs types	2014	2015	2016	2017	2018
Purchase of IT and office equipment	22.1	20.3	20.0	20.0	20.0
Purchase of telecommunications equipment	13.1	13.5	11.6	10.9	10.4
Purchase of software	13.8	17.6	22.4	18.9	18.1
Telecommunication charge payments	23.8	22.2	19.3	17.6	17.8
Employees training	1.0	0.6	0.5	0.4	0.3
Payments to IT subcontractors and outsourcing companies	17.1	20.1	20.3	25.3	26.6
Other costs	9.1	5.6	5.9	6.8	6.8

Source: authors based on [5].

With the Ryabtsev index it was revealed that there were no significant changes in the costs structure over that period (0.150 is a low level of structural differences. It is apparent that there is a change in the share of costs for IT subcontractors and outsourcing companies (from 17.1% to 26.6%) and for the purchase of software (the share increased from 3.8% to 22.4%, then fell to 18.1%). There is a tendency to reduce the share of telecommunication costs (from 23.8% to 17.8%). As for the other changes, they do not exceed the statistical margin of error.

The dynamics of the selected indicators was analyzed in order to assess how the level of the economy informatization has developed in the Russian Federation. These indicators are of priority for evaluating the implementation of "The Strategy for the Development of the Information Society in the Russian Federation for 2017–2030" [11].

1. The number of personal computers per 100 employees (units). This indicator implies the availability of equipment for solving telecommunication tasks.
2. The number of organizations with their own website (%). The indicator demonstrates the organizations' activity in promoting their goods and services electronically.
3. The number of organizations that use global networks (%). This characterizes technologies that allow exchanging information, using various software, and information resources (Internet, Extranet, Intranet).

Figure 1 shows the growth rate (in % to the previous year) for each of the indicators in 2011–2018. As it can be seen from this figure, in general, the dynamics of the development is similar, i.e. the values increased almost during the whole period under study. The period of active growth was replaced by the phases of moderate growth, and in some periods the decline can be observed. But it is apparent that there is an overall upward trend.
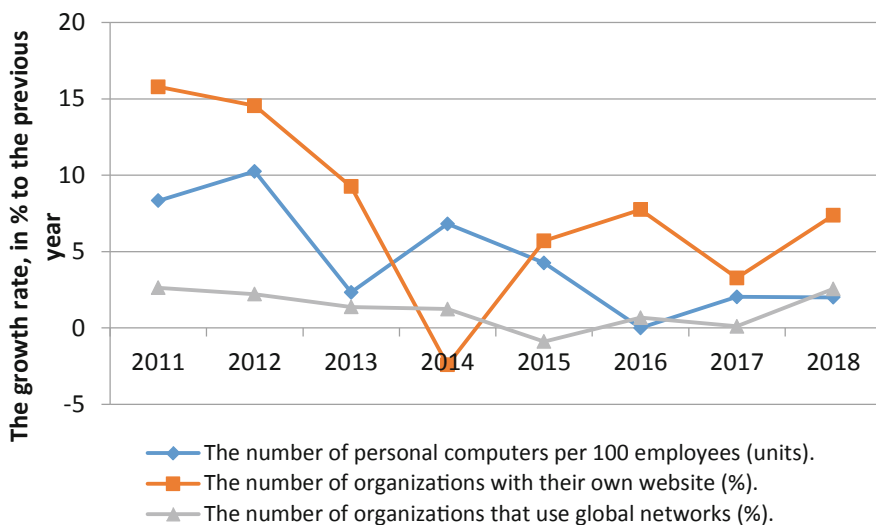
Fig. 1. Dynamics of the main indicators of the Russian economy informatization in 2011–2018 (Source: authors based on [5]).

The number of personal computers (per 100 employees) increased from 36 in 2010 to 51 in 2018, which represents an average annual growth of 4.5%. This growth trend can be explained by the increase in the number of jobs related to intellectual activities, which include the analysis of various data. The reason for this is the expansion of the information database and the complexity of the analysis methods.

The most noticeable growth is observed in the proportion of organizations that have their own website in the Internet (on average 7.5% per year). If in 2010 only one in four organizations had a website, in 2018 the number was one in two. The situation with the use of global information networks in the economy is quite satisfactory, i.e. more than 90% of legal entities use the networks in their activities (average annual growth of 1.2%).

The second task of our research was to forecast the indicators of informatization in the Russian economy. The forecast period is 3 years. The limitation was taken into account, namely, the indicators that were expressed as a percentage could not exceed the value of 100%, since this would contradict their meaning. The results of the forecast calculations and time series models are presented in Table 2.

Table 2. Forecast for indicators of informatization in the Russian economy

Indicators	Time series model	2020	2021
Number of personal computers per 100 employees (units)	$1.833t + 36.167$	56.33	58.17
Number of organizations with websites (%)	$2.505t + 28.331$	55.89	58.39
Number of organizations using global networks (%)	$83.535x^{0.0393}$	91.79	92.10

Source: authors.

Forecast values indicate that the growth of the analyzed indicators is expected. Therefore, the tasks to form a technological basis for the development of the economy and social sphere, as well as the development of information and communication infrastructure, which were announced in "The Strategy for the Development of the Information Society", can be fulfilled.

The cluster analysis methodology was used for a comprehensive multidimensional assessment of the economy informatization level in the regions of Russia.

To describe the level of the economy informatization the following regional indicators were selected:

X1 – The share of internal expenditure on research and development in % to GRP;

X2 – The share of research and development expenditures aimed at economic development in the total volume of internal research and development expenditures, %;

X3 – The share of innovative goods, works, and services in the total volume of goods shipped, works performed, and services provided by industrial companies and service organizations, %;

X4 – The share of innovative goods, works, and services in the total volume of exports of goods, works, and services of industrial companies and service organizations, %;

X5 – The number of patents for inventions issued to Russian applicants, units per 1 mln. people;

X6 – The share of fundamentally new technologies in the total number of developed advanced production technologies, %;

X7 – The share of information and communication technology (ICT) costs in the total volume of products shipped, %.

The entire set is divided into 3 clusters. Thus, the regions of Russia can be divided into the regions with high, medium and low levels of the economy informatization (Table 3). The total number of regions differs by year due to the differences in the mode of providing information by Rosstat.

Table 3. Cluster analysis results on the economy informatization level in the regions of Russia

Level	Cluster number	Number of regions	
		2010	2017
High level of the economy informatization	1	21	18
Medium level of the economy informatization	2	14	42
Low level of the economy informatization	3	48	22

Source: authors.

In comparison with 2010, the situation in 2017 has changed significantly. A noticeable number of regions have changed their rating. For example, the Trans-Baikal *krai* has sharply deteriorated its position, moving from the first cluster to the third. On the contrary, the Voronezh *oblast* has moved from a group with a low level to a group with a high level of the economy informatization.

A positive aspect is the sharp decrease in the number of regions in the third cluster and their mass transition to the second one. This indicates that regional authorities pay attention to the development of informatization of their economies.

4   Discussion

Informatization of the economy is a set of interrelated phenomena and processes that aim to meet the needs of all economic entities in various types of information. Among these entities there can be business units (enterprises) and government agencies, as well as the population (households). Information and communication technologies are a necessary means to achieve this aim.

The period, when the information societies are formed, implies that there is an increasing need for an objective assessment of the impact of information and communication technologies on the regional socio-economic development in the Russian Federation.

Statistical research of the society informatization should be based on the clearly defined category of "information society". The correlation between various indicators of the regional economies' informatization should be taken into account. In many studies one of the important criteria for informatization is represented by the transition of the public sector to the electronic platforms and the ability of citizens to participate in the management of the territory through digital technologies [2, 3, 9].

Moreover, statistical studies should consider the impact of information and communication technologies on the socio-economic development of society, namely the growth of living standards, economic efficiency, labor productivity, and energy efficiency [6, 12]. To solve its problems, statistics can use various methods, including those related to the calculation of multidimensional estimates of the economies' informatization level [8].

The salient feature of the Russian economy is that the development of informatization in the Russian Federation started later than in European countries. This has resulted in the lack of the necessary tools for implementing ICT-related activities provided there is a large amount of knowledge. This has become a catalyst for mass purchases of technical equipment, job restructuring, and training or retraining of personnel to perform new tasks. In turn, that has resulted in increased availability of personal computers, the use of information technology, etc.

5   Conclusion

The importance of the ICT sector development in the transition to a digital economy makes this study ever more relevant in the first place. Next, the findings of this research support "The Strategy of Information Society Development in the Russian Federation for 2017–2030" adopted by the government of Russia [11]. This document defines the target indicators and the guidelines for the development.

To assess the degree of achieving goals, which were set in "The Strategy", the degree of development and trends in the major economy informatization indicators was

analyzed. Statistical methods and the Federal Service of State Statistics database were used for this purpose.

The main financial indicator is the organization's costs on information and communication technologies. There have been no noticeable changes in their structure in recent years, which indicates the set balance in this domain. The analysis of time series has shown that in Russia there is an upward trend in the availability of computers, websites and the use of global information networks. However, in some periods the trend was interrupted by the phases of decline. The forecast values indicate the possibility of achieving the standard values of "The Strategy".

A large potential is represented by the regional economy. The number of regions with a low level of informatization in the economy has significantly decreased over the past few years. That was achieved by the measures taken. Overall, information and communication technologies are gradually invading modern management systems in all sectors of the economy, and in public and municipal management.

References

1. Batrakova, L.G.: Development of digital economy in Russian regions. Soc. Polit. Res. **1**, 51–64 (2019). https://doi.org/10.24411/2658-428X-2019-10338
2. Das, A., Singh, H., Joseph, D.: A longitudinal study of e-government maturity. Inf. Manag. **54**(4), 415–426 (2017). https://doi.org/10.1016/j.im.2016.09.006
3. Demushina, O.N.: Influence factors for e-participation. ARS Administrandi **9**(2), 132–151 (2017). https://doi.org/10.17072/2218-9173-2017-2-132-151
4. Dolgikh, E., Efimova, M.: Statistical analysis of information society development in Russian Federation. Vestnik Universiteta **9**, 90–94 (2018). https://doi.org/10.26425/1816-4277-2018-9-90-94
5. Federal State Statistic Service: Monitoring the development of the information society in the Russian Federation (2020). https://gks.ru/folder/14478. Accessed 05 Mar 2020
6. Kumar, R.R., Stauvermann, P.J., Samitas, A.: The effects of ICT on output per worker: a study of the Chinese economy. Telecommun. Policy **40**(2), 102–115 (2016). https://doi.org/10.1016/j.telpol.2015.06.004
7. Liu, C.: Sustainability of rural informatization programs in developing countries: a case study of China's Sichuan Province. Telecommun. Policy **40**(7), 714–724 (2016). https://doi.org/10.1016/j.telpol.2015.08.007
8. Salyutina, T.Y., Kuzovkov, A.D.: Analysis of methods and approaches to measuring processes of informatization and the movement towards the information society. T-Comm **10**(6), 52–57 (2016)
9. Sangki, J.: Vision of future e-government via new e-government maturity model: based on Korea's e-government practices. Telecommun. Policy **42**(10), 860–871 (2018). https://doi.org/10.1016/j.telpol.2017.12.002
10. Shamina, O.V.: Statistical evaluation of informatization of economics of the Nizhny Novgorod region. Vestnik NGIEI **4**(71), 93–100 (2017)
11. The Strategy for the Development of the Information Society in the Russian Federation for 2017–2030 (2017). http://kremlin.ru/acts/bank/41919. Accessed 01 Mar 2020
12. Zhou, X., Zhou, D., Wang, Q.: How does information and communication technology affect China's energy intensity? A three-tier structural decomposition analysis. Energy **151**, 748–759 (2018). https://doi.org/10.1016/j.energy.2018.03.115

Economic and Social Aspects of the Innovation Management: Decision Making and Control

Analysis of Social Risks Impact on Economic Security of Companies

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Abstract. An effective system of economic security is one of priority tasks of many companies. One of the most important factors in economic security of companies is their compliance with the principles of corporate social responsibility (CSR). The research challenge is that despite many CSR studies, the regulatory framework in the field of CSR remains unsystematic. In addition, the question of assessing the impact of a company's social responsibility on its economic security has not been analyzed. The purpose of the study is to determine the relationship of social responsibility and economic security of companies. As part of the study, an analysis and systematization of the legislative framework was carried out, a system of indicators for assessing social risks calculated based on non-financial reporting data was developed. According to the reporting data of the largest Russian oil and gas companies, a social risk assessment was carried out.

Keywords: Companies · Corporate social responsibility · Economic security · Non-financial reporting · Social reporting

1 Introduction

In current conditions of instable world economy and multidimensional nature of economic relations, business entities are forced to quickly adapt and seek ways to reduce threats to their functioning and development. Creating an effective system of economic security is one of priority tasks of many companies. The content of "economic security" is characterized by complexity and dynamism. It is constantly updated by researchers in connection with the emergence of new factors affecting it. One of the most important factors of economic security of companies is their observance of the principles of corporate social responsibility, according to which companies voluntarily participate in the social development of society, local territorial communities, take measures to protect the environment, create a favorable social environment through social investment and various social projects and programs.

The organization's performance in relation to society in which it operates, and its environmental impact has become an extremely important part of evaluating its overall performance and ability to continue to function effectively. Awareness of advantages and assessment of organization's activities in the field of social responsibility can affect its competitive advantages, reputation, ability to attract and retain employees, shareholders, investors, customers or users.

Certain aspects of corporate social responsibility (CSR) are considered in the scientific works of foreign scientists such as Azzouz & Jack [1], Moneva-Abadia, Gallardo-Vazquez, & Sanchez-Hemandez [4], Han, Li, Lubrano, & Xum [2], Morsing & Spence [5], Nguyen, Kecskés, & Mansi [7], Hsu & Chen [3] and others. Issues of economic security of companies are considered in the works of the following authors: Na, Park, Yu, Kim, & Chang [6] and others. However, issues of the relationship of social responsibility and economic security are insufficiently studied. In addition, the CSR regulatory framework is not systematized. The question of assessing the impact of the company's social responsibility on its economic security is not properly analyzed too.

The main source of information on the effective application of CSR principles, the results of the company's social policy is non-financial reporting, in particular reporting in the field of sustainable development and social reporting. However, the advisory nature of such reporting, as well as the lack of standardized reporting forms, leads to a decrease in the transparency and comparability of non-financial reporting by companies. Thus, the relevance of the chosen topic is due to the need for a detailed study of corporate social responsibility issues in the context of the formation and development of the economic security system of companies. The purpose of the study is to determine the relationship of social responsibility and economic security of companies, as well as the development of indicators to assess the impact of social responsibility of the company on its economic security.

2   Methodology

The study analyzed and systematized the regulatory framework in the field of CSR.

To conduct a social risk assessment, a system of indicators has been developed, one of which is Injury Frequency Rate (Formula 1), which characterizes the number of industrial accidents per 1000 workers

$$IFR = \frac{The\ number\ of\ victims\ of\ accidents}{Average\ number\ of\ employees} \times 1000 \tag{1}$$

However, this indicator does not provide a reliable data on accident rate in the organization. In this regard, it is necessary to calculate additional indicators, such as Lost Time Injury Frequency Rate (LTIFR) (Formula 2), which characterizes the number of injuries resulting in temporary disability, per 1 million hours worked.

$$LTIFR = \frac{The\ number\ of\ victims\ with\ loss\ of\ working\ time}{Total\ hours\ worked\ by\ all\ staff} \times 1000000 \tag{2}$$

Fatal Accident Rate (FAR) shows the number of fatalities due to industrial accidents per 100 million hours worked (Formula 3).

$$FAR = \frac{Number\ of\ fatal\ assidents}{Total\ hours\ worked\ by\ all\ staff} \times 100000000 \tag{3}$$

In connection with the development of infectious and occupational diseases, it is necessary to calculate Occupational Disease Rate (ODR) (Formula 4) and Lost Day Rate (LDR) (Formula 5).

$$ODR = \frac{Number\ of\ cases\ of\ newly\ diagnosed\ occupational\ diseases}{Total\ hours\ worked\ by\ all\ staff} \times 1000000 \quad (4)$$

$$LDR = \frac{Number\ of\ days\ lost\ as\ a\ result\ of\ accidents}{Total\ hours\ worked\ by\ all\ staff} \times 1000000 \quad (5)$$

A decrease in the above indicators illustrates a decrease in social risk and, as a result, increased security of the company.

One of the important indicators of the company's effective HR policy is the turnover rate (Formula 6), as well as dynamics of the number of employees.

$$TR = \frac{The\ number\ of\ retired\ employees\ for\ the\ period}{Average\ number\ of\ employees\ for\ the\ period} \times 100\% \quad (6)$$

Values of the turnover rate in the range of 3%–5% indicate a natural renewal of the team and does not require measures on the part of the personnel department and the company's management. Excessive staff turnover reduces motivation and loyalty of remaining employees, which contributes to an increase in social risk and a decrease in economic security of the company. The calculation of these indicators is carried out according to the reporting in the field of sustainable development of the largest Russian oil and gas companies, published on their official websites.

3 Results

As part of the study, the analysis of the regulatory framework in the field of CSR regulation was carried out. Four main levels of the CSR regulation can be distinguished: international, national, corporate, intracorporate. Table 1 presents international standards used by Russian and foreign companies when preparing reports.

Table 1. Standards/systems used by Russian and international companies

Standards	Russia	World average
Other	10%	29%
UN PRI	3%	6%
Integrated reporting	15%	22%
OECD recommendations	2%	23%
Kyoto protocol to the UNFCCC	26%	37%
CDP	26%	44%
United Nations Global Compact	29%	50%
ISO	76%	63%
GRI	62%	73%

Source: authors based on [14].

The results of statistical studies indicate that more and more companies in Russia and in the world bring their reporting to unified international standards. At the same time, Russia is approaching global trends in the development of the CSR concept and its standardization.

The basis of legal regulation of CSR at the state level is the National Standards of the Russian Federation, Federal Laws, Decrees of the President of the Russian Federation, which regulate companies' advertising policy, charitable activities, guarantee compliance with ethical and social norms, the right of citizens to protection of their health and etc.

The corporate level of regulatory regime of corporate social responsibility relations considers basic international principles, as well as specific requirements of national legislation. Compliance with company certain standards in the field of social responsibility may be a prerequisite for its membership in a particular industry association.

At the corporate level, regulatory documents have a maximum degree of specification. Examples of normative documents of this level are: charter, code of corporate ethics, mission statement, standards of socially responsible behavior, business ethics programs, collective bargaining agreements, etc. Norms prescribed by documents at international, state, and corporate levels form the basis of internal company standards. Thus, from the position of inter-level analysis, the principle of vertical regulation is used here.

To assess the effective application of CSR principles, as well as the degree of influence of the results of the company's social policy on its economic security, a system of indicators has been developed as part of the study. Since economic security is defined as the ability to counteract the negative impact of various factors, it is proposed to assess the impact of CSR on economic security through the assessment of social risks. As part of the study, social risk indicators were calculated according to the social reporting data of the largest Russian oil and gas companies [8–13] (Table 2).

Table 2. Social risk assessment indicators according to financial statements of Russian oil and gas companies for 2018

Company	Average headcount (thousand people)	IFR	LTIFR	FAR	ODR	LDR	TR
PJSC LUKOIL	102,5	–	0,11	0,01	0,06	–	0,078
PJSC Gazprom Neft	70,6	–	0,258	0,89	0,018	9,79	0,129
PJSC Gazprom	466,1	0,28	0,17	0,57	0,03	12,01	0,056
PJSC Rosneft Oil Company	308	–	0,34	2,47	0,06	23,08	0,108
PJSC NOVATEK	13,036	0,79	–	–	–	50	0,07
PJSC Tatneft	48,078	0,14	0,08	0,01	0,027	–	–
PJSC Transneft	115,1	–	–	–	–	–	0,05

Source: authors.

The results of the study indicate that non-financial reports of the studied oil and gas companies have varying degrees of detail and contain different sets of analytical data. The reporting data of PJSC Novatek [10] and PJSC Transneft [13] are insufficient to calculate Injury Frequency Rate, Lost Time Injury Frequency Rate, as well as Occupational Disease Rate. The reports of PJSC Transneft [13] and PJSC Tatneft [12] do not contain data on the dynamics of staff turnover. The reporting of three of the seven companies (43%) [9, 12, 13] included in the sample does not contain information on Lost Day Rate. Four out of seven companies (57%) [8, 9, 11, 13] do not calculate Occupational Disease Rate.

The data in Table 2 indicate low social risks for oil and gas companies. Low values of Injury Frequency Rate indicate that accidents leading to temporary disability or death are rare. Moreover, the dynamics of the given indicators according to the reporting data of the studied companies indicates a reduction in social risk [8–13].

PJSC Gazprom and PJSC Gazprom Neft have the lowest level of social risk. In the reports of these organizations, analytical indicators in relation to the results of social activities are most fully disclosed. The reports of PJSC Tatneft and PJSC Lukoil are less detailed in terms of social policy issues. The least transparent from the point of view of the CSR disclosure is the reporting of PAO Transneft and PAO Novatek. Their reporting contains a small set of analytical indicators. These companies do not calculate Injury Frequency Rate, Occupational Disease Rate and do not disclose data which reporting users could independently calculate using these indicators.

The findings are confirmed by official ratings. The RAEX Rating Review annually compiles ESG rating of Russian companies based on the assessment of a specific set of indicators of the company's impact on the ecological and social environment, as well as the degree of the company's exposure to management risks. The positions of the studied companies in this rating regarding the social component are presented in Table 3.

Table 3. Rating of companies by social factor

Company	Place in the ranking
PJSC Tatneft	2
PJSC Gazprom	3
PJSC LUKOIL	5
PJSC Rosneft Oil Company	7
PJSC Transneft	11
PJSC NOVATEK	14

Source: authors based on [15].

The data in Table 3 indicate that the most transparent from the point of view of social responsibility are the statements of PJSC Tatneft and PJSC Gazprom (PJSC Gazprom Neft does not participate in the rating as a separate company and is considered as part of PJSC Gazprom) [15]. The least transparent from the point of view of the CSR disclosure is the reporting of PAO Transneft and PAO Novatek [15].

4   Discussion

For the most effective application of CSR principles to strengthen the economic security system of companies, it seems necessary to standardize non-financial reporting, such as social report and report on activities in the field of sustainable development. Standardization of the reporting structure will allow identifying significant topics that need to be included in the report, as well as determining a system of non-financial indicators that sufficiently disclose information about key aspects of the company's social policy, risks and opportunities.

The assessment of social risks, as well as analysis of indicators of social risks will allow identifying and eliminating social risks that have the strongest impact on company security. In the past few years, in the practice of exchanging business information between Russian companies and regulatory authorities, there has been a tendency to submit reports in XBRL format, the main task of which is to regulate the exchange of information.

In this regard, it is possible to use the XBRL format in the formation of a social report and a report on activities in the field of sustainable development. World practice shows that the introduction of the XBRL format will reduce the time required to prepare reporting data by almost 90%; reduce the cost of ownership of IT systems by 40%; will provide an opportunity to reduce the cost and speed up the process of exchanging business information. The effective internal control and audit service of companies will allow for monitoring compliance with legal requirements regarding the formation and presentation of social reporting, as well as identifying and eliminating possible problems in a timely manner, thereby increasing the transparency of business reporting.

5   Conclusion

Thus, the condition for the effective functioning of organizations and ensuring economic security of both individual companies and the state is to follow the principles of socially responsible business and the formation of non-financial reporting. The lack of standardization of non-financial, including social, reporting, as well as the optional nature of its use creates difficulties in the preparation and verification of such reports. In addition, a different degree of detail in the reporting of different companies, a different set of indicators used makes reporting less comparable and complicates the assessment of organizations.

References

1. Azzouz, L., Jack, A.: Benchmarking the sustainability reporting of high-speed railways (HSRs): towards a state-of-the-art benchmarking and reporting framework for HSRs. J. Clean. Prod. **250**, 119505 (2020). https://doi.org/10.1016/j.jclepro.2019.119505
2. Han, S., Li, G., Lubrano, M., Xun, Z.: Lie of the weak: inconsistent corporate social responsibility activities of Chinese zombie firms. J. Clean. Prod. **253**, 119858 (2020). https://doi.org/10.1016/j.jclepro.2019.119858
3. Hsu, F.-J., Chen, S.H.: Does corporate social responsibility drive better performance by adopting IFRS? Evidence from emerging market. J. Comput. Appl. Math. **371**, 112631 (2020). https://doi.org/10.1016/j.cam.2019.112631
4. Moneva-Abadia, J.M., Gallardo-Vazquez, D., Sanchez-Hernandez, M.I.: Corporate social responsibility as a strategic opportunity for small firms during economic crises. J. Small Bus. Manag. **57**, 172–199 (2019)
5. Morsing, M., Spence, L.J.: Corporate social responsibility (CSR) communication and small and medium sized enterprises: the governmentality dilemma of explicit and implicit CSR communication. Hum. Relat. **72**(12), 1920–1947 (2019)
6. Na, O., Park, L.W., Yu, H., Kim, Y., Chang, H.: The rating model of corporate information for economic security activities. Secur. J. **32**, 435–456 (2019)
7. Nguyen, P., Kecskés, A., Mansi, S.: Does corporate social responsibility create shareholder value? The importance of long-term investors. J. Bank. Finance **112**, 105217 (2020). https://doi.org/10.1016/j.jbankfin.2017.09.013
8. PJSC Gazprom: Sustainability report 2018 (2019). https://www.gazprom.ru/f/posts/01/851439/sustainability-report-rus-2018.pdf. Accessed 14 Feb 2020
9. PJSC LUKOIL: Sustainability report 2018 (2019). http://www.lukoil.ru/FileSystem/9/347263.pdf. Accessed 14 Feb 2020
10. PJSC NOVATEK: Sustainability report 2018 (2019). http://www.novatek.ru/ru/development/. Accessed 14 Feb 2020
11. PJSC Rosneft Oil Company: Sustainability report 2018 (2019). https://www.rosneft.ru/upload/site1/document_file/Rosneft_CSR18_RU_Book.pdf. Accessed 14 Feb 2020 (2019)
12. PJSC Tatneft: Sustainability report 2018 (2019). http://2018.tatneft.ru/. Accessed 14 Feb 2020
13. PJSC Transneft: Sustainability report 2018 (2019). https://www.transneft.ru/u/section_file/39731/otchet-ob-ustoychivom-razvitii-2018.pdf. Accessed 14 Feb 2020
14. PwC: ESG factors in investing (2019). https://www.pwc.ru/ru/sustainability/assets/pwc-responsible-investment.pdf. Accessed 14 Feb 2020
15. RAEX: ESG-rating (2019). https://raex-rr.com/country/RAEX-600/ESG_rating#table. Accessed 14 Feb 2020

Development Concept for Ski Resorts in the Context of the Economy Digitalization

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Abstract. The article is aimed at developing a concept for domestic ski resorts under conditions of the economy digitalization. The author considers issues and specifics of the competitiveness of ski resorts with an effective 5A business model used as a foundation that forms an approach to the complex's activities as an ecosystem and allows integration into the digital development process. As a result of marketing research, comparative analysis and economic modeling, it was established that when it comes to skiing and leisure, tourists have a great demand for additional digital services or opportunities to receive "package offers". The availability of such services, in conformity with international trends in the development of the industry, is no longer treated as a competitive advantage, but as a standard for skiing complexes. All stages of the concept of development of the ski resort must ensure implementation of digital technologies in the marketing of services. A digital customer-oriented platform (application) can become an operational foundation of the ski complex and be used in "flexible" pricing. To ensure investment attractiveness, competitiveness and strong social significance, the offered conceptual business model should be aimed at processes of creating "added value", transmitting unique offer to clients and extracting profit.

Keywords: Concept · Digitalization of economy · Ski resorts · Ski sports · Tourism

1 Introduction

Active development of digital technology in Russia and abroad influences efficiency of development for all economic subjects at the modern stage. Tourism industry has begun its implementation into a new digital format as a forerunner. At the current moment, the subject's competitiveness in the tourist industry is mainly determined by the level of its involvement in the digital process.

Information technology is becoming the primary resource in current conditions [1]. In recent years, Russia has been developing in conditions of external challenges that require a significant increment in innovation in all economic spheres. The economic development of the Russian Federation has moved to an advanced format. The established development models of most economic subjects require paramount changes. The development of the tourism industry will be intertwined with investments in innovation and reaching more tourists with mobile channels [9].

The leaders in the digitalization of tourism services are major foreign ski resorts. Russian ski resorts have significant development potential. Therefore, the main concept for the company's development in this industry is establishment of an effective business model that allows its integration into the digital development process.

2 Methodology

When conducting research on the advancement of skiing and tourism and establishing a concept in the context of the development of the digital economy, general scientific and applied research methods were used. The author conducted marketing research on the development of ski resorts employing survey methods and content analysis, explored the official sites of the analyzed ski resorts in Russia, and the ski tourism portals of Russia and the world.

The method of comparative analysis was implemented for ski resorts in Russia, the Volga Federal District, as well as the Samara region. An expert analysis of the coordination of interests of subjects in the field of skiing and tourism of the Samara region was carried out. When developing the concept for the development of domestic ski resorts, a prognostic method was used to predict the evolution of the company in the current challenges of the tourism industry. When creating a model for the development of a modern ski complex, the method of economic modeling was used.

3 Results

With each passing year, skiing builds up more and more popularity among Russian population. Climate conditions of the vast majority of Russian regions provide an opportunity to engage in this sport from December to April. The implementation of the Demography national project involves the popularization of sports among Russian citizens and an increase in the share of people engaged in sports from 36.8% in 2018 to 55% by 2024. According to the data for 2018, 125.5 thousand people are engaged in skiing in the Russian Federation (Table 1) [8].

Table 1. Ski athletes training indicators in Russian Federation, 2015–2018

Year	The amount of people engaged in ski sports in Russian Federation, ppl.	The amount of organizations engaged in training ski sportsmen, u.
2015	99262	119
2016	97657	121
2017	107824	114
2018	125509	107

Source: author based on [8].

According to the Ski.ru ski portal, there are approximately 2.5–3 million skiers in Russia, whose annual agenda includes at least one or more trips to the ski resort. On average, a skier performs 1 trip a year for 10 days. Based on this, the market demand can be formulated as 25 million person-days.

In the period between 2015–2019 there is a definite positive trend of an increase in skiing facilities. On current day, there are 325 ski facilities in the country (Table 2).

The majority (23.1%) of ski resorts are located in the Siberian Federal District, which points to a certain sufficiency in the market for ski recreation in this region. The second place in this rating is occupied by the Volga Federal District (21.2%). A positive point is the location of the region in the Volga Uplands grants significant opportunities for the development of this particular type of recreation. The third place in terms of the amount of ski resorts is taken by the Central Federal District - it comprises 17.5% of Russian ski resorts (Table 2).

Table 2. Distribution of ski facilities by federal districts of Russian Federation by October of 2019

Federal district	Ski resorts, u.	Share of ski resorts, %
Siberian FD	75	23,1
Volga FD	**69**	**21,2**
Central FD	57	17,5
Ural FD	39	12,0
Northwestern FD	38	11,7
Far eastern FD	36	11,1
Southern and North Caucasus FD	11	3,4
Total in RF	**325**	**100,0**

Source: author based on [10].

Despite the significant number of ski resorts in the country, only a few dozen of them enjoy considerable popularity.

Below are the 10 best ski resorts in Russia with a total number of visits in the season between 2018–2019 [10]:

Krasnaya Polyana ("Rosa Khutor" & "Gorki Gorod", Sochi), 1,5 mm. ppl.
Sheregesh (Tashtagol, Kemerovo region), 1 mm. ppl.
Sorochany (Moscow region), 0,5 mm. ppl.
Dombai (Karachay-Cherkessia), over 300 k. ppl.
Bobrovy log (Krasnoyarsk), over 300 k. ppl.
Elbrus (Kabardino-Balkaria), 250 k. ppl.
Igora (Priozersky district, Leningrad region), over 200 k. ppl.
Solnechnaya Dolina (Miass, Chelyabinsk region), over 200 k. ppl.
Sviyaga hills (village of Savino, Kazan, Tatarstan), 200 k. ppl.
Gora Belaya (Nizhny Tagil, Sverdlovsk region), 200 k. ppl.

These resorts have a fairly developed infrastructure. They are not inferior to Western "colleagues" in terms of equipment and comfort, and visa-free travel makes them especially attractive to Russian citizens and guests from the CIS countries.

The main competitive advantage of modern ski resorts is their focus on the development of an entirely new support infrastructure. In terms of ski holidays, tourists demand not only the ability to ascend and descend, but also additional digital services

and an opportunity to receive special "package deals". Following the mainstream world trends in evolution of the industry, the presence of associated services is no longer seen as a competitive advantage but as a standard practice for ski resorts. Due to this, comparatively small "one day" resorts enjoy sufficient demand for their services on the regional market [7].

On all stages of implementation of the ski resort development project, it is essential to ensure use of digital technology in service marketing. In this case, a digital customer-oriented platform (application) can become an operational foundation of the ski complex and be used in "flexible" pricing. A modern internet application can promptly supply information on weather conditions, traffic load, availability of parking spaces, discounts, ski pass purchase conditions and its status, etc. Partnership with Yandex, Google and other participants in the digital promotion of services is considered as the most promising.

A specific characteristic of ski sport and recreation is defined in segmentation: professional athletes, amateur nonprofessionals and beginners. Using this division whilst creating a marketing strategy in the digital age will allow further increase in efficiency of advertising and other tools.

To organize an efficient ski resort, it is essential to expand the offer and enhance the system of implementation with new offers, conduct SMM campaigns, and offer discounts to certain specific target groups. One of the advantages that can attract regular users of ski resort services is the Ski Pass system. At the same time projects' weaknesses and risks can be counteracted.

Advertising and promotion of ski resort services should be carried out with the ultimate use of the potential of previously established contacts in the B2B (business to business) and B2C (business to consumer) formats - tour operators, media, advertising agencies, partners, web application developers and SMM specialists, etc.

More bleeding edge access systems for ski slopes, such as the Axess system, are relevant as well. Modern standards establish certain demands to the ski resort services, to the training and certification of personnel. Typical basic service package includes 5 blocks: active recreational services; basic services; additional services; supporting services; passive recreational services (Fig. 1).
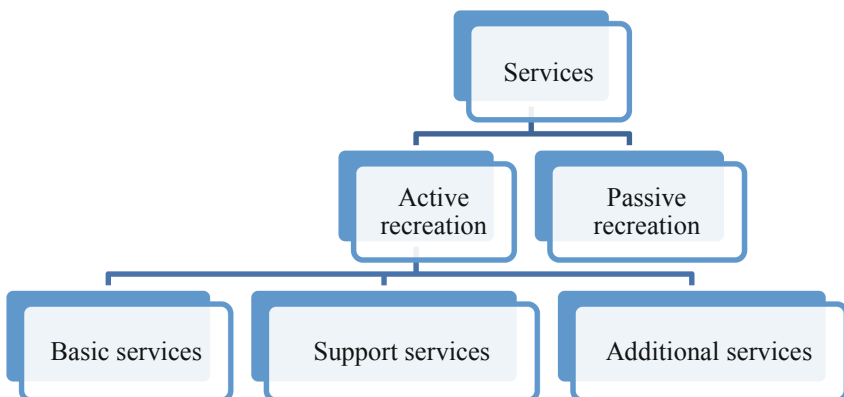
Fig. 1. Ski resort service groups (Source: author).

Foreign countries that rely on development of sports and tourism, the implementation of local projects for the creation (reconstruction) of ski resorts is based on the following basic principles:

– inclusion in the implementation of territory development programs (strategies),
– utilization of public-private partnership mechanism,
– diversification of the range of services (uniform all season).

The best practices are demonstrated by Austria, France, Switzerland, Germany, Italy, Mexico, Turkey (Table 3).

Table 3. Leading countries in ski sports

Country	Main ski resorts
Austria	Innsbruck, Bad Gastein, Zillertal, Mayrhofen, Kitzbühel, Zell am See
France	Les 3 Vallées, Chamonix, Val-d'Isère, Tignes
Italy	Val di Fassa, Val di Fiemme, Breuil-Cervinia, La Thuile
Switzerland	St. Moritz, Zermatt, Grindelwald, Adelboden, Verbier, Saas-Fee, Davos
Andorra	Pas De La Casa/Grau Roig, Soldeu/El Tarter, Arcalís – Ordino, Pal/Arinsal
Turkey	Uludag, Palandöken, Sarikamish
Bulgaria	Pamporovo, Borovets, Vitosha
Slovenia	Kranjska Gora, Bovec, Bohinj
Slovakia	Jasna, Smokovec, Tatranska Lomnica, Strebske Pleso
Germany	Oberstdorf, Garmisch-Partenkirchen
Finland	Pallas, Yllas, Levi
Norway	Geilo, Hemsdal, Lillehammer, Trysil
Czech Republic	Spindleruv Mlyn, Pec pod Snezkou
Poland	Zakopane
Sweden	Öre
Spain	Sierra Nevada
North America (USA)	Aspen, Deer valley, Squaw Valley

Source: author.

For these countries, skiing and tourism is one of the most prioritized directions in economic development, as well as innovative development of resorts with digital technology and bleeding edge equipment used as a foundation. The authorities act as stakeholders in such projects and as the coordinator in all stages of the life cycle and an investor in the infrastructure objects (transport, utilities, social, etc.). After analyzing international practice, domestic and foreign standards it is possible to draw following conclusions essential for drawing up a development concept for domestic ski resorts. The competitive advantage of ski resorts and their sustainable development is determined by the 5A model, which shows an approach to the activities of the resort as an ecosystem.

According to the methodological approach 5A, the business model of the ski resort (or another tourist or sports facility) is based on the following elements (Fig. 2).
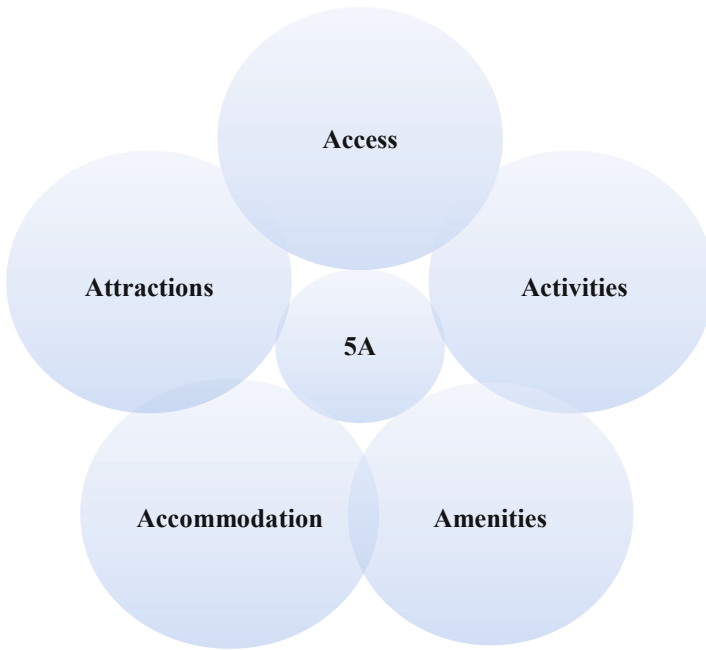
Fig. 2. Elements of a ski resort development business model (Source: author).

More and more resorts question: does their existing business model provide sufficient sales to cover the essential expenses throughout the entire investment cycle? And is it possible to reduce costs by implementing innovative approaches? Aside from the digital transformation of the industry, global trends such as the pursuit of a healthy lifestyle and environmental protection also influence the tourism market.

As such, the business model of a modern ski resort, first and foremost, should prioritize creating "added value", broadcasting its unique offer to the client and making profit. Transfer of tourists to the slope for winter sports, such as skiing and snowboarding, as well as related quality services for associated and additional services, should lie as a foundation for the business model. The offers have to be based on the ability to provide both winter and summer vacations, the originality and innovativeness of the services offered, and the holding of international events. This will provide the ski resort with investment attractiveness, competitiveness and strong social significance in the conditions of modern digital technology development.

4   Discussion

The digital transformation of the tourism industry is being heavily researched and discussed both in the scientific field and at the state level. According to the Decree of the Government of the Russian Federation of 20.09.2019 N 2129-r «On approval of the Strategy for the development of tourism in the Russian Federation for the period until 2035», the maximized digitalization of the Russian tourism sector is heavily implied [4]. The strategy especially notes that the introduction of digital technologies forms the mainstream trends in the development of the tourism industry, increasingly influencing virtually all parts of the tourism service through reducing transaction costs and raising awareness of participants in digital services and platforms. Most studies point to low competitiveness of domestic ski resorts due to an insufficient level of technological development and innovation of resorts and lack of integration into singular digital system. Taking into account new development trends in the digital tourism business, companies have to compete for each client in digital space [5].

One of the factors of increasing the innovativeness of ski resorts is a threat to their economic stability of their development caused by global warming and consequent decrease in snow cover [6]. Researchers also remark that development of ski resorts in face of climate change and active implementation of digital technology provides it with brand new prospect focused on innovation and use of ICT. This should be a channel not solely for communication, but also for commercialization. The results of the study show that ski resorts are well aware of the importance of the Internet. Companies must go beyond the traditional presence, giving priority to digital marketing methods [2]. Ski resorts must provide special attention to their websites. Companies should create efficient customer feedback systems, which will help improve organization management. It is also recommended to introduce more informative content, both about the services of the ski resort and about the aspects of the local environment. This will make the website content relevant for the requirements of the target audience [3].

5   Conclusion

Modern development of the tourism industry should be correlated with development of the international economy and be in line with digital development. This will supply ski tourism facilities with a high level of competitiveness, both in the domestic market and in the field of international tourism.

Promotion of healthy lifestyle on social networks has provided results: the number of tourists who intertwine their travels with various sports has increased. Skiing is one of the popular activities in the field of sports tourism. The dynamics of visits to ski resorts shows growth internationally and in Russia both. At the same time, the infrastructure of the vast majority of domestic ski resorts lags behind modern ski resorts of Europe. And the growing demand for ski services calls for a thorough approach when attracting potential customers in the face of exorbitant competition.

The competitive advantage of modern ski resorts in conditions of developing digital economy is based on certain principles. The most crucial principle is development of innovative supporting infrastructure. Aside from using the routes, modern support infrastructure and the associated services must be provided.

Today, the application of digital technology in ski resort marketing is a primary method of promoting and attracting customers. In this case it is appropriate to implement digital applications and platforms to ensure the operation of ski resorts. As such, the business processes of modern ski resorts should create a specific development concept that allows them to ensure their competitiveness with implementation of innovative technologies based on digital solutions.

References

1. Babkin, A.V., Chistyakova, O.V.: Digital economy and its influence on competitiveness of entrepreneurial structures. Russ. Enterp. **18**(24), 4087–4102 (2017)
2. Cristobal-Fransi, E., Daries, N., Serra-Cantallops, A., Ramón-Cardona, J., Zorzano, M.: Ski tourism and web marketing strategies: the case of ski resorts in France and Spain. Sustainability **10**, 2920 (2018). https://doi.org/10.3390/su10082920
3. Daries-Ramon, N., Cristobal-Fransi, E., Martin-Fuentes, E., Marine-Roig, E.: ICT development in snow tourism: analysis of the online presence of ski resorts in Spain and Andorra. Doc. d'Analisi Geografica **63**(2), 399–426 (2017). https://doi.org/10.5565/rev/dag.348
4. Decree of the Government of the Russian Federation of 20.09.2019 N 2129-r «On approval of the Strategy for the development of tourism in the Russian Federation for the period until 2035». http://government.ru/docs/37906/. Accessed 02 Apr 2020
5. Kornilov, N.Yu.: Improving the business processes of a tourist enterprise in the conditions of digitalization. Bull. Russ. New Univ. Ser. Man Soc. **4**, 85–90 (2019). https://doi.org/10.25586/rnu.v9276.19.04.p.085
6. Moreno-Gené, J., Sánchez-Pulido, L., Cristobal-Fransi, E., Daries, N.: The economic sustainability of snow tourism: the case of ski resorts in Austria, France, and Italy. Sustainability **10**, 3012 (2018). https://doi.org/10.3390/su10093012
7. PWC: Ski resorts of Austria and Switzerland (2018). https://www.pwc.ru/ru/sports-new/assets/pwc-studie-bergbahnen-hoch-hinaus.pdf. Accessed 02 Apr 2020
8. Skiing development program in the Russian Federation for 2018–2022, approved by Order of the Ministry of Sports of the Russian Federation on September 7, 2018 No. 774. https://www.garant.ru/products/ipo/prime/doc/71777346/. Accessed 02 Apr 2020
9. Vintean, A.: Tourism of the future – an on going challenge. Stud. Bus. Econ. **14**(3), 258–272 (2019). https://doi.org/10.2478/sbe-2019-0058
10. Vsnega: Ski resorts of Russia (2019). https://www.vsnega.ru/resorts/russia/. Accessed 04 Apr 2020

Once Again to the Question of Economic Efficiency of Medical Services

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Abstract. The purpose of the article is to develop approaches to assessing the economic efficiency of medical services. The problem of measuring financial performance is very relevant for the financial management of medical care both in the private and in the public sector, especially in the sphere of state management. In modern market conditions, management in the healthcare industry needs to determine the amount of the minimum required financial resources for the successful treatment of incoming patients, in a fairly large set of various methods of treatment of diseases associated with different ways leading to the same clinical effect, a large variety of drugs having the same indications and in the context of sufficiency or deficiency of industry financing.

Keywords: Cost of medical services · Economic efficiency · Financial result · Financial management

1 Introduction

How important is it to evaluate, or to be more precise measure, the efficiency of a medical service? Performance measurement issues are of key importance in conducting research related to management issues, both in scientific, theoretical aspects, and in practical activities. Thus, A. Neely, C. Adams, and M. Kennerley note that in the academic community, research in the field of efficiency measurement is conducted by representatives of functionally different branches of knowledge [11]. Specialists in such fields as accounting, economics, human resource management, marketing, operational management, psychology and sociology, all these spheres study this subject [10].

Moreover, as it is noted by Fedotov [5], despite the fact that a leading position in these studies is the measurement of the efficiency of organizations (organizational efficiency), the components of a subject area studied in economics (productivity and efficiency analysis/measurement) and management (performance management/ measurement, business performance management), the evaluation of efficiency is equally important for the management practice of organizations of any type. Neely & Kennerley [7], Krivonozhko et al. [8], and Gumilev [6] noted the great importance of evaluating efficiency in the field of management.

It is essential for organizations that provide medical services too. In modern conditions of the Russian reality, when medical care has moved from the category of public goods provided by the state to the category of private sphere, financed from various sources (budgets of the country's budget system, insurance organizations that are part of the system of compulsory medical insurance, and others that provide voluntary medical insurance services, as well as from the pocket of those who need medical care directly, without the above intermediaries), issues of economic and financial management of medical institutions come to the fore.

Without such an important criterion for evaluating management performance as efficiency, which links such important performance indicators as the achieved result and the total costs (expenses) to achieve it, it is impossible to find options for the greatest optimal impact on the management object in order to obtain the best result in certain conditions.

2   Methodology

The starting point of the modern concept of efficiency is considered to be the 50s of the twentieth century, when the works of Debreu [3] and Farrell [4] an approach was proposed to measuring the efficiency based on the ratio of results to costs. The most famous is the second work, in which Farrell identifies the following types of efficiency:

1. Technical efficiency – the state in which the enterprise reaches the maximum output for a given set of resources (performance).
2. Allocative efficiency – the state in which the enterprise reaches the minimum expenditure of resources for a given volume of output (effectiveness).
3. Economic efficiency is a state that combines the two previous types of efficiency (efficiency) [4].

Based on the conclusions of Debreu and Farrell, technologies for evaluating the efficiency of complex systems were developed, for example, the technology developed by American specialists Charnes, Cooper and Rhodes [2] in the seventies of the XX century.

Modern research on ways to measure the cost-effectiveness of medical services focuses on achieving the highest efficiency (allocative efficiency), offering various options for reducing the cost of providing medical services. At the same time, scientific research on the economic efficiency of medical services is conducted, as a rule, by narrow specialists within a particular branch of medicine. So, the team of authors headed by Basinkevich et al. [1], investigating the effectiveness of providing services to patients with coronary heart disease, considers 4 options for evaluating the effectiveness of providing a specific medical service: cost minimization analysis, cost effectiveness analysis, cost utility analysis, cost benefit analysis. At the same time, they chose the first method of minimizing the cost, using as a conclusion the thesis that the most cost-effective service will be one that will require less costs if the result is equal. The same approach to evaluating the efficiency is used by Kukolnikova & Zhukov [9], who offer the "cost/efficiency" ratio as a measurement. At the same time, they consider all four of these methods in detail.

The main problem in applying these methods of evaluating the efficiency is the measurement of the result. In this case, the result is taken into account only in the cost utilitarian analysis and in the cost analysis of profit. When using the cost-based utilitarian analysis, the result of medical treatment is based on the choice of preferred or utilitarian health criteria by patients themselves. The result of this choice is a calculated coefficient, called the "quality-of-life indicator" (QALY), which reflects changes in the life expectancy and quality.

In the methodology of cost analysis of profit, the result, as the name of the method implies, is the profit of a medical institution received from the provision of medical services. But here, as Kukolnikova & Zhukov rightly point out, the difficulty of expressing the clinical effect in monetary terms is obvious [9]. Thus, the stumbling block in measuring the efficiency of medical services is the inability to evaluate its result in monetary units. Therefore, the research task is to bring the main indicators of the efficiency formula to a single unit of measurement:

$$\textbf{Efficiency} = \textbf{Result}/\textbf{Costs} \tag{1}$$

If "efficiency" is a relative indicator, then "result" and "cost" should be reduced to a single unit of measurement. The result of the medical treatment of the patient can be expressed in monetary terms only in the amount of the cost of achieving it, but then the effectiveness of any treatment will be equal to 100% or "1", which does not allow us to compare its effectiveness. This conflict has led to the fact that almost all methods of measuring the efficiency are based on the dynamics of changes in costs.

Kukolnikova & Zhukov propose the following solution to this problem. They justify that the method of cost minimization analysis of medical services is applied only when the compared medical actions have "the same clinical effectiveness", i.e. they lead to the same result. Otherwise, they recommend using cost effectiveness analysis and just suggest the "cost/effectiveness" method for this purpose, on the basis of which it is possible to choose a treatment with a desirable clinical outcome [9].

3   Results

It is proposed to develop this methodology for measuring the efficiency based on a reference approach. The essence of this approach is that based on medical observations, the most effective method of treating a specific disease is selected, which makes it possible to achieve the desired clinical result quite quickly, which is taken as a standard. As a postulate (initial message), we assume that the economic efficiency of this treatment method is equal to 1, i.e. the cost of its application expresses its economic result (Formula 2).

$$\textbf{Result 1}/\textbf{Costs 1} = \textbf{1} \tag{2}$$

If it is necessary to measure the efficiency of another treatment method for this disease, then the cost of its implementation is compared with the result of the reference (first) method (formula 3).

$$\text{Result 1}/\text{Costs 2} = \text{Efficiency 2} \tag{3}$$

It is obvious that a more cost-effective treatment method will be measured by a coefficient greater than one, since the desired result is achieved at a lower cost, and vice versa, if the efficiency value is less than one, the reference method is preferable. It is clear that the use of the reference approach is possible only if the same result is achieved.

4   Discussion

As an example, let's consider a typical choice offered to patients in the dental practice. Let's take one common pathology – the absence of one tooth, while two adjacent teeth are healthy. To preserve chewing and aesthetic functions, two methods of treating this pathology are used. That is, the result will be the same, there are only different methods of achieving it. Any dentist, regardless of the specialization, offers the most affordable treatment for the patient. To date, this is the installation of a bridge-like prosthesis on three crowns. The second method is to install an implant in the lower jaw, in place of the missing tooth, followed by the installation of a crown on it.

To solve this problem, we use the proposed method described above. At the first stage, we will take into account costs associated with the installation of a bridge prosthesis. At the second stage, we will calculate the cost of installing the implant and a crown on it. At the third stage, we will compare the economic efficiency of both methods. The first method, widely used now, requires the manufacture of three crowns, depulpation of 2 teeth, preparation of the oral cavity and installation on cement. The average cost of this service is 32 thousand rubles. The cost of the second method is estimated at 26 thousand rubles. If we compare the efficiency of two methods, we need to take the first as a reference, since this is the most common method of treating missing teeth in modern Russia. Thus, its efficiency will be equal 1, and the result expressed in monetary terms, respectively, 32,000 rubles. Now let's calculate the economic efficiency of the second method, based on Formula 3:

$$\textbf{Efficiency 2} = \textbf{32000}/\textbf{26000} = \textbf{1,23}$$

That is, we will get that the efficiency of the second treatment method is higher than the first one and is 1.23. This is a fairly clear illustration of the proposed method of evaluating the economic efficiency of medical services. Thus, for further work it is necessary to consider the number of complications and frequency of visits and many other factors that are associated with the treatment process of other diseases, as in the proposed example, based on the results of the study to date, the complication rate is about the same – 4.2% and 4%, respectively.

But with further research, it may turn out that the number of complications for the second method of treatment may increase the amount of costs and ultimately reduce the economic efficiency of this method to a level less than 1.

5   Conclusion

In our opinion, using the reference approach allows you to:

– express the result in units comparable to the cost (monetary equivalent) and include it in the mathematical model,
– search for a reference method for treating a specific disease makes medical managers to consider more effective ways to treat patients,
– help scientists to evaluate the economic efficiency of the newly developed methods for the treatment of patients,
– measure the efficiency of complex treatment methods by dividing them into simple ones and presenting it as the sum of the efficiency coefficients of the methods or determining the arithmetic mean coefficient,
– develop an ideal model of the most effective way to treat a particular disease, which can serve as a benchmark for the efficient treatment of a particular disease,
– effectively and more realistically plan activities of medical institutions, as well as specific specialists who provide medical services,
– centralize planning of financial provision of medical care based on the approval of reference methods and organize its effective financial control.

References

1. Basinkevich, A.B., Matchin, Y., Bubnov, D.S., Silvestrova, G.A., Shamrina, N.S., Atanesyan, R.V., Vladimirov, S.T., et al.: Clinical and economic efficiency of endovascular treatment of coronary arteries in patients with stable coronary heart disease during hospitalization for "one night". Cardiology **58**(S3), 36–45 (2018)
2. Charnes, A., Cooper, W.W., Rhodes, E.: Measuring the efficiency of decision making units. Eur. J. Oper. Res. **2**, 429–444 (1978)
3. Debreu, G.: The coefficient of resource utilization. Econometrica **19**(3), 273–292 (1951)
4. Farrell, M.J.: The measurement of productive efficiency. J. Roy. Stat. Soc. Ser. A (General) **120**(3), 253–290 (1957)
5. Fedotov, Y.: Measuring the effectiveness of the organization: Features of the DEA method (data convolution analysis). Russ. Manag. J. **10**(2), 51–62 (2012)
6. Gumilev, L.N.: Ethnogenesis and Biosphere of the Earth. AST Publishing House, Moscow (2019)
7. Kennerley, M., Neely, A.: Performance measurement frameworks: a review. In: Neely, A. (ed.) Business Performance Measurement: Unifying Theory and Integrating Practice, pp. 143–162. Cambridge University Press, Cambridge (2007)
8. Krivonozhko, V.E., Utkin, O.B., Senkov, R.V., Antonov, A.V., Volodin, A.V.: Analysis of the Effectiveness of Financial Institutions in the Transition Economy. Nonlinear Dynamics and Control. ISA RAS, Moscow (2000)
9. Kukolnikova, E.L., Zhukov, B.N.: Evaluation of the cost-effectiveness of the treatment of patients with phlebological profile. Pract. Med. **6**(54), 126–129 (2011)
10. Lebas, M., Euske, K.: A conceptual and operational delineation of performance. In: Neely, A. (ed.) Business Performance Measurement: Unifying Theory and Integrating Practice, pp. 125–139. Cambridge University Press, Cambridge (2007)
11. Neely, A., Adams, C., Kennerley, M.: The Performance Prism: The Scorecard for Measuring and Managing Business Success. Prentice Hall, New Jersey (2002)

Internal Control as an Element of Ensuring Sustainable Development of Innovative Enterprises

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Abstract. Innovation today is not only a condition for sustainable business development, but also for its survival. However, it is worth noting that innovative enterprises, due to the specificity and dynamism of their activities, have a whole range of risks, which actualizes the need to implement internal control systems. In order to ensure the reliability of reporting and sustainable development of innovative business entities, the issues of organizing the internal control system, approaches to assessing the costs of implementing this system, the main factors limiting the effectiveness of internal control, requirements and recommendations for the formation of a risk report in innovative business are considered. The article describes the main risks inherent to innovative business entities and shows the advantages of implementing the proposed internal control system.

Keywords: Accounting · Economic security · Innovative business entity · Internal control system · Risk appetite · Sustainable development

1 Introduction

Despite the importance of innovation in the current situation, modern conditions are not very favorable for the functioning of innovative businesses. Due to the need of increasing competitiveness and retain a place in the market, subjects of innovative entrepreneurship need to assess possible risks and obtain reliable business information required for making managerial decisions [3]. To ensure the achievement of goals and increase the efficiency of their activities, it is advisable for entities to use a generalized indicator that indicates the success of the business. This can be sustainable development.

Sustainable development is considered by various authors from different points of view: on the one hand, it can be considered as a series of successive stages of economic growth [9], and on the other – as a balanced state of resources that provides stable profitability and optimal conditions for expanded reproduction, economic growth in the long term, taking into account the influence of the external and internal business environment [1]. We will understand sustainable development as a sequence of states that contribute to the growth of economic stability, creating a foundation for maintaining this situation for a long time. Ensuring the sustainable development of an innovative enterprise depends on a variety of factors and tools used. One of them is the internal control system.

2   Methodology

In the course of economic activity, an innovative enterprise is influenced by industry, legal and other internal and external factors (significant conditions, events, circumstances, actions). In this regard, there are various risks that can significantly affect the financial position and financial performance of an innovative enterprise. Most of the risks of economic activity have financial consequences and, consequently, have an impact on the accounting statements prepared by an innovative enterprise [12]. Based on this, in order to form a complete picture of the financial position of the innovative enterprise, its financial results and changes in its financial position, the annual financial statements disclose indicators and explanations about potentially significant risks of economic activity to which the innovative enterprise is exposed [8]. Disclosure of this information is one of the components of the internal control system (ICS) of the committed facts of economic life of an innovative enterprise [4].

An innovative enterprise should implement a set of measures to identify risks, minimize the probability of their occurrence, reduce possible negative consequences when they are implemented, and ensure the adoption of rational and effective management decisions [7].

We conducted a survey of the owners of 125 enterprises in the Samara region that actively implement innovations in their activities, about the place of ICS in their organizations. According to the results of the survey 68% of the innovative enterprises stated that their organizations use control, of them in 28% of organizations, there is ICS, the remaining 40% use only certain procedures, while 32% of respondents do not consider appropriate the creation of the ICS, as an innovative company, especially in the early stages of its existence, the need in financial resources for its functioning and creation of additional control procedures, according to representatives of the innovative enterprises, it is only an additional financial burden, as well as a bureaucratic element that reduces mobility, which is necessary for the development of innovative enterprises.

Among the key problems hindering the implementation of the internal control system for innovative enterprises, there were also noted: the lack of financial and labor resources, since the organization and operation of this system involves significant costs for innovative business entities [5]. Therefore, in order to ensure the sustainable development of an innovative enterprise, it is necessary to develop a methodological approach to the implementation of ICS.

The main principle of implementing internal control in an innovative enterprise is the principle of rationality, the essence of which is to assess the ratio of benefits and costs associated with accounting. The concept of International financial reporting standards sees this ratio not as a fundamental limitation, but as a qualitative characteristic, since the benefits on a business scale have both financial and non-financial components.

For an innovative enterprise, we recommend two ways to organize the ICS:

– transfer of responsibilities for the organization and functioning of the ICS to the head of an innovative enterprise,
– the use of certain control procedures in the activities of an innovative enterprise that are sufficient for effective management.

It is assumed that for an innovative enterprise, the most appropriate combination of these methods is when control functions are distributed among several responsible persons (depending on the number of allocated business processes) without creating an internal control Department, and the effectiveness of control and evaluation of the actions of responsible persons is evaluated by the head of the organization.

In addition, due to the small number of employees in an innovative enterprise, it is advisable to introduce a system of collective responsibility for detected violations and a simplified unified document flow to reflect the results of the ICS operation. Optimizing the expenditure of available resources will increase the effect of organizing this system (Table 1).

Table 1. Elements of the internal control system

ICS element	Actions required for the element to function successfully within the system
Control environment	Assessment and optimization of the existing organizational structure Assessment of available labor resources Formation of personnel policy Evaluation of the organization's system of values and ethical principles Assessment of the Manager's competence and work style
Risks evaluation	Identification of risks inherent in the organization's activities Assessment of the significance of identified risks Assessment of the scale of consequences from the occurrence of identified risks Development of measures to eliminate identified risks Development of measures to eliminate the negative consequences of the occurrence of identified risks
Internal control procedures	Development of the optimal number of control procedures that are most appropriate for an innovative enterprise Formation of a list of goals and plans, the implementation and achievement of which should be monitored by the ICS
Information and communication	Assessment of the existing hardware and software necessary for the implementation of the ICS functions, for their viability in the new environment Formation of databases required for employees to perform internal control procedures (list of responsible employees, contractors, etc.) Dissemination of information necessary for effective communication and management decision - making Development of support and simplification procedures implemented by the information system for internal control purposes
Assessment of internal controls	Evaluating the actions of employees involved in the ICS Evaluating the effectiveness of the methods and procedures used

Source: author.

The listed elements and the actions to ensure their functioning must be developed once, standardized and consistently applied. It is advisable to re-evaluate the sufficiency of consistently applied methods and procedures in an innovative enterprise once every five years or more often if significant events occur in the business life of an innovative enterprise.

3   Results

Innovative enterprises, setting themselves the task of improving accounting, analytical and control support in order to achieve its sustainable development, face the need to determine the amount of financial costs for innovations and assess the sufficiency of human resources for their implementation. The proposed method for estimating the estimated costs of implementing the ICS is to compare the risk appetite of the organization and the accepted level of materiality.

The following indicators are elements of this methodology:

- the level of costs for implementing the ICS (CICS), %,
- materiality level (ML) – the maximum amount of error in the formation of accounting and analytical, financial (budget) information, that is, the maximum amount of any negative deviations that the organization is ready to incur, %,
- risk appetite (RA) – the amount of risk that an innovative enterprise is willing to accept to achieve its goals,%.

$$CICS = ML - RA. \tag{1}$$

There is no unified methodological approach to calculate risk appetite for an innovative enterprise, but it is possible to adapt existing methods for certain types of economic activity (banking sector, information technology) to the specifics of innovative business. Based on the results of research by foreign and domestic researchers, the most optimal methods were adapted to meet the requirements of innovative business and two methodological approaches to risk appetite assessment were developed.

1. Calculating the amount of risk appetite as a percentage of the balance currency.

In accordance with International financial reporting standards, the most common assessment of the level of materiality is expressed as a percentage of the balance sheet currency or total revenue, depending on the object being investigated for materiality misstatements.

The balance sheet currency is one of the fundamental indicators for conducting control and analytical procedures. According to the value of the balance sheet currency, they give a primary assessment of the stability of the organization's development, form an opinion about its position in the market. Therefore, it makes sense to consider the indicators of risk appetite and materiality as a percentage of the balance sheet currency. In this context, risk appetite will reflect the size of the share of the balance sheet currency that an innovative enterprise is willing to sacrifice to achieve its goals.

2. Focus on business goals and forecasting future activities.

This method, based on the assessment of risk appetite based on the current and expected future volume of economic transactions and the structure of significant risks, is relevant if there is data on the value of risk appetite in previous periods.

The risk appetite in the future period is calculated by increasing the value of the risk appetite of the previous period by the amount of the predicted increase in market and other risks (changes in interest rates, exchange rates, prices for shares and goods, etc.), identified by research of analytical materials of the largest consulting companies. The calculation of risk appetite in the framework of this approach is made taking into account:

– stage of the life cycle of an innovative enterprise,
– opinions of the main users of accounting (financial) statements,
– complexity of the accounting system, understanding of legislation,
– risk of fraud,
– external economic conditions,
– legal restrictions, etc.

According to the research, the effectiveness of ICS for innovative enterprises may be limited:

– changes in the economic environment or regulatory legal acts, the emergence of new circumstances outside the sphere of influence of the management of the innovative enterprise,
– abuse of official authority by the management or other personnel of an innovative enterprise, including cases of collusion of personnel,
– making incorrect management decisions regarding the facts of economic life, aspects of accounting or management accounting, conducting control and analytical procedures, as well as preparing accounting (financial) statements.

The proposed classification of factors limiting the ICS is expanded and adapted to the features of an innovative enterprise (Table 2).

Table 2. Factors limiting the capabilities of the internal control system subject of innovative entrepreneurship

Factors	Factor characteristics and consequences
Incorrectly set goals	An innovative enterprise is focused on poorly formulated, unrealistic and unacceptable goals, which will make the ICS ineffective
External factor	Environmental factors have a significant impact on the organization's activities, but the ICS can not affect them in any way
Erroneous judgments	The ICS does not guarantee the correctness of judgments formed by employees at all levels and the management of the organization, which can lead to negative consequences
Human factor	Any employee of an innovative enterprise may intentionally or negligently make a mistake, misspell, etc.
Negligence of the management	Managers of an innovative enterprise may neglect the ICS due to the isolation of their person from other employees (due to a high position) or to conceal facts that may negatively affect the organization, both reasons can lead to the formation of incorrect business information, erroneous judgments and the adoption of unacceptable and/or ineffective decisions
Collusion	Collusion of employees with each other or with third parties is difficult to predict and difficult to detect, but its presence can jeopardize the functioning of the entire ICS

Source: author.

Overcoming these factors will increase the effectiveness of the ICS, ensure the sustainable development of an innovative enterprise and achieve its goals. According to the summary of current business practices, the following classification of risks is proposed: financial, legal, country, regional, reputational, etc. According to the current legislation, if when preparing accounting (financial) statements, an innovative enterprise faces the need to disclose additional information about its activities in order to form a complete picture of ensuring sustainable development, its financial position, dynamics and financial results, then additional indicators and required explanations are included in the reporting.

To form a complete and adequate view of the financial position of an innovative enterprise and its main performance indicators in order to assess the achievement of sustainable development, it is advisable to disclose information in the annual accounting (financial) statements, including indicators and necessary explanations about the significant risks of the organization's activities [8]. This includes data on the organization's exposure to risks; on the objects of control and analysis, through which you can get a complete picture of the risks; on measures to identify and manage risks, reduce the negative consequences of their occurrence, as well as changes in this issue compared to previous periods.

Innovative enterprises usually neglect the ability to generate additional forms of reporting, using only a simplified one (balance sheet, report on financial results), although such information would be useful for external users, in particular for investors, venture funds, etc.

It is necessary to formalize the description of risks inherent in the activities of an innovative enterprise in the reporting. Moreover, a number of reporting forms compiled according to foreign standards (IFRS and GAAP) contain indicators that disclose such information [6].

Additional information, including indicators and necessary clarifications about risks, can be provided in the form of a separate section as an explanation to the balance sheet and the statement of financial results. Another way to present this information is to include it in the explanation of the relevant indicators of the accounting (financial) statements. To disclose additional information about risks, a separate report may be provided as part of the accounting (financial) statements.

4 Discussion

The implementation of the ICS is a fundamental element in ensuring the sustainable development of an innovative enterprise due to the quality and effectiveness of management decisions made based on the results of the operation of this system. It is difficult to conduct a full assessment of the effect of the introduction of an innovative business entity ICS. However, as practical experience shows, the introduction of ICS helps to reduce losses ensure the sustainable development of an innovative enterprise [11]. In addition, it is important to understand that the reduction of losses cannot always be measured by financial indicators, as well as the effect of using various management tools; therefore, it is advisable for innovative enterprises to analyze non-financial indicators.

To prove this statement, let's turn to foreign experience. The German consulting company RSM [2] conducted a survey of innovative enterprises in Germany, Spain, Poland, Hungary, Greece and Israel, dividing them into two categories: consumers of innovative products and manufacturers of innovative products [10]. In order to confirm the relevance of the problem of assessing the contribution of the ICS to the sustainable development of an innovative enterprise, we interviewed the heads of 125 organizations in the Samara region on similar issues.

When asked whether you agree that the implementation of the ICS affects the sustainable development of an innovative enterprise, the responses of the heads of consumer organizations were distributed as follows (%):

- fully agree – 32,
- rather agree – 53,
- rather disagree – 6,
- completely disagree – 9,
- I don't know – 0.

As for the producer respondents, their responses are distributed as follows (%):

- fully agree – 48,
- rather agree – 20,
- rather disagree – 8,
- completely disagree – 4,
- I don't know – 20.

The survey results can be summarized as a diagram (Fig. 1).
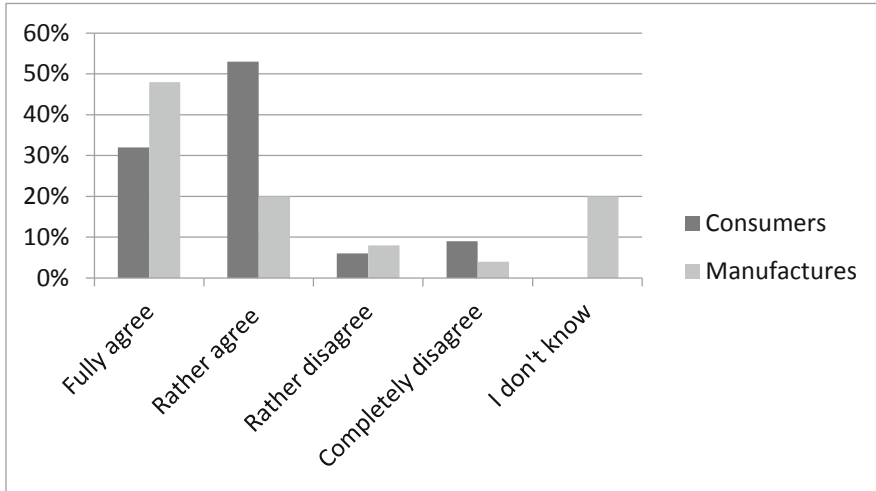
Fig. 1. Distribution of responses from consumers and manufacturers of innovative products on the importance of the role of the ICS in ensuring the sustainable development of their enterprises (Source: author).

From this we can conclude that almost 85% of respondents-consumers agree that the ICS is involved in ensuring the sustainable development of an innovative enterprise. The number of respondents who answered the same way is slightly less – 68%. And only 6% of consumers and 8% of producers disagree with this provision. Consequently, most organizations recognize the contribution of the ICS to ensuring sustainable development, which means that there is a need to determine the most important features of the ICS work for an innovative enterprise.

In response to the question, which aspects of the ICS can be considered the most important, consumers named (%):

– ensuring high financial stability – 42,
– reducing the probability of negative consequences – 50,
– reduction of investment risk – 21,
– high transparency of activity – 50,
– improving long-term performance and future performance – 6,
– increasing the number of efficient and effective business processes – 20,
– improved planning reliability – 5.

Note: it was possible to provide several answers to this question, and the percentage of respondents who marked each question is indicated.

The manufacturers' responses about the advantages of ICS were distributed as follows (%):

– ensuring high financial stability – 38,
– reducing the likelihood of negative consequences – 49,
– reducing investment risk – 11,

- high transparency of activity – 62,
- improving long-term performance and future performance – 7,
- increasing the number of efficient and effective business processes – 37,
- improving the reliability of planning – 3.

Note: it was possible to provide several answers to this question, and the percentage of respondents who marked each question is indicated. The results of the responses of the managers of the surveyed organizations are the same, which means that consumers and producers agree, especially in terms of reducing the likelihood of negative consequences and high transparency of activities.

5   Conclusion

Managers of many innovative enterprises are confident that the functioning of the ICS provides a number of advantages that ensure the achievement of sustainable development. When implementing this system in innovative business entities, it is recommended to clearly define the content of the system elements, develop a set of measures to prevent the occurrence of factors that limit the effectiveness of internal control, develop a report format based on the results of the system, and most importantly, assess the financial capabilities of the organization for the implementation of the internal control system.

Methodology for estimating the estimated costs of implementing an internal control system in an innovative business it is assumed to compare the estimated level of risk appetite of the company and the level of materiality approved in it. The choice of a methodological approach to risk appetite assessment depends on what the attention of management decision makers is focused on: the financial aspect (balance sheet currency) or the strategic aspect (goals, activity forecasting).

The effect of implementing an internal control system in an innovative business entity may be limited by a number of factors. For innovative businesses, the most significant are erroneous goal setting and external factors. The external business environment has a significant impact on the activities of innovative enterprises. Therefore, the internal control system has the task of continuously monitoring changes in the external business environment in terms of identifying risks inherent in the entity's activities, as well as new risks that were not previously considered. In addition, it is advisable to monitor changes in legislation regulating various aspects of financial and economic activities of innovative enterprises.

References

1. Alazzabi, W., Mustafa, H., Karage, A.: Risk management, top management support, internal audit activities and fraud mitigation. J. Financ. Crime (2020, in press). https://doi.org/10.1108/JFC-11-2019-0147. Accessed 30 Apr 2020
2. Bungartz, O., Strobl, G.: Talking points value added by internal control (2012). https://rsmus.com/content/dam/mcgladrey/pdf/talking_points_value_added_by_internal_control.pdf. Accessed 15 Apr 2020

3. Chalmers, K., Hay, D., Khlif, H.: Internal control in accounting research: a review. J. Account. Lit. **42**, 80–103 (2018). https://doi.org/10.1016/j.acclit.2018.03.002

4. Crespo, N., Rodrigues, R., Samagaio, A., Silva, G.: The adoption of management control systems by start-ups: internal factors and context as determinants. J. Bus. Res. **101**, 875–884 (2019). https://doi.org/10.1016/j.jbusres.2018.11.020

5. Kravet, T.D., McVay, S.E., Weber, D.P.: Costs and benefits of internal control audits: evidence from M&A transactions. Rev. Acc. Stud. **23**(4), 1389–1423 (2018). https://doi.org/10.2139/ssrn.2958318

6. Lartey, P., Kong, Y., Bah, F., Santosh, R., Gumah, I.: Determinants of internal control compliance in public organizations; using preventive, detective, corrective and directive controls. Int. J. Public Adm. **43**(8), 711–723 (2019). https://doi.org/10.1080/01900692.2019.1645689

7. Liew, A.: Enhancing and enabling management control systems through information technology: the essential roles of internal transparency and global transparency. Int. J. Account. Inf. Syst. **33**, 16–31 (2019). https://doi.org/10.1016/j.accinf.2019.03.001

8. Loishyn, A., Levchenko, S., Tkach, I., Getmanskii, V.: Assessment of efficiency indicators of internal control system functioning. J. Sci. Pap. «Soc. Dev. Secur.» **9**(4), 120–130 (2019). https://doi.org/10.33445/sds.2019.9.4.9

9. Moskvin, E., Gorodilov, S., Rusyaeva, T., Stotckaia, A.: An approach to overcoming the limitations for launching and functioning the innovative cycle in the scientific and production companies. In: Vorobev, E.N. (eds.) Proceedings of 4th Forum Strategic Partnership of Universities and Enterprises of Hi-Tech Branches (Science. Education. Innovation), pp. 66–68. IEEE, Piscataway (2016). https://doi.org/10.1109/ivforum.2015.7388256

10. Schroeder, J., Shepardson, M.: Do SOX 404 control audits and management assessments improve overall internal control system quality? Account. Rev. **91**(5), 1513–1541 (2016). https://doi.org/10.2308/accr-51360

11. Spanò, R., Allini, A., Caldarelli, A., Zampella, A.: Controlling innovation and innovating control: Insights from a knowledge intensive network. Bus. Process Manag. J. **23**(6), 1359–1384 (2017). https://doi.org/10.1108/BPMJ-02-2017-0036

12. Zhao, Y., Bedard, J.C., Hoitash, R.: Auditor effort and the prevention of financial report misstatements. Audit. J. Pract. Theory **36**(4), 151–177 (2017). https://doi.org/10.2139/ssrn.2693619. (Forthcoming)

Evaluation of the Effectiveness of Personnel Adaptation Process in Small Business

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Abstract. The article is devoted to the discussion of such a personnel management problem as personnel adaptation. The relevance of the work is determined by the fact that poor adaptation always leads to losses: low productivity and rapid dismissal of employees. The aim of the work is to determine the features of evaluating the effectiveness of the adaptation process in small businesses. The components of adaptation and the factors influencing it are considered. The main reasons for the dismissal of employees have been identified. The main indicators for assessing the quality of personnel adaptation are determined and the optimal ones for small businesses are selected. The authors assessed strengths and weaknesses of the adaptation of personnel at a small business – a beauty salon, proposed measures for its improvement and evaluated their effectiveness.

Keywords: Adaptation · Adaptation costs · Dismissal · Methods of adaptation · Personnel

1 Introduction

The relevance of the work is determined by the fact that adaptation of staff is today a process, which is given insufficient attention sometimes. Often, the adaptation of personnel in the organization often occurs spontaneously and the employee himself carries it out. However, it depends much more on the adaptation process than is commonly thought. High-quality staff selection is not enough for excellent work of employees. After the selection process, a period in the life of a new employee necessarily comes when he cannot realize all his potential. This is precisely because he has not yet adapted to the new organization.

Content adaptation is divided into the following components [4]:

1. Organizational adaptation consists of adapting an employee to order and rules, as well as to his new place of work, organization of the work process, place and role of the enterprise in the society. Organizational adaptation solves a number of problems concerning personnel, such as reducing staff turnover.
2. Psycho-physiological adaptation, as a rule, has as its goal to cause the addiction of the human body.

3. Socio-psychological adaptation is a process of introducing an individual into the current organizational system of organizational culture, as well as the need for a new employee to get used to the existing moral and psychological climate in the organization.
4. Professional adaptation is the process when a newly hired employee acquires new theoretical and practical knowledge, masters new responsibilities in the professional sphere. It is aimed at ensuring that a newly hired employee in no way can lower his level of success by applying various kinds of skills in his professional field, using objects and the language of his activities.

The process of adaptation management at the enterprise includes the development of a system of measures that can guarantee the success and high speed of this process. Poor adaptation always leads to losses. Moreover, these losses are manifested not only in reducing the productivity of a new employee. Also, the negative consequence of poor-quality adaptation may be the rapid dismissal of an employee from the organization, which, in turn, suggests that again you have to spend money on staff recruitment. However, even if you put up with these costs, it is far from the fact that the new employee will not quit quickly, too. This leads to a meaningless and endless cycle of new employees, which greatly affects the finances of the organization. There are several reasons for the dismissal of employees in the first three to six months of work [3]:

1. Mismatch of his ideas about the organization and the upcoming work and reality, that is, unjustified expectations;
2. An inappropriate employee was initially selected with inappropriate competencies, specialty, etc.;
3. The lack of a clear technological system that would allow a novice to quickly and painlessly join the organization.

The main errors in the adaptation system are:

1. Overload of adaptation;
2. Lack of participation in adaptation of the heads of departments;
3. Disinterest of mentors in training;
4. Inconsistency of adaptation tools to adaptation goals;
5. "Blur" of the responsibility of adaptation performers;
6. Duplication of the content of the adaptation tools used [3].

A high-quality system of adaptation of employees can break the circle and solve this problem. However, it is not enough just to create an adaptation system for employees; it is important to constantly evaluate and improve it to avoid waste of money in adaptation. The aim of the work is to determine the features of evaluating the effectiveness of the adaptation process in small businesses. To achieve this goal, the following tasks should be solved:

– analyze current research on the adaptation of personnel in small businesses,
– determine the methods and indicators for assessing the effectiveness of personnel adaptation in small businesses,

– identify the main problems and errors in the adaptation system,
– suggest measures to improve the effectiveness of the adaptation system using the example of a beauty salon and determine their effectiveness.

2 Methodology

Various persons including the head of the organization, the head of the department, which accepts a new employee, the head of the human resources department, a specialist in the human resources department and the mentor of a new employee, are engaged in the construction, implementation, management and control of the personnel adaptation system in the organization.

Adaptation management tools are understood as a way of transferring information to a new employee undergoing adaptation.

The most common adaptation management methods are [4]:

1. Training – it is implemented within the organization using both corporate training and training in various educational institutions.
2. Staff retraining – it will give an employee the opportunity to master a new position or profession. It is used for employees who have had a long break in work.
3. Cases, trainings, situational tasks – aimed at the successful development of new knowledge through interactive learning, involves interaction with all employees of the organization.
4. Business games – aimed at examining the situation from the inside, searching for a new optimal solution to a particular situation.
5. Instructions – suitable for employees who are more comfortable getting to know their functional activities on their own, using various tools.
6. Mentoring – attaching a more experienced employee with a similar work experience to a newcomer.
7. Budding – infusion of a new employee into the team through the establishment of friendly relations with the team.
8. Staff rotation – implies the movement of personnel within the same organization for different or similar positions, with a change not only in the position, but also in functional responsibilities.
9. Shadowing – a newcomer attaches himself to a more experienced employee of a subdivision or department and observes how he performs his functional duties, how to react in those or other situations and learn to be flexible in this position.
10. Immersion method – developed for leadership positions. Independent and intensive implementation of all their duties. The employee must quickly engage in work, establish communication with the employees of the unit and fulfill their immediate responsibilities.
11. Coaching – individual tuning with a coach that will help to reveal his professional qualities in the employee, achieve a clearly defined professional goal, teach the employee how to make decisions.

The most common adaptation methods in Russian organizations are mentoring and instructions. This is due to the fact that employers are poorly aware of the connection between the process of adaptation of employees and the company's profit. The main indicator of the successful passage of adaptation by a new employee is the fulfillment of his functional duties with maximum labor productivity. The optimal tool for monitoring and evaluating new employees is feedback on the work done, namely the following objective and subjective indicators. The objectives are the reduction of costs for attracting, searching and selecting new staff; and the decrease in the employee turnover rate in the organization for less than a year. Subjective results include:

– the formation of a positive HR brand outside and inside the organization;
– improving the moral and psychological climate in the team;
– the formation of loyalty to the organization of a new employee from the first days of his work;
– satisfaction with the company as a whole.

The following approaches to assess the effectiveness of the adaptation process.

1. Evaluation through staff satisfaction. It is implemented in the company by questioning new employees after the adaptation process. The quality and satisfaction with the process of adaptation of the employee and the difficulties faced by the employee are assessed with use of the questionnaire. Both a new employee and his immediate supervisor fill it. There indicators of "job satisfaction" and "employee satisfaction with the organization." The disadvantage of this approach is the inability to determine the impact of an aspect of adaptation on the success of the whole process.
2. Assessment of the adaptation process through the identification and development of employee performance indicators, as objective: professional (compliance with qualification requirements and place of work), socio-psychological (compliance of the new employee's behavior with the standards adopted in the organization), psychophysiological (fatigue, level of stress) and subjective - determine their own assessment of the employee's attitude to the organization, process and relations with the team and the chief. Both the new employee and his mentor or chief carry the assessment.
3. Integral assessment of the system for evaluating the effectiveness of adaptation programs not only in relation to a new employee and indicators of its effectiveness, but also the impact of this program on internal organizational processes.

The following criteria are used to analyze the level of adaptation:

– costs incurred by the employer for the full adaptation of the new employee, taking into account his profile of activity (necessary printed material and literature, trainings, training courses);
– the cost of working hours of employees responsible for effective adaptation (HR manager, responsible employee in the department and the time of the head of the new employee or specialist who will be the direct mentor);

- expenses for the training of mentors for new employees (measures to improve their professional level, development and creation of narrow-profile training programs, through which mentors will work with new employees);
- number of employees hired and successfully completed the probationary period;
- the percentage of employees who have successfully worked in the organization for at least one year after completing the adaptation;
- the number of employees who left voluntarily during the probationary period.

Qualitative criteria:

- assessment of satisfaction with the process of work in a new place;
- knowledge and understanding of the mission and values of the company, as well as the corporate culture of the organization;
- level of satisfaction with the socio-psychological climate in the company and in its department.

The normative indicators are also compared with the actual results of the new employee, for example, the performance of daily office tasks, namely the speed of their execution, quality and effectiveness, assessment of the sociability of the new employee, for example, if his/her main function is to work with customers, suppliers or other partners. The assessment occurs at regular intervals to evaluate the adaptation system. and professional growth of the employee.

For small businesses with a small number of employees, the following methods for evaluating the effectiveness of the adaptation system can be selected:

- expert – analysis of the presence of adaptation elements in the personnel management;
- economic – a comparison of the labor productivity of a newly hired employee and an employee who has worked for more than one year;
- sociological – a survey of employees on the degree of satisfaction with adaptation methods.

With an improvement in the performance of personnel movement and an increase in the stability of labor resources, the efficiency indicators of personnel use are significantly increased. The performance indicators of employees who work in the team for a long time are significantly higher than those of newcomers. Wages of employees on piecework salary directly depend on production, so, the current situation may affect the decision of a new employee to quit this job, which will negatively affect the efficiency of the enterprise.

The right approach in choosing adaptation tools is to analyze the existing situation in the company and the goals that the company faces and, specifically, the adaptation system in the organization. It is necessary to carefully consider which tools are worth using and which are not (target approach). Unfortunately, often organizations use two approaches while choosing adaptation tools: a problem-oriented approach (the problem is found, it needs to be solved quickly) and a process-oriented approach (as it should be, because others have it).

3   Results

The authors will evaluate the adaptation system for small enterprises using the example of the Chika beauty salon, located in the center of Samara. Chika LLC is a small business enterprise, therefore there is no separate service or personnel management officer, including adaptation processes at the enterprise. The personnel management structure in the cabin is two-level. At the first level, personnel management is carried out by the director of the salon, at the second level, personnel management of the beauty salon is carried out by the administrator, who is the organizer of all labor activities inside the beauty salon.

The most important and priority problems at the enterprise that need to be addressed immediately are:

- inefficiency of the existing mentoring system,
- lack of attention of management to employees,
- ignoring the socio-psychological side of relationships in the team;
- lack of criteria for assessing the effectiveness of the existing system of adaptation of new employees.

The salon is characterized by a fairly high staff turnover - 40% in 2018, despite the fact that in small enterprises in the service sector, turnover, as a rule, rarely exceeds 20%. The reasons for the dismissal were clarified. Dissatisfaction with wages accounts for the largest share in the reasons for dismissal (35%), which negatively characterizes the adaptation system at the enterprise, since in manual processes the productivity of an unadapted employee is much lower than the employee who joined the team. Other reasons for dismissal are directly related to the ineffective adaptation system of personnel in the salon – this is pressure from the team (16.7%) and lack of attention from the management (25%). Let us evaluate the effectiveness of the adaptation system according to a five-point system, and analyze the presence of the necessary types of adaptation (Table 1).

Table 1. Assessment of the personnel adaptation system of Chika LLC

Type of adaptation	Characteristic	Availability	Rating
Organizational	Organizational - familiarization with job responsibilities, the structure of the salon, hierarchy, management mechanisms; acquaintance with the immediate supervisor	Present	4
Socio-psychological	Socio-psychological - acquaintance with the salon and the team, employees, with the traditions that exist in the salon	Partially present	3

(continued)

Table 1. (*continued*)

Type of adaptation	Characteristic	Availability	Rating
Labor	Job training	Present	5
Extra education	Improving professional skills to a certain level required in this salon, familiarity with working on certain brands used in the salon	Absent	0
Mentoring	The practice necessary for a newcomer to work at the level of the rest of the masters of the salon, the opportunity to upgrade qualifications "by the chair"	Partially present	2
Financial	The employee must start making money and bring profit to the enterprise, therefore, the help of management is required for the client to develop a base for newcomer	Absent	0
Total			14
Average rating			2,33

Source: authors.

As can be seen from the above calculations, the assessment of the personnel adaptation system in the beauty salon shows very low efficiency – out of the selected six main types of personnel adaptation, the most important in the beauty industry, only two are fully executed, two are partially executed, and two are not performed at all. Evaluation of the adaptation system is 2.33 points, a very low level. To solve these problems, three following directions were proposed to increase the effectiveness of the adaptation system:

1. Development and implementation of a mentoring system.
2. Development and implementation of an adaptation program.
3. Evaluation of the effectiveness of adaptation measures.

Let's consider these areas in more detail.

I. Development and implementation of a mentoring system

In the beauty industry, the introduction of a mentoring system is inevitable in order to get an effective return on the work of salon staff. This is due to the fact that no matter how much and wherever did master study before starting work, he will definitely have questions about a brand new to him and about the features of work in this particular salon, and he will turn to his colleagues with them.

Forms of mentoring in a beauty salon can vary (from the least to the most costly in time and effort):

– tips on working with brand products,
– a novice observes the work of the mentor from the side and asks him questions (assists the mentor),

– mentor-teacher monitors and checks the work of a beginner at the first stage of adaptation in the cabin.

The period of mentoring (in practice) lasts two months or less. For effective feedback from the mentoring system, it is necessary to stimulate mentors, for example: fixed coaching bonus, mentoring bonus and increase of the bonus for services performed by the mentor himself during the period of mentoring.

II. Development and implementation of an adaptation program.

It includes the following steps:

1. Presentation of information about the organization and features of the labor process regulations. Acquaintance of candidates with their upcoming official duties, with the list and price list of services provided by the salon. Identification of financial aspects of future work.

When hiring a time wage employee, salary value during and after the probationary period and payment dates are announced. When hiring piecework employees, it is important to consider that people are afraid to come to a new place of work, realizing that it takes time to generate a large number of clients. During the period of adaptation, such employees must get a fixed salary plus a percentage of the volume of surrendered revenue. It would be logical to pay the adaptation salary until the interest that this master earns would be comparable to the earnings of other colleagues.

2. If the employee is not completely ready to start work, it is necessary to make a schedule for preparing for work, trying to implement it as soon as possible so that he does not lose motivation for a new job and he can survive the financial "downtime".
3. On the eve of the first day of work, familiarization with the organization and the workplace is carried out. It is carried out after registration of the employee for work by the way of excursion and includes instruction on the use of equipment, tools, materials.
4. An explanation of the requirements for conducting professional activities, personal behavior. It includes preparing a workplace, creating a load for beginners and advertising a new specialist among clients. The first 4 stages in total take about 1 week and are carried out until the beginner goes to work.
5. The leader draws up a clear plan of professional and financial development for a newcomer, designs the trainings and seminars that must be completed; describes the revenue plan, the goals of working with clients. Takes 3–4 weeks.
6. The implementation of an individual plan should be constantly monitored by management.

Throughout the entire adaptation period, the leader should include personal communication with a new employee in his weekly work schedule in order to discuss the results of work and ways to further promote the newcomer to the salon.

III. Evaluation of the effectiveness of adaptation measures

The profitability (loss-making) of a newcomer, the attitude of clients to him, collects information about whether the new specialist has taken root in the team, whether it needs some continuation of adaptation (for example, it would be nice for him to undergo additional training or change something in his work, relations with clients and colleagues) is assessed.

The result of the completion of adaptation can be considered:

– the fact that the employee did not quit during the probationary period and is not going to do so,
– consent of employer to keep it working,
– the employee makes a profit and is able to work independently, without a mentor.

The results of the calculation of economic efficiency are shown in Table 2.

Table 2. Cost-effectiveness of measures to adapt staff

Cost item	Number of persons	Expenses for 1 person, rub. in month	Cost, rub.
Expenses			
Salary of mentors for 2 months	3	2500	15000
Contributions to social funds	3	750	4500
Adaptive salary for new employees for 2 months	4	7000	56000
Training costs (duration - 1 month)	4	5000	20000
Unexpected costs			5000
Total costs			**96000**
Labor productivity growth			337000
Saving dismissal costs	1	30198	30198
Saving staff recruitment costs	1	14911	14911
Reception cost savings	1	46	46
Saving adaptation costs	1	9731	9731
Total additional profit			**391886**
Economical effect			**295886**

Source: authors.

The application of these measures from the experience of similar enterprises should give the following results: labor productivity growth is at least 20% of the current, and a decrease in staff turnover is 20%. The results obtained indicate the economic efficiency of the proposed measures.

4   Discussion

During the work, the literature on the issue of staff adaptation was analyzed. Makhmudova, Bikulova, and Eremina discuss the methodology for assessing the effectiveness of adaptation in companies as the main stage that each employee goes

through when joining the organization [5]. The main task of working with staff is to retain an employee in the enterprise in order to unleash his/her potential and make a profit in the future. Of course, to achieve this goal, a new employee needs an adaptation period during which he will be able to master the main goals and objectives of the company. However, at the present stage of economic development, the leaders of many companies do not test methods for evaluating personnel adaptation programs, since its quality is difficult to express using quantitative indicators. The existing methodologies for assessing the effectiveness of personnel adaptation and the possibility of testing it in Russian realities are analyzed [5].

Sharapova, Sharapova, and Borisov consider the issue of mentoring as one of the methods of staff training [8]. The main advantages of mentoring for both a new employee and a mentor are considered. The article explains the duration of mentoring and the goals that a mentor must achieve for successful teaching. The importance of financial and non-financial motivation of mentor staff is also identified. The authors take into account indicators such as the number of mentors and the number of trainees. They calculate the workload of one mentor and take into account the number of employees who have been successfully trained through mentoring. The main advantages of mentoring for both a new employee and a mentor are considered. The article explains the duration of mentoring and the goals that a mentor must achieve for successful learning. The main advantages of mentoring both for a new employee and for a mentor are revealed. The importance of material and non-material incentives for mentors is determined. The stages of the mentoring process are discussed. The authors take into account indicators such as the number of mentors and the number of trainees. They calculate the workload of one mentor and take into account the number of employees who have been successfully trained through mentoring. For the training staff, the implementation of the proposed activities will allow to choose a training course within the agreed cost; improve student satisfaction and also motivates employees to further development and career growth. It is proposed to evaluate not only in terms of satisfaction with the mentoring system, but also by calculating the effectiveness of professional responsibilities. It is noted that for future research it will be useful to analyze the impact of the quality of mentors on improving the professional competence of the chief [8].

Bilorus notes that the rating indicator of the competitiveness of the personnel management system of an enterprise is the result of the interaction of such factors: the effectiveness of the motivation and incentive subsystem; the effectiveness of subsystems for the selection, adaptation and assessment of personnel; level of organizational and working conditions, social infrastructure of the enterprise; level of socio-psychological climate in the team; corporate culture and company image; the level of development of the subsystem of training, promotion and personnel development; level of development of the personnel planning and marketing subsystem. Thus, the use of the modified GE/McKinsey matrix model will allow company managers to formulate strategic recommendations for the development of the personnel management system and its competitive advantages intelligently (not intuitively), which would make it possible to remain on the market and increase the attractiveness and image of the company as an employer [1].

Sucre and Chirinos believe that because of constant changes in the environment the staff needs high motivation and qualification, in order to facilitate its adaptation to high variable environment, it is necessary to increase employee productivity by identifying potential that contributes to the formation of career plans and the creation of replacement tables. In the selection of personnel, it is necessary to process large volumes of scattered information that are not agreed upon or not standardized; this can also be interpreted in different ways. To this end, it is proposed to create a structure for managing work profiles, which provides a generalized solution for the exchange of information and services, interacts with business systems related to human talent management [7].

Popova and Shynkarenko consider the issue of maintaining staff competencies and skills that contribute to the process of adaptation to the world of volatility, uncertainty, complexity and ambiguity, is one of the mechanisms for ensuring the development of the enterprise. In accordance with modern trends in personnel management, some specific actions for the adaptation, development and training of personnel were proposed [6].

Blumberga and Treilina note that the competitiveness of modern global business depends on flexibility and adaptation skills. Work abroad has become relevant in recent years, when companies develop their activities at the international level. When moving to work abroad, each expatriate experiences a range of psychological changes in adaptation process. To reduce the number of unsuccessful international appointments, it is necessary to analyze existing processes, understand the weaknesses of the process and find out how to avoid or reduce these shortcomings. The purpose of the study is to find out what are the main shortcomings of the international appointment process in terms of expatriates and returnees in order to improve the processes of the global mobile team. The authors proposed two surveys: one for expatriates and returnees, the other for managers and HR specialists [2].

Klochkov, Didenko, Makov, Zapivahin, Ostapenko, and Volgina believe that professional adaptation of specialists occurs not only after the stages of employment, but also with changes in technology, regulations, and industrial culture. At the same time, forecasting the level of personnel resistance to changes will reduce additional costs, build an adequate system of professional development and prepare personnel for changes by determining the degree of personnel resistance to changes in the requirements for them [3].

Kolesnichenko, Radyukova, and Kolesnichenko note that the problem of staff adaptation is urgent due to a direct impact on the results of employees, but despite this, many organizations do not receive proper attention to staff adaptation, and the process occurs spontaneously. Many managers underestimate the importance of adaptation, believing that it can be spontaneous, do not want to spend available resources, or often partially adapt. Most organizations do not even have basic adaptation programs. However, how well the adaptation process is organized will depend on the employee fulfilling professional duties, the degree of his/her identification with the company, the adoption of its norms and values [4]. In general, the problem of staff adaptation at small enterprises in recent years has not been adequately addressed.

5   Conclusion

The head of enterprise directly carries personnel management functions at small enterprises. The costs associated with the replacement of the employee who quit during the adaptation period, which the enterprise would save when implementing the proposed adaptation system include:1) dismissal costs, 2) staff recruitment costs, 3) adaptation costs, 4) reception costs, 5) the costs associated with lost profits, because an adapted employee works with greater productivity than an unadapted employee. The last point plays the greater role, the greater the proportion of manual labor in the production process. At the same time, in hardware processes, its plays no role.

To implement the proposals for improving the personnel adaptation system, the following costs are required:

1. Salary and contributions to social funds of mentors for first 2 months.
2. Adaptive salary for new employees for 2 months.
3. Training costs.
4. Unexpected costs.

The main economic effect of the proposed measures to improve the process of staff adaptation in small business enterprise is to save money by organizing funds as a result of reducing financial losses associated with staff adaptation. Thus, the introduction of the proposed measures to improve the process of adaptation of employees in the organization will help to increase employee productivity, reduce staff turnover during the adaptation period, as well as costs associated with the adaptation of personnel and increase the stability of the team.

References

1. Bilorus, T.V.: Development strategy formation of the personnel management system of the enterprise based on portfolio analysis. Market. Manage. Innov. **1**, 189–195 (2018). https://doi.org/10.21272/mmi.2018.1-13
2. Blumberga, S., Treilina, D.: International assignment process in organization: expatriates and repatriates perspective. In: Proceedings of the SGEM 2016, BK2: Political Sciences, Law, Finance, Economic and Tourism Conference Proceedings, vol. 5, pp. 401–408. SGEM, New York (2016)
3. Klochkov, Y.S., Didenko, N.I., Makov, K.M., Zapivahin, I.O., Ostapenko, M.S., Volgina, A.D.: Employment and professional adaptation of specialists. In: Shestopalov, M. (ed.), Proceedings of the 6th Forum Strategic Partnership of Universities and Enterprises of Hi-Tech Branches, pp. 162–164. IEEE, New Jersey (2017)
4. Kolesnichenko, E., Radyukova, Y., Kolesnichenko, D.: Improving the management of employees adaptation in regional authorities. In: Ślusarczyk, B. (ed.), Proceedings of the 31St IBIMA Conference Innovation Management and Education Excellence Through Vision, pp. 1481–1487. IBIMA Publishing LLC, King of Prussia (2018)

5. Makhmudova, I.N., Bikulova, P.V., Eremina, I.Y.: Methodology of evaluation of the personnel adaptation effectiveness in companies. In: Mantulenko, V. (ed.) Proceedings of GCPMED 2018 – International Scientific Conference Global Challenges and Prospects of the Modern Economic Development. The European Proceedings of Social and Behavioral Sciences, vol. 57, pp. 1023–1031. Future Academy, London (2019). https://doi.org/10.15405/epsbs.2019.03.102
6. Popova, N., Shynkarenko, V.: Personnel development at enterprises with regard to adaptation to the VUCA world. Econ. Ann. XXI **156**(1–2), 88–91 (2016)
7. Sucre, F.S., Chirinos, D.P.: Ontological framework for the management of job profiles based on labor competencies. GECONTEC-Revista Internacional de Gestion del Conocimento y la Tecnologia **5**(1), 17–41 (2017)
8. Sharapova, N.V., Sharapova, V.M., Borisov, I.A.: Mentoring as a method of staff training. In: Ślusarczyk, B. (ed.) Proceedings of the 31St IBIMA Conference Innovation Management and Education Excellence Through Vision, pp. 3245–3251. IBIMA Publishing LLC, King of Prussia (2018)

New Perspective in Projecting University Graduates' Competencies: Talent Management

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Abstract. The paper reveals an innovative approach to knowledge management in the development trend of a Cognitive University. Graduate's competencies are derived from changes in business processes in the organizations that are potential employers, taking into account the digital economy requirements. The authors of the study implemented the talent management approach, not the knowledge management one. The socio-psychological analysis of the components of students' professional and qualification skills was used. The terminological determinacy of the concepts of graduates' loyalty and reliability by the criterion of their participation in the potential business process was established. The approaches to measure the graduates' potential abilities were defined. The differences between highly professional (HiPro) and high-potential (HiPo) graduates were identified. The subject of responsibility for the timely and high-quality formation of new graduates' competencies under the conditions of new reality in employers' organizations was distinguished. The mechanism of HR-technologies, in which a high-potential graduate is not able to reveal their qualification level and reduces the organization's innovative development, was explicated. The role of staff involvement in the personnel reserve formation was determined.

Keywords: Activity · Competencies · High-potential potency · Highly professional potential · Loyalty · Talent management

1 Introduction

The implementation of digital technologies in the Russian economy has also influenced the learning process in higher education. According to the long-term strategy of economic development in the domestic economy, the national objective is to modernize the traditional sectors of economic growth and form the digital economy focused on knowledge and high technologies [3, 13]. Awareness of the importance to evaluate the graduates' potential abilities comes with the formation of new socio-economic relations in the society and the introduction of modern digital technologies in production and training. University graduates' professional competencies are also updated to meet modern development strategies in new organizations and their business ideas.

Solving these issues leads to a change in the concept paradigm from knowledge management to talent management, and to the formation and accumulation of students' knowledge capital. An innovative approach to knowledge management in the development trend of a Cognitive University is becoming relevant.

2   Methodology

The process to build the information and innovation economy obliges organizations to keep the most accurate records of the quantity and quality of available resources, as well as to redistribute them with maximum efficiency. However, recent years have been marked by a lack of experienced specialists, a sharp decrease in the efficiency of labour potential, and a large amount of raw data in the work. There is an increase in employees' dissatisfaction with work and turnover of labour and, as a result, a sharp decrease in staff loyalty in the organization.

Such conditions do not contribute to the effective development of organizations. On the contrary, they reduce their effectiveness and profitability. In this regard, business leaders cautiously select applicants for vacant jobs.

Consequently, educational organizations are faced with the task to train a potentially in-demand labour. A new approach to the knowledge component in the formation of graduates' professional and qualification skills is required. The entire training system should be adapted to the graduate's potential demand to work in renewed organizations. Similarly, all the components of the graduate's qualification level, the training content, and technology through the use of advanced cloud solutions become more complicated.

Today, it can be noted that the task to provide enterprises with highly professional personnel has failed. The objective reason is that it is difficult to prepare a specialist for the labour market, who has the necessary qualification corresponding to modern digital technologies. This is due to the fact that the required competencies are not precisely defined, either by the employers or academic staff. Therefore, an innovative approach to build the graduate's qualification level in accordance with the business objectives is required. The main condition to provide an organization with high-end professionals at the right time and in the right place is to create a coherent and logical talent management system. Today, the tasks to motivate employees are shifting towards providing greater opportunities for self-realization, professional growth, and career development within the employing company. According to KPMG research, efficiency improvement of organizations' activity in Russia is becoming a higher priority, which is achieved by increasing employees' engagement (55%) and talent management (51%) [2].

3   Results

Building such a complete and transparent talent management strategy, integrated into all elements of the HR management system, is impossible without terminological determinancy.

Let us try to figure out what kind of employee a modern organization needs. To do this, we need to decide who can be called high-potential employees (HiPo)? How do they differ from highly professional (HiPro) staff? Who has a higher degree of labour activity and/or is more correlative with the strategy of the organization's modern business process? Can they be included in the personnel reserve? How reliable will they be? And what loyalty level should we expect?

The issue of loyalty and reliability is not circumstantial. The level of staff loyalty is closely related to the employee turnover rate. Employee's loyalty is characterized by the staff personal positive attitude to the company's activities, policies, and management. The basis of the loyal employees' behavior is their desire to benefit the company and avoid actions that can damage it. The highest degree of employees' loyalty is when they treat the company's affairs as their own business. Loyal employees, on the one hand, deeply accept some company requirements, but on the other hand, they are ready to put up with others that do not quite suit them [1].

Loyal staff should not be confused with reliable personnel.

Staff reliability reveals the degree of behavior standards in relation to the company. Employees try to respect all rules and regulations established in the company. But in case of unfair treatment by the management or discordance between their personal interests and the interests of the company, they are able to commit an illegal action against the company [6]. In fact, reliable personnel are passive to demonstrate their labour potential. They assume a wait-and-see attitude to evaluate the benefits that are provided at their workplace by the company management. Such an employee can be classified as a highly professional (HiPro) staff.

Under the conditions of technological changes, when we have to look for innovative approaches and operational procedures, deal with raw data, master modern mechanisms and technologies that require an initiative attitude when performing tasks, respect the requirements and standards of labour discipline, and treat the company's policy positively, this means to slow down innovative changes. A highly professional (HiPro) employee uses past experience, which, in the ideal case, may not fit into a new relationship, and in the worst case, it can spoil innovative initiatives.

Loyal staff may not be included in the category of HiPro employees. However, due to high motivation, they are HiPo employees, who are ready for any tasks in new reality. They have inquisitive mind and are ready to search for non-standard solutions, because they are not burdened with experience and imposed solutions (rules and outdated standards). They are proactive to find solutions that results in readiness to actively progress, master and use modern technologies in their work, and get a positive result for the organization.

Respectively, projecting the situation to the educational process, we can conclude that the formation of the students' perspective teaching trajectory in high school requires graduates' enthusiasm in such restricted professional actions as accomplishment of calculation tasks, accurate compliance with the operating procedure requirements, knowledge of professional work algorithms, etc.

At the same time, a high motivation level is an important condition for being a HiPo employee. To stimulate activity and initiative attitude to work, it is necessary to bring the HiPo employee to the partnership and co-management level in the organization, and increase the engagement rate. They should understand their personal benefit not in the form of one-time compensation/bonus, but in the form of the prospects for their personal development in this organization. That is not to become a nominal, but a real personnel reserve in accordance with the performance evaluation, which reflects the achievement level of the employee's business objectives. To achieve this task, the university graduate should gain an active personal responsibility to build their professional competencies, which are necessary to work in a new environment.

With a focus on HiPo employees, the higher school should be guided by an active training in the format of practice-oriented distance e-learning majors courses, in order not to form an "effective" training group. The course may be in demand by individual students who are deeply interested in certain aspects of the field-specific knowledge. Checking the quality of such students training is possible through the use of the testing assignments method. These assignments should be developed in consort with organizations that are potential employers, in which students plan to do their work placement or internship/working activity under contracts. The main requirement is to match two sources: Job success profile and Skill-matrix, which provide a detailed description of the development level of professional skills for a specific job position.

It is necessary to plan student progress development guide (PDG), based on an electronic document (on SAP platform), which allows the student independently and/or with the tutor support conducts self-assessments (according to the competency model developed by the employing company), and elaborate the plan of their future profession-oriented development. When evaluating the professional level of student's competencies, we can follow two criteria: sustained performance (stability of work results) and potential level (from 1 level of non-compliance to 3 maximum). As a result, the graduate will be assigned to a certain category, according to the talent development level.

However, it is important to maintain a balance when involving an employee in self-management and self-assessment processes. The student's activity in the process of getting involved in the profession can decrease dramatically in the case of overcharge, fatigue, lack of assessment of the results achieved, and loss of their own growth prospects. A student may experience occupational burnout and dissatisfaction with the training process and results. Loyalty to their future profession with the loss of their activity transforms the student's qualities in favor of reliability, calmness, and lack of initiative. If the occupational burnout process intensifies, such graduates demonstrate absolute lack of initiative and desire to study. They stop attending classes and, most often change training to work, but not according to their specialty profile. That is, a student either looks for a new place to apply their abilities and the university becomes the primitive mechanism to produce graduates, or goes to the underground (changes the sphere of professional activity), that means that this student leaves the university or changes to another specialty, while still hoping that this change can make a difference in the life.

4   Discussion

The assessment of the required competence level is recommended in accordance with the content of the SHL HiPo formula, presented above, to evaluate potential. The authors [2, 4–12] propose to include only three components, which we support and determine in the study. They are:

1. Desire to achievements (potential to take a managerial position).
2. Abilities (Hogan, Talent Q questionnaires).
3. Engagement (potential assessment, PiF test and Potential in Focus).

At the same time, it is much more important not just to assess the graduate's potential, but, based on the assessment results, bring information about their enrollment in a particular group at the HiPo level when applying for employment. This is an indicator of the formation of students' potential and the graduates' qualification level, recognition of their potential performance in work, and success in implementing the personal development trajectory in the company. Enrollment in a specific HiPo group gives an idea of the graduate's potential enrollment in the personnel reserve of the employing company and the personal advantages that may be available to a particular graduate – job applicant in a potential employing company. In this context, the motivational interest factor determines the level of students' responsibility in the development of their own professional and qualification level.

The main problem in the functioning of this system is that both the university management and the student, due to different circumstances, can accelerate this process. This has a negative impact on the students' well-being. They are overcharged with tasks, power and, sooner or later, they will experience an occupational burnout. This leads to dissatisfaction, disappointment in the chosen profession, and a loyalty decrease in the chosen training area. The student loses the valuable HiPro quality, that is their quality characteristic, even while remaining a high professional.

The developed technology, innovative approaches to build and use the students' potential, and the graduates' qualification level in new environment are based on the analysis and comparison of research results, published for public use in the Internet environment. The authors research to identify specific HiPo and HiPro competencies that correspond to digital technologies [4, 5, 9, 10] was also used as a basis to solve the tasks. The proprietary technology of competencies evaluation to measure the labour activity level and identify new trends and patterns of building competencies of end-to-end technologies in the implementation of labour potential was used [4].

5   Conclusion

For the foregoing reasons, we can highlight several important points. Speaking about the students' potential and university graduates' qualification level, it is necessary to keep in mind not only a set of certain knowledge and skills for performing professional duties, but the level of their active and initiative use by the students in order to solve the tasks.

The activity level is achieved by providing the opportunity to engage in self-development, using advanced cloud technologies (in the format of online e-learning courses). Owing to these courses, a university graduate can be involved in the co-management in the organization after employment. At the same time, the graduates must be extremely goal-oriented, understand their role and the level of participation in the business process in a potential employing company, which is determined by the relevant competencies formation.

The type and list of current competencies is determined and approved by the management of the employer's organization in coordination with leading professors of higher education for each specific business task. Thus, it is important to the management and teaching staff of the university not only to provide a cumulative system for building professional qualities of a HiPo student in accordance with new technologies of personnel management and the business environment. It is also necessary to identify indicators, which allow to timely determine the loss moment, occupational burnout, lower level of loyalty and student's initiative activity to solve problems. All this will result in revealing the graduate's qualification level when using it in a potential employing company.

References

1. Borzunov, A.A.: The importance of the personnel direction to ensure the company's economic security under the conditions of digital transformation. Vector economy. Economics and Enterprise Management 7 (2017). http://www.vectoreconomy.ru/index.php/number7/economicmangment-7-2017. Accessed 09 Mar 2020
2. Business Switzerland: World economic forum (2016). https://business-swiss.ch/mezh-dunarodny-e-organizatsii/vsemirny-j-e-konomicheskij-forum-ve-f/. Accessed 12 Dec 2019
3. Federal Law: On independent assessment of qualifications, dated on 3 July 2016, No 238-FL. http://www.consultant.ru/document/cons_doc_LAW_200485/. Accessed 09 Mar 2020
4. Kifa, L.L., Kryuchkova, I.V.: On the issue of staff development trends. Azimuth Sci. Res. Econ. Manage. **4**(17), 175–177 (2016)
5. Laktionova, K.: Potential of employees: Illusiveness and reality. Pro-Personal (2015). https://www.pro-personal.ru/news/1086977-19-m8-zarplatu-nado-perechislyat-po-novym-pravilam-inache-shtraf-100-tysyach. Accessed 09 Mar 2020
6. Mahmudova, I.N., Krivoruchko, Y.: From reliability to staff loyalty to provide personnel security of the organization. Kadrovik **7**, 93–100 (2019)
7. Mahmudova, I.N., Zhuchenko, S.I.: Unclaimed employment in the digital economy. In: Gulyaev, G.U. (ed.), Vth International Scientific and Practical Conference on Economic and Management in the XXI Century: Strategies for Sustainable Development, pp. 84–88. MCNS «Science and Education», Penza (2018)
8. Mahmudova, I.N., Ilyukhina, L.A., Bogatyryova, I.V.: The corporate personnel training system development: the experience of Russian enterprises. In: Mantulenko, V. (ed.) International Scientific Conference on Global Challenges and Prospects of the Modern Economic Development. The European Proceedings of Social & Behavioural Sciences, vol. 57, pp. 654–655. Future Academy, London (2018). https://doi.org/10.15405/epsbs.2019.03.65
9. Makhmudova, I., Belonogova, E.: Using digital technologies in staff training. Slovak Int. Sci. J. **1**(16), 19–22 (2018)

10. Makhmudova, I.N.: Methodology for assessing the staff competence to determine compliance with the professional standard. Sci. Rev. Theory Pract. **1**, 59–74 (2017)
11. Makhmudova, I.N., Novoselova, O.V.: Evaluation of the reliability of a business partner in an updated reality. In: Soloviev, D.B. (ed.) International Multi-Conference on Industrial Engineering and Modern Technologies "Far East Con", pp. 1200–1204. Atlantis Press, Paris (2019). https://doi.org/10.2991/ISCFEC-18.2019.269
12. Makhmudova, I.N., Bikulova, P.V., Eremina, I.Y.: Methodology of evaluation of the personnel adaptation effectiveness in companies. In: Mantulenko, V. (ed.) Proceedings of the International Scientific Conference on Global Challenges and Prospects of the Modern Economic Development. The European Proceedings of Social & Behavioural Sciences, vol. 57, pp. 1023–1031. Future Academy, London (2019). https://doi.org/10.15405/epsbs.2019.03.102
13. National Program: "Digital economy of the Russian Federation" approved 24 December 2018. http://base.garant.ru/72190282/. Accessed 09 Mar 2020

Inevitability of Company's Corporate Culture Transformation Under Conditions of New Management Technologies

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Abstract. The purpose of this article is to establish the relation between the level of employee's satisfaction and the achieved digitalization level of the company. At the same time, job satisfaction is considered as an important factor in the formation and development of corporate culture. The authors analyze a problem of decreasing the level of job satisfaction in the context of internal organizational changes occurring in the company as part of its digital transformation. The problem is that the creative component and motivational attitudes of employees decrease with the increasing use of modern information technology tools. In the context of digitalization, the development of an effective strategy for interaction between the company's top management and its employees is largely subject to the following chain of criteria: the automation level of business processes – the degree of satisfaction with working conditions by the staff – in the corporate culture of the company.

Keywords: Automation level · Corporate culture · Company employees · Digital technologies · Job satisfaction

1 Introduction

Changes in the economy associated with the transition to a new technological order are invariably accompanied by a serious internal organizational transformation. The active process of digitalization of business processes for most domestic companies is accompanied by a growing number of corporate tasks that are solved using modern information and communication technologies [8]. This leads to the need to form specialized services and divisions within the organizational management structure. While investigating processes of digital transformation of companies, the authors of the article focus on significant changes simultaneously occurring in their corporate culture [4].

Today, hardly anyone doubts that most companies have their own corporate culture. At the same time, corporate culture is not only values and beliefs, rituals and symbols, artifacts and heroes, internal rules and regulations, but also the loyalty of the staff, the employees' satisfaction with the content, characteristics and results of their work. This is something that is valuable to most employees, which determines their behavior, world outlook and motivation to achieve their goals. Corporate culture is a subtle category that does not always lie on the surface. To a greater extent, we observe

the manifestation of corporate culture in the behavior and actions of employees, rather than in the declared appeals and internal regulations.

2   Methodology

The authors have developed a model for assessing the current level of employees' satisfaction with the job/work and the level of digital transformation achieved by the company. At the same time, the authors make two assumptions: the level of digital transformation is determined based on the results achieved by the company in automating the most important information, production and technological business processes; the level of job satisfaction is considered as an important component of the corporate culture.

Many factors have a significant impact on the stability and development direction of the corporate culture. Before the beginning of the XXI century, an important element in the formation of corporate culture was the material base of the company. It was the basis of reproduction processes and largely determined the economic efficiency of the company's operation. The more complex and expensive the material base of the company was, the more professionally trained, qualified, responsible and disciplined employees it needed, the more meaningful and creative their work was. High and strict requirements for the personnel selection made it less painful for employees to adapt and their further professional development more effective [2].

In the conditions of transition to the stage of mass digitalization, both at the state and internal levels, there is a change in the basic element of the corporate culture. Researchers increasingly consider the level of automation achieved by the company (Levels of Automation, hereinafter LOA) to be the basic factor in the development of the corporate culture in the conditions of digitalization of technical, technological, financial, economic and information processes implemented at the strategic, tactical or operational levels. LOA is a quantitative and qualitative description of administrative, industrial-technological, information-analytical, documentary and other operations, in whole or in part made by an independent from a person automated complex (during operation), as well as by a dependent on corporate information system (hereinafter CIS).

Today, there is no global standard or unified method for evaluating the achieved level of automation. In practice, specialists most often use quantitative and qualitative indicators and characteristics: the number of computers, in terms of a certain number of employees; the provision level of production, technological and management processes with modern software and hardware; the share of manual, mechanized and automated operations; the degree of reduction (as a percentage) of direct human participation in management, information, production and technological processes; the dependence of automated processes performed on the operator, etc.

Russian researchers use the criterion of the degree of human participation in decision-making processes or in the direct execution of operations to evaluate LOA. According to this approach to the LOA assessment, business processes can be classified as: manual, automated (mechanized) and automatic (robotic).

In the practical work, the Sheridan & Verplank method is often used, based on the assessment of the level of independence from a person of performed production,

technological, managerial and other operations. This approach makes it possible to present a formalized description of the ten levels of achieved LOA [7]. Each level is a numeric expression of the automation degree of operations performed by the employee, including the decision whether to perform a particular operation. The minimum level 1 corresponds to a situation when all operations in the company are performed manually by employees without any exception. The maximum level 10 excludes human participation in any production, technological, managerial, information and other operations. The other levels are called intermediate. Table 1 gives a formalized description of all LOA levels.

Table 1. Description of levels of automation (LOA) according to the Sheridan and Verplank method

Levels of automation (LOA)	Formalized description of the automation level
1	Computer assistance is not expected. All operations, including deciding whether to perform each of them separately, are performed by the employee independently
2	The computer is used to develop the maximum number of possible (alternative) solutions. All operations, including deciding whether to perform each of them separately, are performed by the employee independently
3	The computer develops possible alternative solutions or generates a complete list of solutions/actions; selects several most appropriate alternatives. The employee makes a decision about the operations to be performed
4	The computer develops possible alternative solutions or generates a complete list of solutions/actions; selects the only economically (technically, technologically, etc.) feasible alternative. The decision to perform the operation is made by the employee
5	The computer generates one appropriate decision and executes it only after receiving confirmation from the employee
6	The computer generates one appropriate decision and executes it if the employee, within a pre-defined time corridor, does not reject the automated execution of operations
7	The computer generates one appropriate solution and executes it in automated mode, necessarily informing the employee about the progress of the performed task. The employee retains the function of full control over the progress of operations (task solutions)
8	The computer generates one appropriate solution and executes it in automated mode, informing the employee about the progress of the task if the corresponding request is received. The employee partially controls the progress of operations
9	The computer forms an appropriate solution and performs it in automated mode. The employee is informed about deviations in the course of operations (task solutions). The employee performs the final control function, evaluating the result
10	Fully automated task solving cycle that excludes employee participation in any of the stages

Source: authors based on [7].

Analysis of the formalized description of LOA levels in the Sheridan and Weplank methodology shows that tasks assigned to the 6–10 levels of automation can and should be performed without the participation or with the minimum possible participation of company's employees. The more employees have to deal with these LOA levels as part of their job responsibilities, the more clearly two divergent trends become apparent in the company. The first is manifested in a decrease in the creative component of employees' work, reducing the number of communication contacts that they enter into; their professional knowledge and experience become less in demand. In other words, companies with a high level of LOA are characterized by: less meaningful work activities of employees; a lower need for creative employees; not a high need for managers with high leadership qualities. The second trend is characterized by a high need for specialists who are able to make non-standard decisions in critical situations; providing uninterrupted operation of computer systems and complexes, including the development of their own or adaptation of specialized software; having professional knowledge that ensures high-quality expertise of modern information technologies presented on the market. This trend indicates the need of the company's management and HR department to solve a complex structural problem. Its essence is to reduce or retrain personnel whose functions are sufficiently or fully automated. This is a task to search for personnel who can work efficiently in a highly automated environment [1].

Today, the company's achievement of even level 4 of LOA sets fundamentally different tasks for its personnel department in the processes of search, selection or retraining of staff [5]. Achieving 6 or higher LOA levels is not only time-consuming, but also quite expensive and requires a long time to implement changes. This goal will not be achieved without the involvement of specialists with a high level of specialized professional knowledge and extensive practical experience in the development, implementation and operation of multifunctional and multi-user software [11].

What in the conditions of a sharp decrease in the meaningful content of work can "force" an employee to effectively perform an ever-growing volume of low-content administrative and control functions? What can contribute to maintaining a unified corporate communication space? To get answers to these questions, we analyzed the level of employees' satisfaction with their work in companies with different LOA levels. Generalization and theoretical understanding of data collected as a result of the survey of experts allowed: to identify material and non-material factors that significantly affect the formation of the level of labor satisfaction; to determine the direction of influence of various factors; to assess which factors are relevant in the transition to digital management technologies, and which are most effective in the traditional management.

In the study, the proposed evaluation model is applied to employees of two companies that have fundamentally different achieved LOA levels. The authors made a methodological assumption that at the research period the achieved LOA of the first company should not exceed level 3, and the second company should have an advanced LOA level – no less than level 5. Methods used in the research: theoretical, mathematical, methods of comparison and generalization, survey, testing, expert assessments and comparative analysis.

3   Results

The authors analyzed opinions of experts representing two domestic companies that have been operating in Moscow for more than 10 years. The first company, with the conditional name A, has been actively using a specialized multi-user ERP system in its management practice for the past two years. The implementation of this system began in 2015 and took three years. The second company, with the conditional name B, has been using two local standard software platforms for six years, which provide automation of the main accounting and management tasks, taking into account corporate functional and industry specifics. Each software product has limitations for taking into account individual characteristics of the company's business and further development its functional and hardware capabilities. Table 2 provides a description of the personnel structure of companies A and B.

Table 2. Characteristics of the personnel structure of companies A and B

Indicator	Company A		Company B	
	People	%	People	%
Total number of employees	258	100	276	100
Those from them who have:				
Higher education	153	59,30	145	52,54
Secondary vocational education	75	29,06	69	25,00
Secondary general education	30	11,63	62	22,46
Education in the field of development and operation of IT systems and technologies	28	10,85	7	2,54
Number of employees: At the age under 35	73	28,30	53	19,20
At the age from 35 to 60	139	53,88	136	49,28
Over the age of 60	46	17,83	87	31,52
With more than 8 years of experience in the company	160	62,02	194	70,29
With less than 2 years of experience in the company	57	22,09	32	11,59
Average staff turnover over the past 3 years, %		21,86		7,00

Source: authors.

The total number of employees in company B is 18 people more than in company A. Employees with higher education in company A are 6.76% more than in company B; with the secondary vocational education – 4.06% more; with the secondary general education – 10.83% less. This data indicates a higher educational level of employees of company A. Employees of company A are characterized by a younger age. The number of employees who have worked for more than 8 years in company A is 62.02%, and in company B is 70.29%. The data presented correspond to the average turnover rate for the last 3 years (company A – 21.86%, company B – 7.0%).

An important distinctive feature of company A is a significant number of specialists with specialized education in the field of IT (10.85% vs. 2.54% in company B).

Company A is also characterized by the presence in the staff list of the following positions: programmer, system analyst, system administrator, information security specialist, database administrator. Company B's staff includes the following positions: PC operator, programmer, and system administrator.

In the course of the study, 186 people were interviewed, employees of both companies, representing the following categories of experts: senior managers (2% of the total number of experts); 24% – middle managers and 19% – lower managers, 52% – specialists and only 3% – workers. The sample includes deputy directors of companies, heads of divisions, departments and services, line managers, members of project teams and groups, specialists and workers who use corporate information technologies and software products in their daily activities that partially or more automate the work or operations performed. Men in the presented sample made up 64%, women – 36%. By age, the sample structure is as follows: 21 years old – the age of the youngest expert and 67 years old – the age of the oldest one. The average age of the expert group is 53 years old.

The assessment of the LOA level achieved by the companies was based on information collected using the open-question interview method. In their responses, the experts described the level of automation of tasks and operations performed at their workplaces. When preparing their responses, the experts were not influenced by external factors. The responses that were formulated did not depend on the influence of the proposed response options and their sequence. The interview results were subjected to qualitative and quantitative content analysis. The final results were used to calculate the level of LOA using the Sheridan and Verplank methodology. The results of the analysis are presented in Table 3.

Table 3. Characteristics of the achieved LOA level in companies A and B

Indicator	Company A	Company B
Percentage of employees who use computer technology to perform their job duties, %	94	79
Percentage of employees using application software, %	100	100
Percentage of employees using functional software, %	74	48
Percentage of employees using tool software, %	12	7
Percentage of employees using individual software,%	19	48
Percentage of employees using group software, %	17	35
Percentage of employees using the network software, %	64	17
Percentage of employees using general-purpose software, %	14	57
Percentage of employees using method-oriented software, %	24	11
Percentage of employees using problem-oriented software, %	62	32
Percentage of employees who use standard platforms to perform their job duties, %	21	37
Percentage of employees using a ERP-system to perform their job duties, %	62	–
Assessment of the achieved LOA	**6**	**3**

Source: authors.

The evaluation of the achieved LOA in the general and partial assessment was based on a comparative analysis of responses received from experts from both companies. The comparative analysis was carried out within the range of maximum and minimum limits of automation of the main set of functional tasks solved by the company's management in current conditions. Thus, the achieved level 6 (LOA) is confirmed by the survey results, according to which 64% of employees in company A use a specialized multi-user ERP-system at all levels of the corporate hierarchy for: information support of implemented management processes; development and implementation of management decisions; formation and development of a single corporate data bank. At the same time, time corridors are regulated and strictly observed for performing the corresponding computing and other information operations in automated mode, which can only be changed by employees who have the appropriate software permission.

The achieved level 3 (LOA) is confirmed by the survey results, according to which only 37% of company B' employees use standard software platforms to perform their job duties. The unified software and information space is available to 17% of employees. Standard software platforms are used exclusively for informational support of the process of developing possible alternative management solutions at the operational and partially tactical levels of the corporate management. Management decision-making processes are carried out without the active use of digital technologies. The majority of employees (57%) need general-purpose software used to automate the simplest functional tasks. This data is evidence that the company B's employees have little access to modern digital technologies.

The labor satisfaction index was calculated based on the survey results of the same 186 experts who participated in the study of the LOA achieved by companies. The authors used a questionnaire containing a single basic set of indicators for assessing the level of job satisfaction for companies. The experts were asked to answer two questions. First of all, it was necessary to determine the influence degree of each of the basic indicators on the overall satisfaction of experts with the results of their work. The second question was intended to help to assess the expert's satisfaction with each of their indicators. Each basic indicator was evaluated on a five-point scale.

The experts were not able to change the list of basic indicators. The fact is that less important or unimportant (for an expert) indicators that have little effect on the satisfaction index are not able to fully reflect the overall level of their satisfaction with working conditions and results. The satisfaction index of each expert was defined as the arithmetic value of the satisfaction indices for each indicator. The assessment of the employee's overall satisfaction with work was conducted separately for each company and calculated as the arithmetic average of the satisfaction indicators of all experts representing the respective company. The final results of the study are presented in Table 4.

Table 4. The achieved level of job satisfaction in companies A and B

Indicator	Company A (LOA ↑)	Company B (LOA ↓)
Interest in work	2,78	3,14
Satisfaction with work achievements	3,23	4,11
Satisfaction with relationships between employees	2,14	3,96
Satisfaction with the relationship with management	4,19	3,02
The level of demand for professional knowledge	2,94	4,15
The level of demand for professional skills and experience	2,01	4,23
General professional demand	2,11	4,17
Responsibility for the work performed	3,76	4,31
The level of creative component in the work	1,98	3,16
Preference for the work performed to high earnings	1,89	3,45
Satisfaction with the overall content of the work performed	3,67	3,21
Possibility of career growth or promotion	2,33	2,88
Satisfaction with the current state of corporate culture	3,16	3,98
Outlooks (forecasts) on the development of corporate culture	3,43	4,76
The overall level of job satisfaction	**2,83**	**3,76**

Source: authors.

The achieved level of satisfaction is characterized not only by the technical and functional content, but also by the social and psychological comfort of working in the company. Table 5 shows the indicators that have the greatest impact on the employee's satisfaction in companies with fundamentally different levels of automation.

Table 5. The main indicators that affect the level of the employee's satisfaction with the work in companies with different LOA levels

Company A (LOA ↑)	Company B (LOA ↓)
Satisfaction with the relationship with management	Development prospects of the corporate culture
Responsibility for the work performed	The level of demand for professional skills and experience
Satisfaction with the overall content of the work performed	General professional demand

Source: authors.

Table 4 and 5 data show: the multidirectional influence of indicators that determine the level of employee's satisfaction with work in companies with different LOA; a significantly lower overall level of job satisfaction among employees of companies with a significantly higher LOA.

4   Discussion

Automation of business processes, which occurs both within a particular company and in its external environment, is a significant factor that affects the quantitative and qualitative parameters of the corporate culture, regularities of its effective use and development. Serious structural, organizational, content and personnel changes taking place in companies that are on the path of active digitalization are increasingly forcing specialists to discuss what motivational factors in these conditions will be the determining factors for their employees. In this case, it is not only about achieving a higher LOA and increasing production results, but also about maintaining a unified and effective corporate communication space.

Increasingly, researchers are turning to the tools of corporate culture theory in search of an answer to the question of the influence degree of the achieved level of business process automation on the stability and viability of the company's key values system. This question is important and relevant. Often, managers, when making digital changes in the company, encounter a decrease in the level of satisfaction with their work among their employees. Decline processes are observed both in companies that have been characterized by a stable corporate culture for many years, and in companies whose internal culture has not yet been fully formed. This state of affairs is not acceptable. Without the support and understanding of employees, digital changes implemented in the company are doomed to failure [9]. In the context of digital transformation, high production results often depend not on the quality and quantity of employees' labor, not on the number of high-tech technical means used, but on the balanced operation of corporate information systems. At the same time, a large number of employees of the company whose functionality has been successfully automated, demonstrate a serious decrease in the creative component in their professional activities. Employees face: a significant increase in the cost of working time to perform administrative and control functions; reduced diversity in the functions and work performed, independence and responsibility in decisions made. All this negatively affects the level of job satisfaction and staff confidence in the changes being made [7].

Thus, job satisfaction, in the context of total digitalization, should be recognized as an important tool for consolidating the potential of departments and employees in the process of achieving the company's strategic goals. Job satisfaction should be considered as an integral part of: the corporate management philosophy; the processes of formation, functioning and development of an effective corporate social and economic environment. Its main goal is to increase the motivational factors of labor and organizational efficiency of internal corporate processes; formation, preservation and multiplication of basic corporate values. On the one hand, the organization of work to increase the level of job satisfaction assumes and contributes to the maximum return of each employee of the company in accordance with their education, work experience,

qualifications, formed personal qualities. On the other hand, job satisfaction should be based as much as possible on the functions that employees are able to perform effectively: they have the necessary professional knowledge and experience, and appropriate personal qualities; sharing not only basic corporate values, beliefs, norms, and rules, but also properly motivated to maximize their own and corporate potential [3, 6, 10].

5   Conclusion

Increasing the company's competitiveness in the Russian and foreign markets today is impossible without the use of modern information and communication technologies. In these circumstances, company management should pay attention to the changing trend of effective motivation of their employees. The previous trend, which was based on the development of corporate culture and demand for an employee as a professional, was replaced by a trend of fairly strict regulation as an integral part of the business process automation.

Labor ceases to carry elements of creativity, its content and attractiveness decrease. All this leads to a significant decrease in the level of employee's satisfaction with their professional activities in companies with a high level of business process automation. Subordination to the power, strict regulations and automation protocols is a way not only to reduce motivation, but also to psychological or social alienation of employees. In these conditions, the readiness and ability of the company's top management to develop and implement a fundamentally new strategy of corporate culture becomes important.

References

1. Astafeva, O.V., Pecherskaya, E.P., Tarasova, T.M., Korobejnikova, E.V.: Digital transformation in the management of contemporary organizations. In: Ashmarina, S.I., Vochozka, M., Mantulenko, V.V. (eds.) Digital Age: Chances, Challenges and Future. Lecture Notes in Networks and Systems, vol. 84, pp. 382–389. Springer, Cham (2020). https://doi.org/10.1007/978-3-030-27015-5_46
2. Kot, M.K., Spanagel, F.F., Belozerova, O.A.: Problems of digital technologies using in employment and employment relations. In: Ashmarina, S., Mesquita, A., Vochozka, M. (eds.) Digital Transformation of the Economy: Challenges, Trends and New Opportunities. Advances in Intelligent Systems and Computing, vol. 908, pp. 227–234. Springer, Cham (2020). https://doi.org/10.1007/978-3-030-11367-4_21
3. Kraev, V.M., Tikhonov, A.I.: Risk management in human resource management. TEM J. Technol. Educ. Manag. Inf. **8**(4), 1185–1190 (2019). https://doi.org/10.18421/TEM84-11
4. Mitrofanova, E.A., Bogatyreva, I.V., Tarasenko, V.V.: Digital reality and perspective of the management of educational organizations. In: Ashmarina, S.I., Vochozka, M., Mantulenko, V.V. (eds.) Digital Age: Chances, Challenges and Future. Lecture Notes in Networks and Systems, vol. 84, pp. 390–397. Springer, Cham (2020). https://doi.org/10.1007/978-3-030-27015-5_47

5. Mitrofanova, E.A., Konovalova, V.G., Mitrofanova, A.E.: Opportunities, problems and limitations of digital transformation of HR management. In: Mantulenko, V. (ed) Proceedings of the GCPMED 2018 – International Scientific Conference on Global Challenges and Prospects of the Modern Economic Development. The European Proceedings of Social & Behavioural Sciences, vol. 57, pp. 1717–1727 (2019). Future Academy, London. https://doi.org/10.15405/epsbs.2019.03.174

6. Schekoldin, V.A., Bogatyreva, I.V., Ilyukhina, L.A.: Digitalization of labor regulation management: new forms and content. In: Ashmarina, S.I., Vochozka, M., Mantulenko, V.V. (eds.) Digital Age: Chances, Challenges and Future. Lecture Notes in Networks and Systems, vol. 84, pp. 137–143. Springer, Cham (2020). https://doi.org/10.1007/978-3-030-27015-5_17

7. Sheridan, T.B., Verplank, W.L.: Human and computer control of undersea teleoperators (1978). https://www.semanticscholar.org/paper/Human-and-Computer-Control-of-Undersea-Sheridan-Verplank/d48b94e6af5093e7cc41e20fa6aca4f3a2d860bb. Accessed 20 Mar 2020

8. Svistunov, V.M., Lobachev, V.V.: Four questions about digital economy. Pers. Intell. Resour. Manag. Russia **40**(1), 5–14 (2019)

9. Svistunov, V., Kuzina, G., Lobachev, V.: The level of trust of the company staff as the factor of the increase of social and economic systems management efficiency. In: Nikitov, S.A. (ed.) Proceedings of *the* XXI International Conference Complex Systems: Control and Modeling Problems, pp. 799–802. IEEE, New York (2019)

10. Svistunov, V.M., Lobachev, V.V., Simonova, M.V.: Staff responsibility as efficiency-driven factor of ERP-systems. In: Ashmarina, S.I., Vochozka, M., Mantulenko, V.V. (eds.) Digital Age: Chances, Challenges and Future. Lecture Notes in Networks and Systems, vol. 84, pp. 480–486. Springer, Cham (2020). https://doi.org/10.1007/978-3-030-27015-5_58

11. Troshina, E.P., Mantulenko, V.V.: Influence of digitalization on motivation techniques in organizations. In: Ashmarina, S.I., Vochozka, M., Mantulenko, V.V. (eds.) Digital Age: Chances, Challenges and Future. Lecture Notes in Networks and Systems, vol. 84, pp. 317–323. Springer, Cham (2020). https://doi.org/10.1007/978-3-030-27015-5_38

Making Decisions in Cyclical Regional Economy: Innovative Import Substitution and Export

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Abstract. The article is aimed to theorize the basis for valuating regional sectoral economic cycles stages and develop an algorithm of decision-making on innovative import substitution and export under regional cyclicity conditions. The methodology of the study is based on the thesis stating that the cycle stage reflects supply and demand rate on production factors and results, describes market expectations and in that regard is important in making decisions on production, investments and regional import substitution and export policy. Current scientific researches evaluating import substitution and export often fail to consider that regional sectoral cycles may significantly vary from the national one which may lead to wrong conclusions and management decisions. When addressing this problem, the authors proposed a "demand-markets-industry cycles" approach. It allows all stakeholders (manufacturers, investors, and regional authorities) to get information on most popular goods groups for innovative import substitution, state preferences, and also to make decisions on production, investments, import substitution and export policy based upon a certain stage of the regional cycles.

Keywords: Economy cyclicity · Export · Import substitution · Region · Sectoral cycle

1 Introduction

In an open economy, the development of innovative import substitution and export is an important part of national and regional economic policies. Import substitution can be considered as a certain stage that allows import-dependent countries to first solve the problem of imports and then move to a competitive production of export products. For instance, that happened in China, where it was possible to provide the development of the machine building industry in just a decade and become one of the world's leading manufacturers in terms of exports [15]. In a dynamic world with a cyclical economy, it is important to make quick decisions about production, investment, and government support for regional import substitution and export. Slow processes of economic reorientation are unacceptable, especially for developing countries where industries have accumulated a certain lag of underdevelopment [11].

Litvinova, Talalaeva, and Ledeneva identified the positive impact of innovative import substitution on structural changes in the economy [9]. An increase in the export of innovative goods is accompanied by a decrease in their imports. Weidong and Yeung showed that the introduction of multinational corporations and deregulation by China were the determining factors in the geographical distribution of the automobile industry in China [15]. Researchers note serious difficulties in determining an effective model for assessing import substitution and product competitiveness. Southworth [13] focus on a comparative analysis of imports to determine the effectiveness of the development of domestic production. The research topic is interesting for all countries of the world. A number of papers was devoted to the problems of foreign economic activity participants due to the specifics of production in certain industries. Flores, Villarreal, and Flores, [3] described the necessity to create supply chains in the aerospace industry that could reduce external impacts or deliberate knowledge transfer, as well as create networks with local economies and businesses. The study was aimed to examine the location models of firms and institutions around the aerospace industry throughout Mexico. Kopczewska, Kudła, and Walczyk [8] used spatial secondary effects between taxation and economic growth. The researchers consider the evaluation strategy that is taken into account in applied research of economic policy. The evaluation includes the concept of spatial side effects and their local and global effects, direct and indirect impacts, as well as the role of various spatial weighting schemes, which creates a combined approach to the analysis.

Volkodavova, Zhabin, and Yakovlev proposed a methodological approach to organize the import substituting industry and an index to evaluate the competitiveness of import substituting products [14]. The authors note that for the purpose of effective import substitution, it is necessary to estimate the market dynamics in the framework of strategic analysis, to identify factors affecting the internal and external competitiveness of the national economy and manufacturers of import-substituting products. Scientists have also highlighted the effectiveness of preferential zones. Using the examples of Japan, China and South Korea, Hassink, Hu, Shin, Yamamura, and Gong (2018) note a high impact of government actions on industrial restructuring and differences in approaches [4]. Hence, it is important to have the fullest possible understanding of the state of production processes and export potential in the industries [5]. Researchers point out that regional differences in cyclicity are among significant factors in providing the effectiveness of economic policy decisions [1]. However, the stage of the industry cycle is usually disregarded when making decisions about innovative import substitution and export, which reduces their effectiveness, since market expectations for growth and decline in the industry are not taken into account. The authors of the paper have attempted to fill this gap.

2 Methodology

The authors have worked out an algorithm for making decisions on import substitution and export, based on the study of the most important market factors "demand-markets-industry cycles".

1. The "Preliminary" stage is necessary to understand the dependence of a region on imports of innovative products. For this purpose it is necessary to assess the actual dependence on imports in terms of the volume dynamics and the proportion of exports and imports for at least 10 years.
2. The "Demand" is aimed at determining the groups of innovative products that are most resistant to possible changes in demand. To do this, we use the XYZ analysis method, which gives good results when determining the stability of sales of certain types of goods and fluctuations in their consumption level. The scale of reference values for groups is shown in Table 1.

Table 1. Referent values of the variation coefficient

Group	Variation coefficient	Class characteristics
Group «X»	0.10 < V < 0.20	Absolutely stable demand
Group «Y»	0.20 < V < 0.25	Stable demand
Group «Z»	V > 0.25	Unstable demand

Source: authors.

The level of product groups stability varies from absolutely stable to unstable.

3. The "Markets" stage consists in evaluating the potential domestic market for innovative products and the potential for sales abroad. To assess the domestic market, it is necessary to carry out a content analysis of information portals that place government orders. This will result in the creation of a database of public procurement and region's enterprises that need domestic products instead of imported ones. We estimate the prospects for sales abroad using the previously proposed [7] mutual trade growth potential (P_{ic}):

$$P_{ic} = \frac{X_{ic} - X_{irc}}{X_{ir}} \cdot 100 \tag{1}$$

where X_{ic} is a total sum of exports of the ith product to the cth country; X_{irc} is a sum of exports of the ith product from the rth region to the cth country; X_{ir} is a total sum of exports of the ith product from the rth region.

The main idea of the index is that the region as an economic entity of the country, due to increased competitiveness and active management actions, is able to increase exports of products within the framework of existing agreements between trading countries, thereby replacing the share of exports of other regions. The minimum value of 0 is reached when a region fully meets the country's product needs. The greater the potential is, the greater is the possible exports growth from the region.

4. The "Industry Cycles" stage is necessary to understand the risks of cyclical behavior for producers, investors, and the state and to develop management solutions for implementing the policy of innovative import substitution and export orientation of the economy. At this stage, using the industries selected at the preliminary stage, we construct models of trends, cyclical and seasonal fluctuations of these industries for at least 10 years. This method was first introduced by the

authors in [9]. To evaluate the dynamics models of regional economic indicators, the authors implemented the method as a script in an open-source programming language R.

Each model included four unobservable components, among which are: trend T_t; cyclic component C_t; seasonal fluctuations S_t and stochastic component ε_t, combined in both additive and additive-multiplicative (mixed) structures:

$$Y_t = T_t + C_t + S_t + \varepsilon_t \tag{2}$$

$$Y_t = (T_t + C_t)(1 + S_t) + \varepsilon_t \tag{3}$$

The components are evaluated one by one inside an iterative process.

The authors considered seven trend models: linear trend, growth models (generalized exponent and power functions), logistic curves (generalized sigmoid model and arctangent), symmetric and asymmetric bell-shaped curves. Such a set of trends covers various dynamics' types that differ by direction, speed and symmetricity. The cyclic component was modeled as a sum of three sines with non-proportional frequencies:

$$C_t = \sum_{j=1}^{3} A_j \sin\left(\omega_j t + \varphi_j\right), \tag{4}$$

where A_j is the amplitude of the ith sine, $\omega_j > 0$ is its frequency, and $\varphi_j \in [-\pi;\pi)$ is its phase.

The summation of three sines with non-proportional frequencies is a suitable tool to describe complex, not strictly periodical fluctuations which is the most common case for economic cycles. The idea is also responding to Slutsky's hypothesis at the meso-level of economy [12]. To eliminate the seasonal fluctuations, we used the LOESS method which considers seasonality evolution from one year to another.

3   Results

We will show the results of the proposed methodological approach application by the example of one of the Russian regions. The Samara region is among the industrial leaders of Russia, but its economy is dominated by old-industrial sectors. Therefore, the production of innovative products for domestic and foreign markets is an important task for the region.

1. The "Preliminary" stage is necessary to assess the dependence of the economy of the region from imports which is determined on the basis of the indicators: the dynamics of export and import, the structure of foreign trade and commodity structure of import of the Samara region for 2013–2018.

   The calculation results showed that exports and imports are decreasing in absolute values. In 2013–2018, due to sanctions, exports decreased by almost 2 times and amounted to $ 4.52 billion at the end of the analyzed period. The import decreased due to the solvency of Russian enterprises in 2015–2016. During 2017–2018,

imports increased and amounted to $ 2.25 billion. A sharp drop in foreign trade indicators is replaced by the increase again in both exports and imports since 2016. This creates additional opportunities for import substitution and expansion of export production.

An assessment of the actual scale of the dependence of the regional economy on imports indicates that the Samara region needs to implement a policy of import substitution primarily for the following groups of goods: machinery, equipment and hardware; transport; metals and their products; food, beverages, & tobacco; chemical products; plastics and rubber; tools and devices, watches.

2. The "Demand" stage. To justify the potential demand for the selected groups of products, a study of sustainable demand is conducted using the XYZ method. The XYZ-analysis calculates the dynamics of the import structure for the groups of products identified at the previous stage, then estimates the yearly variation of import volumes, and after that calculates the standard deviation, variation coefficient, group and level of stability (Table 2).

Table 2. Final comparative data table

Group of products in import of the Samara region	Average growth rate in 2013–2018	Standard deviation	Variation coefficient	Group	Level of demand stability
Food, beverages, tobacco	83.37	16.40	0.17	X	Absolutely stable
Chemical industry products	55.82	43.13	0.25	Y	Stable
Plastics & rubbers	62.93	66.34	0.28	Z	Unstable
Metals and their products	69.06	76.21	0.24	Y	Stable
Machinery, equipment and hardware	72.96	235.77	0.24	Y	Stable
Transport	53.91	180.40	0.32	Z	Unstable
Tools and devices, watches	49.77	25.82	0.27	Z	Unstable

Source: authors.

The results of the analysis show that the following groups of goods are the most resistant to demand for import substitution: food, beverages, & tobacco; chemical industry products; metals and their products; machinery, equipment and hardware.

3. The "Markets" stage allows to provide an indication of potential domestic and foreign markets. This stage and the next one are demonstrated by the example of the group of products "Plastics & Rubber". This choice is justified by the following arguments: First, the Samara region is one of the leaders in the production of this group of products. In 2018, the region was the 4th one among Russian exporting regions with a volume of $318 million. In the structure of chemical industry products exports, the rubber occupies the second position after the fuel and energy

sector. It is necessary to further develop this export direction, since along with the growing global demand the region has all the necessary resources for that. Secondly, this group is characterized by high risk level, since the demand for products is unstable, which makes it particularly necessary to assess the cycle stage of production of chemical products at the method's fourth stage "Industry cycles". Table 3 shows the calculation results of the export potential factor for the item "Plastics and rubber" using the formula (1).

Table 3. Export potential of the Samara region in the sector "Plastics & rubber", units

Country	2018	Interpretation	Country	2018	Interpretation
China	69.84	Medium	Ukraine	90.44	Medium
India	38.42	Medium	Spain	5.39	Low
Germany	53.44	Medium	Belarus	204.76	High
Kazakhstan	177.54	High	South Korea	4.76	Low
Turkey	27.26	Low	Thailand	3.28	Low

Source: authors based on [7].

The results of the calculation have showed a high potential for expanding exports of products of the item "Plastics & rubber" with Kazakhstan and Belarus. Thus, the total export of "Plastics & rubber" from Russia to Kazakhstan is $586 million per year, while supplies from the Samara region are $23.2 million, or 3.9% of the total. Kazakhstan is neighboring the Samara region, and trade agreements provide for a single trade economic space (duty-free trade). In addition, a number of support measures have been adopted at the state level, such as concessional lending, provision of state guarantees, simplification of the customs clearance process, creation of attractive conditions for bringing goods to the world market, information support and expert advice.

4. The "Industry cycles" stage is necessary to improve the efficiency of management decisions regarding the launch of new import-substitution and export-oriented projects.

To assess the interrelation between the considered industries to the economic cycle stages we first describe the stages graphically (Fig. 1).
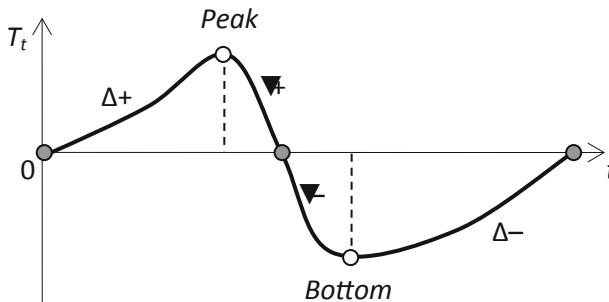
Fig. 1. Cycle stages indication (Source: authors)

Cycles' stages are signed as it is shown on the Fig. 1: symbol Δ means growth, symbol ▼ – decline, plus sign + marks positive area (cycle over trend), minus sign is used for negative areas (cycle below trend).

Table 4 shows the evaluations of the cycle stages performed by the authors for the key industries of Russia and the Samara region.

Table 4. Current cycle stages

Industry	Consumer prices index	Extraction	Manufacturing	Food, beverages. & tabacco	Chemical Industry	Pharmacy	Metals, & their products	Machinery	Cars	Trains
Russian Federation	▼–	▼–	▼+	▼+	Δ –	Δ –	Δ +	Δ –	▼–	▼+
The Samara Region	▼–	Δ –	▼ –	Δ –	Δ –	▼+	Δ –	Δ +	▼–	▼+

Source: authors.

The calculation results show that there is an increase in the economic cycle in the chemical industry both in the country as a whole and in the Samara region in 2019–2020. This leads to the conclusion that exactly now it is necessary to start developing projects to increase the production of import substituting and export-oriented products.

4   Discussion

Public authorities usually pursue several goals at once (in our case, the growth of import substitution and export is assumed), so the process of policy development can be considered as a multi-criteria task. Production development options are possible using innovative or inertial scenarios of the domestic economy [2].

In any case, the success of decisions on import substitution and export is determined by the availability of reliable information about available resources, sales markets and the market situation. To do this, researchers have developed and analyzed methods for evaluating import substitution and production of competitive products in all industries, based on the strategic priorities in the industry and the region. The strategic priorities provide important information from the point of view of goal setting in import substitution, which may be insufficient, as they only provide an understanding of the starting point for developing measures to implement import substitution policies, and this is clearly not enough to develop current investment projects in this area. The information in the "demand-markets - industry cycles" area is an important data frame to make decisions on import substitution and export. The calculation of potential demand indicators allows to identify the most stable product groups over time. Market data is a base to assess the potential of the domestic market for innovative products and their potential for sales abroad.

The picture of the uprisings and downturns of business cycles provides important information to entrepreneurs and authorities about the stage of the industry [10]. This information gives the investors the ability to minimize the risks of investment. The entrepreneurs get the understanding what to do to increase or reduce sales, whether to use a new production method or a new commercial usage approach of an existing product; to create a new benefit or change its quality; develop new market or new source of raw materials; implement organizational innovations. Regional authorities get the opportunity to adjust regional industrial policy.

5 Conclusion

Effective management decisions cannot be made without reliable and complete information about the current situation. However, enterprises and authorities often do not take into account information about the cyclical nature of the economy in general as well as the stage of the industry cycle in particular when making decisions. This increases a rate of cyclical risks. Meanwhile, taking into account the depth of bottom cycles is necessary not only to identify the current stage in the industry, but also for future expectations regarding the cyclical behavior of market participants [6].

The algorithm proposed by the authors complements the existing scientific and methodological basis for the development of import substitution policy, considering the depth and amplitude of cycles. For instance, in a case of fatal failures, it is probably useful to first identify the causes of the decline and thus take targeted import substitution measures addressing these causes. For other example, a deficit or high cost of investment necessitates subsidizing loan rates and government guarantees for investment in import substitution and export projects. If there is a short-term decrease in the cycle, we can expect a positive effect from support measures in a shorter time. From that point of view, it is important to evaluate the duration of economic recovery after economic failures when planning measures in import substitution policy. The amplitude of the cycle indicates the potential response of the industry on economic changes. If the amplitude is wide and sharp, there may be a "swing effect", which causes the risks of an inertial pullback of the economy to negative values. Thus, we can conclude that along with data on markets and potential demand, understanding the cyclical nature of the regional economy significantly complements the information base for making decisions about import substitution and export.

References

1. Beraja, M., Hurst, E., Ospina, J.: The aggregate implications of regional business cycles. Econometrica **87**(6), 1789–1833 (2019). https://doi.org/10.3982/ECTA14243
2. Borisov, V.N., Pochukaeva, O.V.: Innovative machine engineering as a factor of developing import substitution. Stud. Russ. Econ. Dev. **26**(3), 225–232 (2015). https://doi.org/10.1134/S1075700715030028

3. Flores, M., Villarreal, A., Flores, S.: Spatial co-location patterns of aerospace industry firms in Mexico. Appl. Spat. Anal. Policy **10**(2), 233–251 (2016). https://doi.org/10.1007/s12061-015-9180-0

4. Hassink, R., Hu, X., Shin, D.-H., Yamamura, S., Gong, H.: The restructuring of old industrial areas in East Asia. Area Dev. Policy **3**(2), 185–202 (2018). https://doi.org/10.1080/23792949.2017.1413405

5. Kale, D., Wield, D.: In search of the missing hand of 'collaborative action': evidence from the Indian medical device industry. Innov. Dev. **9**(1), 1–23 (2019). https://doi.org/10.1080/2157930X.2018.1429807

6. Khmeleva, G.A. (ed.): Russian Regions in the Conditions of Sanctions: The Possibility of Priority Development of the Economy Based on Innovation. Samara State University of Economics, Samara (2019)

7. Khmeleva, G.A., Fedorenko, R.V.: International economic integration of certain regions: the case of the Samara Region. In: Nahlik, A. (ed.) Proceedings from Modern Economy, Smart Development, vol. 19, pp. 516–530. University of Sopron Press, Sopron (2019)

8. Kopczewska, K., Kudła, J., Walczyk, K.: Strategy of spatial panel estimation: spatial spillovers between taxation and economic growth. Appl. Spat. Anal. Policy **10**(1), 77–102 (2015). https://doi.org/10.1007/s12061-015-9170-2

9. Litvinova, A.V., Talalaeva, N.S., Ledeneva, M.V.: Innovative import substitution in Russia and the world: a comparative analysis. In: Popkova, E.G., Sergi, B.S. (eds.) The 21st Century from the Positions of Modern Science: Intellectual, Digital and Innovative Aspects. Lecture Notes in Networks and Systems, vol. 91, pp. 521–533. Springer, Cham (2020)

10. Luo, X., Lu, X., Zhang, Z., Pan, Y.: Regional differences and rural public expenditure cyclicality: evidence from transitory and persistent shocks in China. The Annals of Regional Science (2020). https://link.springer.com/article/10.1007%2Fs00168–020-00985-5. Accessed 17 Apr 2020

11. Schmalz, S.: The Brazilian Economic Policy: From the Crisis of Import Substitution to the *Programa de Aceleração do Crescimento*. In: de la Fontaine, D., Stehnken, T. (eds.) The Political System of Brazil, pp. 265–281. Springer, Heidelberg (2016). https://doi.org/10.1007/978-3-642-40023-0_15

12. Slutsky, E.E.: Addition of random causes as a source of cyclic processes. Market Issues **3**(1), 34–64 (1927)

13. Southworth, F.: Freight flow modeling in the United States. Appl. Spat. Anal. Policy **11**(4), 669–691 (2018). https://doi.org/10.1007/s12061-018-9273-7

14. Volkodavova, E., Zhabin, A., Yakovlev, G.: Dichotomy of import substitution and cooperation strategies in industry. Econ. Ann. XXI **162**(11–12), 48–52 (2016). https://doi.org/10.21003/ea.V162-10

15. Weidong, L., Yeung, H.: China's dynamic industrial sector: the automobile industry. Eurasian Geogr. Econ. **49**(5), 523–548 (2008). https://doi.org/10.2747/1539-7216.49.5.523

Challenges of Entrepreneurship Education in the Republic of Tatarstan

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Abstract. The relevance of the study falls within the necessity to create conditions for the development of entrepreneurship based on socially-oriented support mechanisms. The purpose of the study is to identify the main directions for the development of educational infrastructure of entrepreneurship in the socio-economic environment of the Republic of Tatarstan. The study used the methodology of institutionalization of infrastructure, based on the theory of social justice and the theory of synergies between the participants in the infrastructure. A mechanism has been developed for institutional infrastructure support of entrepreneurship with implementation of partnership principles. Considering synergies in the use of labor resources, the necessary strategic decisions on infrastructure management are indicated. Challenges facing entrepreneurship in developing educational infrastructure are explored, including key factors causing these problems. The necessity to address issues of developing educational infrastructure through the mechanisms of infrastructural support of entrepreneurship in the Republic of Tatarstan is justified.

Keywords: Business development conditions · Business support · Enterprise infrastructure · Educational infrastructure · Infrastructure

1 Introduction

In the current socio-economic conditions of management accompanied with a drop in oil prices, an increase in the value of foreign currency, a policy of sanctions and restrictions, the competitiveness of domestic enterprises is particularly acute.

On the one hand, protectionism policies – as retaliatory sanctions and counter-measures – help protect domestic households, and on the other, limit healthy competition. The issue of developing the educational infrastructure of entrepreneurship and the implementation of socio-economic programs is especially acute, and is associated with the active work of state ministries and departments.

Creating comfortable conditions for business development in the Republic of Tatarstan addresses several problems at the state level. First of all, it is a solution to the problems of employment and self-employment of the population, when small and medium-sized enterprises create jobs. A separate area is the employment of socially vulnerable part of the population – single mothers, people with disabilities, and persons recently released from prison. Secondly, the effective development of small and medium-sized enterprises increases payments to state budget funds and organizations.

A transparent and clean mechanism based on state support and regulated reporting system solves the issue of control and monitoring of receipts in all areas. Thirdly, the widespread development of economic activity increases the welfare of certain groups of the population, and for others makes a wider range of diverse products more accessible: from food products that can be purchased at agricultural fairs in the "Agro-Industrial Park "Kazan" to technological devices and art objects sold by entrepreneurs via the Internet.

The key entities regulating the provision of state subsidies in the region are: the Ministry of Economy of the Republic of Tatarstan and the Ministry of Agriculture of the Republic of Tatarstan. The main areas of state support are [1]

1. The program "Leasing grant"
2. The program "Innovation"
3. The program supporting agricultural producers "Beginner Farmer" and "Family Livestock Farm"
4. Compensation for training costs

The development of the educational infrastructure of entrepreneurship in the Republic of Tatarstan is directly related to the last point, as it sets the trends and patterns of evolution of the studied course. In order to study this area of management, we analyze the concept of "educational infrastructure of entrepreneurial activity". At its core, infrastructure is a system of interconnected and interdependent elements (subjects and objects) that ensure its functioning.

2 Methodology

With regard to enterprise infrastructure development as a system of relations between the participants of infrastructure support in relation to the educational infrastructure of the business, we can distinguish synergies in the use of labor resources. The synergy in the use of labor resources is due to communications between the subjects of demand (enterprises) and the supply of labor resources (objects of social infrastructure), which is reflected in the dynamics of labor market indicators and quality of life [10]. The implementation of labor synergy occurs by bridging the gap between the emerging needs for labor resources of entrepreneurial structures and the supply on the labor market [9]. By putting in place mechanisms of co-creation (co-working), creating special educational programs and coaching (aimed at specific competencies) centers, labor specialization of the population takes place, in line with the priority areas of specific business units. Synergy in the use of labor resources is becoming a catalyst for entrepreneurial activity of the population.

In the study of entrepreneurial activity an important scientific support is given by the concept of Durkheim [4], which solves the problems of solidarity of the social system by considering external factors of regulation, self-organization, freedom and justice. At the same time, entrepreneurial solidarity is determined by the "harmonious interaction of regulation, self-organization, freedom and justice, as well as the quality of life and adaptation, ensuring maximum entrepreneurial effect" [7, p. 74].

Based on the studied ideas about entrepreneurial activity and the institutionalization of entrepreneurial activity, we can propose a mechanism for institutionalizing the infrastructure of entrepreneurship, which includes the actions of agents at the federal and regional levels in order to enhance entrepreneurial potential through targeted impact within the infrastructure (Fig. 1).
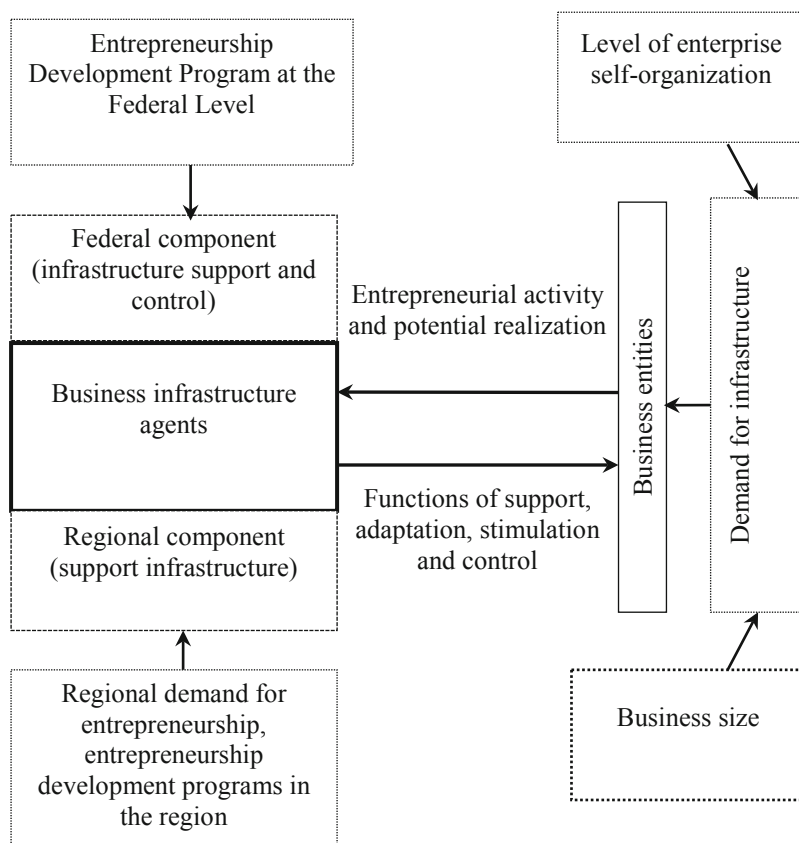
Fig. 1. Implementation of the mechanism of institutional infrastructure support to entrepreneurship. (Source: authors)

Within the mechanism, the infrastructure plays the role of a dynamic open system of agents' interaction in various areas of the management functions of control, adaptation, support and stimulation, with regard to the level of development of self-organization of business structures [8]. Wherein the infrastructure support system acts as an open platform, contributing to the achievement of a high level of entrepreneurial activity based on the regulated conditions for doing business, and at the same time maintaining entrepreneurial freedom and social justice [7]. The main parameters of synergy in the use of labor resources are presented in Table 1.

Table 1. Parameters for building the synergy in the use of labor resources

Parties involved	Objectives of parties	Interaction terms	Interaction indicators	Key interaction structures
Entrepreneurs	To realize the labor and educational potential of employees	Development of employment centers and educational forms in the field of entrepreneurship	– level of educational programs development for SMEs, (points) – development and implementation of co-working projects, (points) – increase in the average salary of SME employees, % – additional jobs at SME enterprises, ppl. – qualification level of SME employees, (points)	– public private partnership – network business structures – objects of social infrastructure and employment, – coach centers, co-working facilities
Infrastructure Owners	To increase workforce competencies			
Government structures	To solve unemployment problems, increase labor activity of the population			

Source: authors.

In the perspective of strategic development of infrastructure participants interaction, the synergy in the use of labor resources is most effective for infrastructure implementation strategy [6]

According to the implementation strategy, achieving synergies in the use of labor resources is permissible, subject to particular tasks

– development of educational services for entrepreneurship
– introduction of educational and training projects in enterprises;
– development of public capital and co-financing tools for educational projects;
– development of mechanisms for open interaction between business, educational institutions and personnel.

3   Results

In our opinion, the educational infrastructure of entrepreneurial activity is a complex of interconnected elements represented by the training and learning subsystems in conjunction with technical and technological means (premises, equipment, the global Internet) and limited to a specific place for projects implementation. The training subsystem is represented by specialists from various sectors of the economy engaged in training and sharing their knowledge, best practices and experience. The learning subsystem is represented by people interested in developing their entrepreneurial skills, acquiring knowledge and solving existing problems in business management [2]. These include students of universities of the Republic of Tatarstan, employees of state and public organizations, commercial enterprises. The technical and technological means include all the necessary audio and video equipment, software, furniture, stationery and others [1].

The problems of developing the educational infrastructure of entrepreneurship in the Republic of Tatarstan are directly related to the aforementioned elements and, by analogy with the theory of constraints by E. Goldratt, the quality of ongoing educational projects will be determined by the quality of the weakest subsystem [3]. Thus, we further identify and formulate the key problems of the educational infrastructure of the region. Currently, a conflict of interests between the learning subsystem represented by the target audience and the training subsystem, represented by various kinds of business trainers, is widespread. This problem can be identified as an information conflict, when the educational material presented is either not properly understood (students cannot understand it), or is insolvent (irrelevant and invaluable).

On the one hand, the target audience of educational events can be described as low-quality, as it is represented by disinterested students. An ineffective advertising campaign, failing to attract the highest quality audience, leads to the fact that the information is not properly absorbed and the effectiveness of the event tends to zero. A separate issue is the lack of a selection, monitoring and control system for those wishing to participate in educational activities. The organizers, upon reaching the required number of participants (as a rule, limited with the capacity of the room where the educational event will be held or with quota according to the statement of work) stop the advertising campaign. In practice, most of the declared participants refuse or cannot attend the event and the customer/organizer does not achieve the goals.

When the organizer is a commercial company, then its goal is to maximize profits, that is why it does not stop advertising campaigning for an event until its inception. However, if the state acts as an initiator, and the public organization as an organizer, then in practice the advertising campaign is ineffective in 80–85% of cases. Effective channels for disseminating information on educational events dedicated to entrepreneurship in the Republic of Tatarstan are: social networks, announcements on websites and digital media, printing materials, mailing lists, calling businessmen and public organizations according to available databases, contextual and targeted advertising.

On the other hand, the quality of the training subsystem is not trustworthy. Most of the so-called business trainers frequently invited to participate in educational events are the same undergraduate and postgraduate students of Kazan universities or regional centers, professors from regional universities, failed entrepreneurs who share theoretical knowledge and lack business management practices. The lack of competencies of a real business trainer complicates the educational process devoted to address challenges facing small and medium-sized enterprises. Such kind of specialists and so called "practitioners" teach a theoretical course by inertia without going into practical aspects; they do not highlight pitfalls and do not provide in-depth materials within an educational event.

The third and most important issue is the discrepancy between the offered educational courses for entrepreneurs in the Republic of Tatarstan and the real needs of the business sector. Quite often, the key principle of marketing is violated - to produce what is needed, and not what is possible. An entrepreneur running business for more than ten years is not interested in wasting his valuable time and listening to a course devoted to "Typical mistakes of a novice entrepreneur" from a person giving a lecture at sight. Businessmen need to consult with more qualified entrepreneurs and get their

advice on business development and difficult business cases. Unfortunately, modern business trainers are trying to make their program the most attractive and colorful, but they do not have strong practice and cannot professionally advise heads of business entities.

The fourth problem is the centralization of the educational infrastructure for the development of entrepreneurship in the capital of the Republic of Tatarstan, Kazan. Despite a large number of platforms, industrial parks and other business support entities in other cities and regions of the republic, the main efforts are always happening in the capital, which is a big omission. We cannot say that educational events are not implemented in the districts, however, the question of the competence of the business trainers who implement them, the relevance of the topics and their relevance to the real business problems of a given city or region is especially acute.

4   Discussion

Studies in the field of infrastructure support for entrepreneurship of the Republic of Tatarstan show that republic has a sufficiently developed socio-economic system, but there are certain problems of infrastructure support for small businesses identified in the process of determining the effectiveness of the infrastructure support system, and they form the key problems of the socio-economic development of the Republic Tatarstan. Among these problems, first of all, a weak coordination in the activities of infrastructure elements and the short of qualified personnel in infrastructure sectors. All these problems must be solved within the strategy for developing infrastructure support for entrepreneurship, thereby providing directions for the development of the mechanism of infrastructure support [8].

The system of infrastructure support for entrepreneurship is created to balance the interests of participants in the socio-economic space and to transform the relations between entrepreneurship in the region and state regional bodies from the traditional interaction between the object and the subject (with the participation of infrastructure institutions as intermediaries) to partnership relations [5]. The identified negative trends in educational infrastructure have developed for two main reasons. Firstly, the interest in entrepreneurial activity among the population has increased due to the vigorous activity of state bodies in this direction. As a result, educational events have turned into a specific product sold on a wide market through social networks, because demand creates supply. These products include various kinds of webinars, master classes and speeches by unknown business gurus, without real management experience. Secondly, educational events aimed at supporting and developing small and medium-sized businesses tends to be quickly implemented on their own.

As a result, most qualified trainers are rarely if ever attracted, as the organizers aim not to improve the educational infrastructure of entrepreneurship in the Republic of Tatarstan or to solve the real problems of businessmen by means of professional consulting, but to make a profit. Maximum financial result from such events is possible only through costs optimization or reduction resulting in the quality of implemented events.

5   Conclusion

Achieving sustainable development of educational infrastructure is impossible without providing infrastructure to entrepreneurs. From the position of managerial solutions at the level of developing the enterprise infrastructure in the Republic of Tatarstan, it is necessary to expand the infrastructure support system by creating a unified information and analytical base of entrepreneurial activity, maximizing the interconnection of entrepreneurs with developing infrastructure elements – the development of training and internal communication; establishing a body for the interconnection of entrepreneurs and state authorities as partners, implementing structural and functional relationships between infrastructure elements (by enhancing the self-organization of each element in the overall system and establishing information interaction).

The development of the educational infrastructure of entrepreneurship in the Republic of Tatarstan has a number of weaknesses to work and improve. Undoubtedly, in recent years the situation has significantly changed for the better, but it is necessary to carefully approach the issues of selecting business trainers, presented content, as well as the target audience of such events.

References

1. Akhmetshin, R.M., Narsov, I.A.: Educational entrepreneurial infrastructure development challenges in the Republic of Tatarstan. Kazan Econ. Bull. **5**(25), 73–76 (2016)
2. Antonchenko, N.G., Kalenskaya, N.V.: Developing a methodology for assessing the efficacy of managerial decisions in entrepreneurial establishments. Life Sci. J. **11**(7), 365–369 (2014)
3. Dettmer, W.: Goldratt's Theory of Constraints: A Systems Approach to Continuous Improvement. Alpina Publisher, Moscow (2010)
4. Durkheim, E.: The Division of Labour in Society. The Method of Sociology. Science, Moscow (1991)
5. Kalenskaya, N.V., Akhmetshin, R.M., Grigoryeva, L.L.: The development of state regulation in small entrepreneurship infrastructure provision. Mediterr. J. Soc. Sci. **5**(18), 27–33 (2014)
6. Kalenskaya, N.V., Palyakin, R.B., Tarkaeva, N.A.: Strategic management of regional business infrastructure system. Mediterr. J. Soc. Sci. **18**(5), 311–316 (2014)
7. Palyakin, R.B.: Formation of a Binary Model of the Development of the Entrepreneurial Infrastructure Based on the Asymmetry of the Institutional Environment. Paragraph, Kazan (2018)
8. Palyakin, R.B., Akhmetshin, R.M., Rolbina, E.S.: Modeling of an entrepreneurial infrastructure support system in the Republic of Tatarstan. Issue Multi. Soc. Sci. Manage. **10**(1), 162–167 (2019)
9. Roger, S., Nijkamp, P.: Knowledge spillovers, entrepreneurship and economic development. Ann. Reg. Sci. **43**, 835–838 (2009)
10. Strauss, T.: Growth and government: is there a difference between developed and developing countries. Econ. Governance **2**, 135–157 (2001)

Dispositional Education as a Resource of Innovative Economy

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Abstract. This article discusses the issues of improving the education management system, since the methodological level of its development does not fully reveal their essence, which indicates a divergence of theoretical positions. The emphasis is on dispositional technologies in education. The main components of scientific novelty is the effective functioning of the higher education system, which is the strategic task of the state at all levels of its development, on the solution of which depend both social stability and economic growth, as well as the country's competitiveness.

Keywords: Innovation · Innovative development · Innovative education · Knowledge management · Innovative economy · Knowledge economy

1 Introduction

The role and impact of higher education on the country's economic growth is increasing every year. As a result of analysis and research of foreign experience in ensuring the economic sustainability of universities, it was noted that a special role is given to both the state and the private sector. The role of the state is focused on financial support for innovation and research, the positioning of universities in the global academic community, while the role of business structures is focused on building cooperative and integration ties with the higher education system. The existing mechanism ensures the economic sustainability of universities, and its main criteria are the development of the export of educational services, the availability of educational services and the integration of academic and scientific activities with business processes in the economy.

The transition to the fourth industrial revolution, aimed at restructuring all spheres of life based on digital technologies, provides a change in the status of a classical university, which becomes a driver of innovative socio-economic development. In modern conditions of economic and social development of society, new management tools for higher education institutions are needed. The search for new models for the integration of innovative higher education will help to identify factors that influence the country's economic growth.

The intensification of the innovative development of Russia should be coupled with the progressive and dynamic development of human capital and the entrepreneurial ability of society, which in world practice are considered as leading state economic

resources that ensure the progressive development of industrial production and the most important industrial sectors. The practice of the last 20 years has shown that the high level of use of natural resources and the intensive lending policy of small, medium and large enterprises have not fully contributed to the innovative development of industry, the formation of a new socio-economic structure.

At the present stage, innovative activity in industry does not exceed 2.5–3%, and innovative projects are implemented by an extremely small number of industry entities. A comprehensive change in the current situation should be directly connected by creating an effective system of functioning of the higher education system, taking into account its integration with the real sector of the economy.

For Russia to become one of the five world economies in the world, it is necessary to have an efficiently functioning higher education system in the country, providing fundamental scientific, socio-cultural and practical training of competent specialists, able to adapt to changing situations in the production and social sphere, as well as to create new knowledge necessary for the formation and development of production of the fifth and sixth technological structures. In the light of the above, scientific research aimed at studying the interaction of factors of higher education and other factors of innovative development in terms of economic growth are very relevant.

2   Methodology

To develop the technological sustainability of higher education institutions, the main guideline of the development strategy of Russia is focused on the modernization of teaching methods and the active development of the online education system. Most higher education institutions retain the traditional form of work from potential contractors: enterprises; governing bodies; financial structures; institutional structures of various sectors of the economy [1].

Together, the organizational and economic mechanism for ensuring the sustainable economic development of universities makes it possible to:

– implement in a new quality the existing educational technologies, including distance and dual forms,
– implement at a qualitative level additional subsystems of economic sustainability, such as marketing and branding in the system of university activities.

At the present stage in world practice, in the framework of ensuring technological (production) sustainability, universities have a significant "arsenal" of educational technologies.

In world practice, such innovative teaching technologies as information, communication, and interactive have become widespread.

Interactive technology is based on innovation activity. The organization of interactive learning involves:

– modeling of practical market situations,
– use of variable case studies,
– interaction of information flows and logical methods of thinking.

To ensure a high level of market and technological sustainability, organizational sustainability through the use of managerial and organizational innovations is of particular importance. Based on the scientific generalization of modern theoretical approaches to dispositional education, we believe that the development of universities is the achievement of an equilibrium state between all types of sustainability and the university environment by building adaptive systems (dosing managerial influences and investments in development), and also that the essence of economic sustainability consists of the three backbone categories, such as sustainability, balance and sustainable development.

In the short term, the principles of building adaptive systems should become:

– building an economy based on "knowledge", and not on resource potential;
– integration of academic and scientific activities;
– integration interaction of universities with the manufacturing and non-manufacturing sectors of the economy;
– transition of the education system from an extensive to an intensive path of development. Knowledge management systems belong to the class of information systems used to manage the knowledge of organizations.

Under the management of university knowledge should be understood:

– a set of processes related to the creation, distribution, processing and use of knowledge of the activities of the university;
– a systematic process established by the university to work with information and knowledge resources.

The basis of a new form of managerial technology in education is knowledge management:

1. Management technology for the operational coordination of traditional university values with entrepreneurial ones.
2. Management technology for the construction of extended peripherals, focused on external relations and research units
3. Management technology stimulating the academic structure – the mainstay of an entrepreneurial university.
4. Management technology of the integrated change-oriented entrepreneurial culture.
5. Management technologies for the development of own region and cooperation with other universities.
6. Management technologies for creating a university without borders.

3   Results

Summarizing the conceptual approaches to the definition and essence of dispositional education, we can conclude that the sustainable development of universities is achieved through managerial impact, the availability of financial stability and investment in development, and, therefore, an urgent direction is to consider the principles of building modern mechanisms to ensure this sustainability. For the purposes of studying

the increment of new knowledge, directions for their systematization have been developed (Fig. 1).
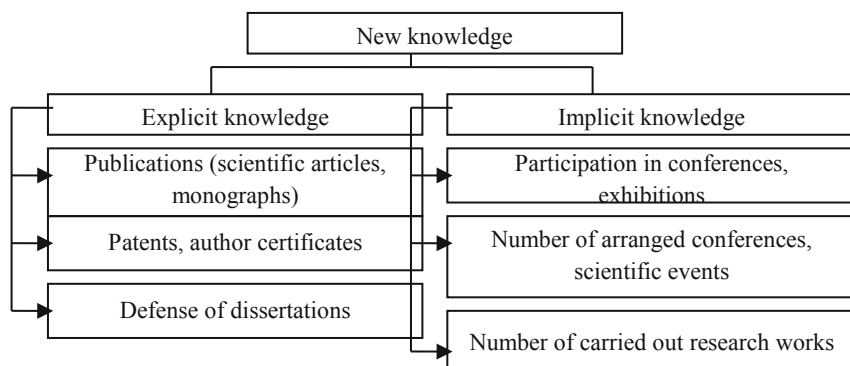
Fig. 1. Systematization of new knowledge. (Source: authors)

The modern concept of education is based on the priority of knowledge, intelligence, and erudition. The specifics of higher education institutions determines the diversity of corporate governance, which includes mechanisms by which the university is managed and controlled. Corporate governance implies a system of relationships between university management, academic council, professional union, board of trustees or supervisory board, shareholders and other interested parties. Corporate governance should be based on a structure that is created to achieve the goals of the university and their control.

Corporate governance is recognized as a model that is designed, on the one hand, to regulate relations within the organization, and on the other hand, to coordinate the goals of the organization with external stakeholders. Corporate management systems of higher educational institutions should be based on the use of innovative organizational and managerial structures. The classical structure of university management is linear-functional. The university management model is a vertical structure. Linear-functional structures in the conditions of innovative development cannot ensure the effective functioning of innovation-oriented autonomous higher education institutions [5].

For innovation-oriented autonomous universities, organizational-managerial structures based on the principle of decentralization are most inherent. In the development and implementation of organizational innovations in higher education institutions, the main provisions of modern development concepts should be taken into account. An assessment of the interaction of components is based on a modified Lotka-Volterra interaction model. This statement is the basis for identifying new management technologies in education for knowledge management. In studies on the management of inter-organizational interaction to identify the technology of the interconnections of the organization, organizational changes and organizational training, the Lotka-Volterra system aroused great interest [6]. The Lotka-Volterra model makes it possible to differentiate the impact of internal interactions and external cooperation on the growth of

knowledge in the organization. The following characteristics of knowledge formation are defined in the Lotka-Volterra system:

1. Endogenous growth rate: This is an internal rate of knowledge accumulation (or knowledge destruction) within an organization.
2. Speed of internal interaction.
3. External speed of interaction: This is the speed at which knowledge is created or destroyed in an organization through interaction with another organization. This indicator can be positive if the interaction brings new knowledge to the organization or negative if the organization loses knowledge in the process of interaction with another organization.

   Mechanisms that bring new knowledge to the organization:

1. Endogenous growth (positive part a_i) due to the creativity of individuals or groups, the transfer of knowledge from the environment (with the exception of another organization).
2. Constructive internal interactions (the positive part of b_i) that makes it possible to build architectural knowledge when people from different groups in cooperation build new knowledge based on their specific knowledge.
3. Constructive interaction with another organization (the positive part of c_{ij}) in favor of transferring knowledge from one organization to another.

   Mechanisms that remove new knowledge from the organization:

1. Endogenous decline (the negative part of the speed a_i) due to the standardization of individuals, the lack of transfer of knowledge from the environment, the outflow of key individuals;
2. Destructive internal interactions (negative part b_i) are often necessary in order to be able to effectively use new knowledge with limited resources;
3. Destructive interactions with another organization (negative part of c_{ij}), where knowledge is stolen or transferred with negative consequences to one of the organizations, for example, with the transfer of key personnel.

   The question arises how to interpret the endogenous growth rate a_i, within the population (internal) b_i to interpret the interaction rate, and between the population c_{ij} to interpret the rate of (external) interaction [7]. Thus, the symmetry between both organizations (as is the case for competition or symbiotic models) is not favorable for the creation of new knowledge, as this leads to stability through negative feedback or to instability, through positive feedback.

4   Discussion

In the scientific literature, the problems of education are constantly being raised, but, unfortunately, most often they are unsystematic, fragmented in nature and concern any of its individual sides. In world practice, significant attention of scientists is focused on the economic sustainability of universities. In this aspect scientific works of such scientists as Koryakov [9], Malysheva [10], Mikhalev [11] and others can be noted.

Considered concepts of economic sustainability are associated directly with the activities of industrial enterprises, the organizational and economic mechanisms of which may not be fully associated with the activities of higher education institutions. In recent years, new scientific papers have been devoted to the economic sustainability of the education system. Here can be noted the scientific papers of scientists such as Belyakov, Belyakov, and Klyachko [2], Gusev and Polovova [5], Bely, Bespalova, and Romanova [1], Savenkova and Sovetkina [14], Popov, Vlasov, Orlova [13] and others.

To ensure the sustainable economic development of universities, a series of phased reforms were implemented, such as decentralization of management, the introduction of a credit training system, the development of a three-stage training system, academic freedom and academic mobility. The creation of research universities and the introduction of university autonomy based on corporate governance principles are planned as strategic guidelines. Meanwhile, the complex of unsolved problems in the sustainable economic development of the higher education system remains quite wide.

Despite a large number of fundamental studies by foreign and domestic scientists, the problems of adapting positive global experience in creating a new model of innovative development of the country's economy, based on the integration of higher education, science and industry, have still been poorly studied. Dispositional education involves communicative orientations, personality traits, and individual predispositions.

An analysis of the literature data suggests that the monitoring system for the effects of teaching communicative skills should include those that are directly related to the components of communicative competence. A special place is occupied by studies in which the study of joint (parallel) changes in various types of components of competency is carried out: knowledge and skills, knowledge and attitudes (dispositions), skills and attitudes (dispositions) [2]. The central place in the structure of a person is occupied by the possibilities of its self-realization in communication. The institute is the highest step in the system of continuing business education. In the disciplines, the study of which in accordance with the state educational standard is mandatory, integrated curricula are compiled.

The change in the economic situation in the country posed the institute the problem of providing the educational process with educational and scientific-methodological materials. The accumulated educational literature is now beginning to become obsolete over the years. However, the transition to a personality-oriented education requires a significant change in the information and educational environment. It is about creating an electronic library and video library. And although electronic materials do not replace the teacher as the main carrier of information on the studied subject, the electronic library plays an important role in providing the student with the necessary procedural information in supporting motivation and maintaining interest in learning, setting out common goals and concretizing the objectives of the course, explaining difficult ideas and concepts. The electronic form of the course makes it possible to make quickly changes to the content and structure of the course, due to the development of existing and the emergence of new technologies.

A flexible system of settings makes it possible to adapt the system to the individual characteristics of the university. It reflects the basic data that is used by the entire system during the training process. Among them, the training system, the proportion of average current, rating, exam grades. In the final, the maximum possible percentage

change in the individual curriculum. Effective education quality management is the ability to monitor and analyze performance data and make timely decisions [3].

Distance learning with interactive tools, a testing system makes it possible to conduct an interesting and objective learning process. Developing course packages requires the involvement of the most experienced teachers in this creative work. Such an organization of work makes significant changes in the control and assessment of students' knowledge, and contributes to the training of a new level specialist. At all stages of the work, it is proposed to use the included observation method in the educational process of teaching students. In the conditions of the formation of social and moral orientations, the student must develop the ability to independently solve the problems posed, becoming an initiative, business, and creative person. In many universities, new technologies for the provision of services are being tested, distance learning, new information technologies are being introduced. In this aspect, technologies such as credit and distance learning technologies, case technologies can be noted. Technological innovations include new teaching methods and technologies using information technologies, the development of which does not always bring the desired results. Distance learning technologies should be based on distance learning information exchange tools, the strategic focus of which is corporate training [4].

5   Conclusion

In the modern world there is an increase in the economic value of knowledge that:

- the development of progressive forms of organization of production, thereby ensuring an increase in GDP growth,
- increase the competitiveness of domestic goods and services, reduce the return on investment,
- form a healthy social environment, it is better to adapt to its rapidly changing conditions.

We believe that knowledge management plays a key role in shaping intellectual capital. Knowledge is an object (property), while an organization (its employees) is a subject (owner). In modern conditions there is no clearly formed model of higher education aimed at the needs of the market in relevant specialists. But, it should be noted that none can be called innovative. At present, they are leaning toward models of universities directly, since universities themselves determine innovative parameters of education [8].

Nevertheless, several types of modern models of innovative higher education can be distinguished. So, according to the model of network interaction, operate many universities. In market conditions, higher education institutions carry out the production and dissemination of knowledge, the formation of public and professional consciousness, and the development of culture. At the same time, important problems of the underdevelopment of the innovative component of higher education are: ineffective system of professional development of the faculty; low labor motivation, etc. [9].

The domestic higher education system is under the influence of the following threats:

– the lack of an adequate system of performance indicators for universities,
– underdevelopment of the system of strategic partnership between universities and production in solving problems of professional education.

The strength of universities is the development of strategic partnerships between higher education institutions and business structures, state and public organizations. The university development strategy should be innovative, since innovation-oriented organizations are able to best respond to market demands and the actions of competitors. It should satisfy the needs of society in the formation of a professional encyclopedist, able to withstand entropy processes in society, to ensure the achievement of a systematic, comprehensive quality of all aspects of its activities. The functioning and development of the university is carried out by pooling resources with its partners, implementing targeted programs together with the university and participating in its development [10].

The SMART University concept provides students with the opportunity to study at foreign universities on the basis of free access to international educational content; the opportunity to work in the specialty acquired at the university; rational alternation of the process of obtaining knowledge in the classroom with work on-line.

It is advisable to introduce the model of a research university primarily in humanitarian universities, where basic research predominates, and the model of an innovative university in technical universities with a developed material and technical base for applied research and development and commercialization of their results. The introduction of the criteria of economic sustainability in the practice of universities and their widespread use in practice will significantly increase the economic sustainability of the higher education system in Russia [12, 13].

The introduction of innovations should become attractive for business entities themselves, therefore, it is necessary to create free competition in the market. In addition, a mechanism of incentives and tax incentives should be created for domestic innovators. In particular, it is possible to exempt partially from taxes those business entities that are actively introducing innovative products in their activities or it is possible to use a mechanism of partial state funding for the development of innovative products and their implementation in practice.

The theory of system integration of universities with the real sector of the economy is supported by a number of scientists. So, in the works of scientists it is noted that the economy should be futures, that is, work for the future, and the development processes today should not focus on quantity, but on quality and anthroeconomics – investing in a person. Thus, it is necessary to further develop and improve this process. Improving sustainable economic development offers a package of measures that will allow universities to reach the world level of training.

References

1. Bely, E.M., Bespalova, M.P., Romanova, I.B.: On competitiveness and market stability of state universities. High. Educ. Today **6**, 15–17 (2011)
2. Belyakov, S.A., Belyakov, N.S., Klyachko, T.L.: Analysis and Assessment of the Economic Sustainability of Universities. Maks-M, Moscow (2008)
3. Castiaux, A.: Inter-organizational learning Lotka-Volterra modeling of different types of relationships. In: Kelly, G.J., Walker, P. (eds.) International Conference of the System Dynamics Society – Community-Level Systems Thinking, pp. 2–6. Springer, Cham (2004)
4. Fedorova, A.V.: Integration of universities and innovative enterprises: aspects of knowledge management. Econ. Manage. Innov. Tech. **12** (2013). http://ekonomika.snauka.ru/2013/12/3598. Accessed 11 Apr 2020
5. Gusev, Yu.V, Polovova, T.A.: Problems of a stable trajectory of universities functioning. ETAP Econ. Theory Anal. Pract. **1**, 112–121 (2009)
6. How, J.: Crowdsourcing. Collective Intelligence as a Tool for Business Development. Alpina Publisher, Moscow (2012)
7. Ivinskaya, I.V.: Enterprise activity of high school as the factor of economic development of region. Socio-Econ. Phenom. Process. **10**(032), 53–60 (2011)
8. Kalinina, S.V.: Assessment of the competence of the teaching staff in the quality management system of the university. Manage. Russia Abroad **1**, 115–122 (2011)
9. Koryakov, A.G.: Methodological issues of sustainable development of enterprises. Issues Econ. Law **4**, 4–5 (2012)
10. Malysheva, M.A.: Modern Teaching Technologies at the University (Experience of the HSE in St. Petersburg): A Teaching Aid. HSE Research Institute, St. Petersburg (2011)
11. Mikhalev, O.V.: Economic Stability of Economic Systems: Methodology and Practice of Scientific Research and Applied Analysis. Publishing House of the St. Petersburg Academy of Management and Economics, St. Petersburg (2010)
12. Niu, K.-H.: Knowledge management practices and organizational adaptation Evidences from the high technology companies in China. J. Strategy Manage. **3**(4), 325–343 (2010)
13. Popov, E.V., Vlasov, M.V., Orlova, N.V.: Transaction costs of generating explicit knowledge of an academic institute. Manage. Russia Abroad **1**, 107–114 (2011)
14. Savenkova, Y., Sovetkina, A.A.: Management of the competitiveness of a university in modern socio-economic conditions. Educ. Issues **4**, 182–198 (2009)

Innovative Methods of Managing
the Company's Financial Results

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Abstract. The article investigates the experience of using innovative methods of managing financial results in a joint venture and the possibility of using these methods at a Russian enterprise. The importance of managing financial results for an individual enterprise and for the country's economy as a whole is indicated. The research includes CVP analysis of the enterprise, DuPont model, and profitability analysis of the enterprise. The authors make conclusions about the applicability of classical and innovative methods at each of the considered enterprises. Recommendations for managing financial results within the research object are proposed, their effectiveness is calculated, and the repeated CVP analysis was performed based on the expected results. It is concluded that these measures will be effective for the company in various ways. They can be implemented together or separately. However, their combined effect may differ from the sum of the effects.

Keywords: Financial results of the company · Innovative management
methods · Profit · Profitability

1 Introduction

The financial result of an enterprise is an indicator that affects not only the enterprise itself, but also the state as a whole. This indicator allows you to determine the stability of enterprises in a particular industry, as well as to increase the market value of the enterprise. A high-quality system for managing financial results is a fundamental basis for ensuring sustainable growth of an economic entity. The practical significance of this study is to develop specific proposals for improving the organizational and economic system for managing financial results at the enterprise, which can be used by the company's management in developing a comprehensive system for this purpose.

Thus, the study of various methods and techniques for managing financial results of an enterprise is an actual and promising direction of economic research. The enterprise "EPK Samara" is the research object. This enterprise produces more than 4.5 thousand types of radial ball bearings, radial thrust bearings, and roller radial and thrust bearings. The company is part of the European Bearing Corporation, which produces bearings for all branches of mechanical engineering. The foreign representative of this corporation is the joint venture "EPK Brenco" organized with the American partner Amsted

Rail. In the framework of this study, the authors try to compare methods used at domestic and foreign enterprises of the same corporation to manage their financial results. Based on this, it will be possible to draw a conclusion about the adjustment of methods used by enterprises to improve the efficiency of their activities.

2 Methodology

First of all, it is necessary to assess the current financial condition of the research object. One of the methods used for strategic analysis of the company's financial results is a CVP-analysis, which provides an opportunity to optimally compare variable and fixed costs, as well as the price and volume of sales [2].

The main elements that are analyzed in this method are margin profit, break-even point (BEP), financial safety margin, and operating leverage. The calculation of indicators is shown in Table 1.

Table 1. CVP-analysis

Indicator	2017	2018
Revenue (thousand rubles)	4 596 856	4 741 589
VC	1 877 535	2 030 560
FC	1 081 378	1 083 262
Marginal profit	2 719 321	2 711 029
Specific margin profit	0,85	0,9
Break-even point (pieces)	1 272 838	1 197 936
Break-even point (rubles)	1 828 008	1 894 625
Financial safety margin (FSM)	2 768 848,58	2 846 964,05
Coefficient of FSM	0,6	0,6
Operating leverage	1,66	1,67

Source: authors.

As we can see, changes in the cost structure in 2018 mostly affected their variable part. Due to the decrease in production volumes in 2018, the share of raw material costs decreased. At the same time, the share of costs associated with paying for the services of third-party organizations involved in the production process has increased almost 3 times. Despite this, margin profit decreased by less than 1%. This change was caused by the revenue growth in 2018, which allowed covering increased variable costs. In 2018, the specific margin profit averaged 0.9 rubles per unit of output.

The value of the break-even point in physical terms has also decreased. At the same time, the break-even point in cost terms has increased. This is due to an increase in the share of the variable part in the enterprise's cost structure. Due to the increase in revenue in 2018, the company's financial safety margin also increased. But, despite these changes, the excess of sales revenue over its threshold value in 2018 compared to 2017 did not change and amounted to 60%. In this regard, the value of the operating

leverage has not changed much. That is, the extent of the cost structure impact on the company's revenue has not changed.

Based on the analysis, we can conclude that the increase in revenue is caused by an increase in prices for manufactured products, since the production volume tends to decrease. This method of increasing revenue is the extensive one, which is not always applicable. The "EPK Samara" cost structure is dominated by variable costs, which have increased despite a decrease in production volumes. There is an increase in the cost structure of expenses for third-party services. This leads to the assumption that optimization of this particular cost item can have a positive impact on the company's profit. In this case, it's worth considering the possibility of changing contractors who perform such services to more budget options.

Another way to reduce these costs is to link the cost item to a specific product group. In this case, it is possible to reduce costs by decreasing the production volume of goods that require the involvement of third-party organizations for their production, while increasing the production volume of other product groups. Another approach to optimizing this cost item may be the creation of the own department that would perform functions of third-party organizations. However, it makes sense to evaluate alternatives first, since there are examples where maintaining own divisions is more expensive. The next step was to analyze the profitability using the three-factor DuPont model [1]. The initial data for the analysis of the return on equity (ROE) of "EPK Samara" are presented in Table 2.

Table 2. Initial data on the company's financial results

Indicators	2017	2018	Changes, %
Net profit, *thousand rubles*	1 374 334	1 355 953	−1,3
Revenue, *thousand rubles*	4 596 856	4 741 589	+3,1
Assets, *thousand rubles*	4 953 568	4 487 981	−9,4
Equity capital, *thousand rubles*	3 903 140	3 980 251	+2,0
ROE, %	35,2	34,4	−2,3

Source: authors.

The data presented in the table indicate that the ROE indicator is decreasing in 2018 compared to 2017 by 0.8% points or 2.3%. This is because of a decrease in net profit (−1.3%) by an increase in equity (+2.0) for the period under review. To calculate the measure of influence of each of the factors on the change in the ROE index, an index factor analysis is used, in particular the method of chain substitutions (Table 3).

As it can be seen from the calculations in Table 3, the ROE decreased in 2018 compared to 2017 by 0.8%, which indicates a decrease in the efficiency of the company. ROE decreased by 0.12 p.p. because of a decrease in profitability of sales by 1.3 p.p. or 4.3%. It is possible to increase the profitability of sales (net margin) by reducing the cost per ruble of products and services provided. ROE increased by 0.36 p.p. due to the acceleration of the working capital turnover by 0.111 turns or 12.4%. ROE decreased by 0.32 p.p. due to a decrease in financial leverage by 11.1%.

Table 3. Calculation of indicators using the DuPont model

Indicators	2017	2018	Absolute change	Relative change, %	Influence of the factor
Profitability of sales	29,9%	28,6%	−1,3	−4,3	**−0,12**
Asset turnover ratio	0,893	1,004	0,111	12,4	**0,36**
Financial leverage ratio	1,269	1,128	−0,141	−11,1	**−0,32**
The combined effect of three factors					**−0,8**

Source: authors.

3   Results

3.1   The Modern System of Financial Results Management

Planning and budgeting at "EPK Samara" is carried out by the budget planning and analysis department. When the company's divisions interact, the general budget for the year is drawn up. This is a coordinated plan for all divisions and functions of the enterprise as a whole, which combines private budgets and characterizes the information flow for making management decisions. Monthly budgets are also drawn up for divisions.

The budget planning and analysis department deals with issues related to making settlements with contractors, determining the need for inventory items, drawing up revenue and expenditure budgets, the sales budget taking into account services, the cash flow budget and the balance sheet.

The sales department provides information on sales of the main production, the dynamics of finished products stocks, the project of the annual application for production for the upcoming period, etc. The production department is responsible for preparing the production and procurement budget for production needs. The department of labor and wages is engaged in the formation of the wage fund, the distribution of labor costs and the development of the production calendar for the upcoming period. The HR department is responsible for transferring funds for social programs. The technological department deals with the issues of production reconstruction and modernization, as well as reducing production costs. The production department provides information about work in progress, the accounting department – about the size and structure of tax payments, etc. (Table 4).

After analyzing this system, we can conclude that only one department – the technology management – is indirectly related to financial results management. This department deals with reducing costs, which helps to influence the financial result only from the production point of view.

Based on a comparison of the use of classical methods of managing financial results, it can be concluded that there is no particular difference at the enterprises under consideration. Therefore, classical methods will not be able to give the necessary result

Table 4. Comparison of classical methods used for managing financial results

Method	«EPK Brenco»	«EPK Samara»
Accounting policy	+	+
Information policy	+	+ −
Profit forecasting	+	+
Planning	+	+
Financial structure management	+ −	+ −
Production assets management	+	+
Managing the use of production non-current and current assets	+	+
Depreciation policy	+	+
Price policy	+ −	+ −
Assortment policy	+ −	+ −
Sales policy	+	+
Tax policy	+	+
Dividend policy	+	+
Managing the cost of capital	+ −	+ −
Risk management	+	+
Personnel policy	+ −	+ −

Source: authors.

when managing financial results of the enterprise. Next, we will consider the use of innovative methods for managing financial results at enterprises (Table 5).

Table 5. Comparison of innovative methods used for managing financial results

Method	«EPK Brenco»	«EPK Samara»
CVP-analysis	+	−
Cost-killing	−	−
Kaizen costing	−	−
Benchmarking	+	+
ERP-system	+	−
Budgeting	+	+
BSC	−	−
BRP	−	−
Brainstorming	+	+
5S	+	−
DuPont Model	−	−

Source: authors.

Most of the innovative methods of managing the company's financial results have not been applied at "EPK Samara" yet. At the same time, "EPK Branco" uses some

innovative methods for managing financial results that are not used in "EPK Samara". These methods are CVP-analysis, ERP-system and 5S-system. Therefore, it makes sense to consider the possibility of implementing some of these methods in relation to the research object.

3.2   SWOT-Analysis of the Enterprise

SWOT-analysis is one of the most common methods that assess internal and external factors that affect the company's development in a complex. It follows from the SWOT-analysis of the enterprise, that despite the large number of strengths and opportunities of the enterprise, it is necessary to take into account threats and reduce a number of weaknesses (Table 6).

Table 6.   SWOT-analysis of the research object

Strengths:	Weaknesses:
1) availability of unique technologies;	1) lack of staff (workers);
2) high level of training of working personnel;	2) uneven distribution of job responsibilities;
3) positive reputation of the company;	3) an insufficiently developed system of interaction between departments;
4) a large share in the domestic market;	4) inefficient system of rewarding employees for completing tasks;
5) high level of technical equipment in the production of new types of products;	5) high degree of depreciation of production assets in the production of basic types of products;
6) a wide range of products;	6) insufficient level of profitability
7) development of new types of bearing products	
Opportunities:	**Threats:**
1) high demand for bearings;	1) emergence of new competitors;
2) new R&D and NTP in the bearing industry;	2) the economic situation in the country;
3) preferential conditions for the production of bearing products;	3) negative changes in the tax legislation;
4) increase in government funding/grants;	4) a fixed state price for bearing products
5) increasing the state defense order	

Source: authors.

SWOT-analysis allows concluding that, despite the development and application of new technologies in the production, the availability of a wide range of products and positive reputation of the enterprise, the weak point limiting its development and, as a consequence, the increase in profits is the lack of staff, lack of clear organization units, and a high degree of the equipment deterioration. State orders build a large share of the company's orders. Therefore, a decrease in their volume can significantly affect the performance of the enterprise. However, a wide range of products can compensate for these trends by entering new markets. The insufficient level of the enterprise profitability indicates the need to improve the mechanisms for managing financial results.

In addition, the results of the SWOT-analysis clearly show that the main weaknesses of the considered enterprise are related to the imperfection of the enterprise work

organization. Such features may affect the ability to implement certain measures designed to affect the financial results of the company. Poorly organized management activities will prevent the application of new systems, or the implementation of activities will not be able to give the necessary effect.

3.3 The Improvement Directions of Mechanisms for Managing Financial Results

Based on the results of calculating the ROE indicators, it was noted that the indicators of the enterprise are lower than the values of the main competitors from China (ROE = 42.8) [4]. Previously, CVP analysis and analysis based on the DuPont model were conducted, the results of which allowed us to draw conclusions about the use of asset turnover and increased production volumes as a source for the ROE growth. Focusing on the ROE of Chinese manufacturers, we set the ROE rate at the level of ROE = 42. Based on this, it is possible to determine the target rate of return. So, if ROE is approximately equal to 42, and the average amount of equity is equal for 2018, then, substituting the indicators in the formula, we can say that the target net profit should be equal to 1,655,513 thousand rubles. This value is more than the actual value by about 300,000 thousand rubles.

Based on the results of the CVP-analysis, it should be noted that an extensive way to increase profits by increasing sales prices is not optimal for the company. The risks of reducing revenue while maintaining prices are not so great, which is due to the presence of regular customers, a high level of products quality, as well as a good reputation of the manufacturer. Therefore, it makes sense to use the operating leverage to increase the financial result. In this case, there is a possibility of transferring a part of variable costs to the permanent category. Let's consider the cost structure of the enterprise (Table 7).

Table 7. Cost structure of the company for 2018 (thousand rubles)

Real	Prospective
Variables: 2 030 560 Including: – raw materials: 1 637 041 – third-party services: 393 519	Variables: 1 768 692 Raw materials: 1 768 692
Constant: 713 440 Including: Wages: 431 402 Deductions from wages: 121 724 Depreciation: 111 843 Other expenses: 48 472	Constant: 1 049 810 Including: Wages: 684 227 Deductions from wages: 205 268 Depreciation: 111 843 Other expenses: 48 472
Cost price: 100% Variables: 74% Constant: 26%	Cost price: 100% Variables: 63% Constant: 37%

Source: authors.

As you can see, reallocating a variable cost item such as third-party services to a fixed cost item allows reducing the share of variable costs in their overall structure, which is what the impact of the operating leverage is manifested in. It is also possible to influence the financial result by accelerating the turnover of assets through reducing the duration of the production cycle and the loss of working time. All this can be implemented through the modernization of the company's financial results management system. Based on all calculations and conclusions, we can offer the following recommendations for improving the management of "EPK Samara" in relation to the financial results.

First of all, it is the implementation of the lean production system in the workplaces not only in production, but also in engineering and technical departments. The responsible division for the operation of this system will be the production department and employees who perform the necessary functions at their workplaces. The main costs associated with the implementation of such a system are costs of maintaining cleanliness and order in the production, as well as costs of conducting an audit of the implementation of standards associated with the existing remuneration system. Another activity that can affect the target profit is the influence on variable costs such as third-party services (for example, annealing and rolling out components, as well as their transportation). These costs make up a large share of the total cost structure, and, as a result, have the greatest impact on the production cost.

There are several ways to reduce costs. The first is to change the counterparty. If there is such a possibility, it makes sense to find another supplier with more favorable conditions. If this is not possible, the enterprise management should consider the opportunity of opening the own department that would do similar work. However, first of all, it is necessary to assess whether this will be cost-effective for the company. Costs of creating a workshop, attracting additional employees, purchasing raw materials, etc. should be taken into account.

Initially, this measure requires quite high costs associated with the direct creation of workshops and the purchase of equipment. At the same time, in the future, costs will consist of expenses for raw materials, maintenance of the workshop and wages for additional workers. However, it is assumed that these costs will be significantly lower than when contacting contractors. If such a measure is profitable, the company will be able to reduce the level of variable costs, which will also reduce the production cost. The company will be able to increase production volumes by reducing costs, as well as speed up turnover, since the dependence on contractors will be less. Based on this decision, the authors performed a repeated CVP-analysis after transferring part of the costs from the variable category to the constant one (Table 8).

The results of the repeated CVP analysis show that with unchanged revenue and sales volume, the transfer of a part of variable costs to the category of constant ones enables an increase in the margin profit by about 12%, while the break-even point in physical terms decreases by almost 32%, and the financial safety margin increases by 16.6%. It is a point when the effect of the operating leverage is clearly shown, the value of which has decreased by almost 15%. And the further the company is from the break-even point, the smaller the operating leverage is.

Table 8. Repeated CVP-analysis

Indicator	Expected value	Changes, %
Revenue (thousand rubles)	4 741 589	–
VC	1 697 941	−16,4
FC	892 792	+25,1
Marginal profit	3 043 648	+12,3
Specific margin profit	1,1	+22,2
Break-even point (pieces)	811 629	−32,2
Break-even point (rubles)	1 099 889	−42
Financial safety margin (FSM)	3 319 112	+16,6
Coefficient of FSM	0,7	+16,7
Operating leverage	1,42	−15

Source: authors.

4   Discussion

Considering the management of financial results of an enterprise, a lot of authors note that financial indicators are largely dependent on various management mechanisms used at enterprises [5]. They also describe the impact of innovative methods of managing the company's financial results on the effectiveness of its activities. It is believed that a greater effect is achieved when several innovative mechanisms are used together [7]. Some authors note that the choice of innovative mechanisms for managing financial results for a particular enterprise depends on its accounting policy, financial indicators, risk levels, and the enterprise itself [3]. Other scientists note the inadequacy of classical mechanisms for managing financial results in relation to modern realities. In this regard, the importance of using innovative mechanisms to influence the enterprise financial efficiency is confirmed [6].

5   Conclusion

The study confirmed the need to use recommendations to optimize and improve the mechanism for managing financial results at the enterprise:

– implementation of the lean production system in the workplaces of employees not only in the production, but also in engineering and technical departments,
– creation of additional production workshops that will substitute services of third-party organizations.

Based on the results obtained, we can conclude that the enterprise uses only a few innovative methods for managing financial results, and these methods do not give the result needed. After conducting the CVP-analysis and using the DuPont model, it was found out that the variable part prevails in the cost structure, costs of services from third-party organizations. In order to optimize the cost structure and increase profits, it is proposed to use the 5S system and create the own workshop, which would substitute

services of third-party organizations. Summing up, we can conclude that these measures could be effective for the company in various ways. They can be implemented together or separately. However, their combined effect may differ from the sum of the effects.

References

1. Dauphiné, A.: Dupont and systemic models. Bulletin d'Association De Geographes Francais' **95**(3), 361–370 (2018)
2. Kenton, W.: Cost-volume-profit – CVP analysis definition. Corporate Finance & Accounting (2020). https://www.investopedia.com/terms/c/cost-volume-profit-analysis.asp. Accessed 11 Apr 2020
3. Kober, R., Subraamanniam, T., Watson, J.: The impact of total quality management adoption on small and medium enterprises' financial performance. Account. Finance **52**(2), 421–438 (2012)
4. Luo, H.R., Wang, R.: Foreign currency risk hedging and firm value in China. J. Multinational Financ. Manage. **47**, 129–143 (2018)
5. Ma, W., Jin, M., Liu, Y., Xu, X.: Empirical analysis of fractional differential equations model for relationship between enterprise management and financial performance. Chaos Solitons Fractals **125**, 17–23 (2019)
6. Quon, T.K., Zéghal, D., Maingot, M.: Enterprise risk management and business performance вuring the financial and economic crises. Probl. Pers. Manage. **10**(3), 95–103 (2012)
7. Rasid, S.Z.A., Isa, C.R., Ismail, W.K.W.: Management accounting systems, enterprise risk management and organizational performance in financial institutions. Asian Rev. Account. **22** (2), 128–144 (2014)

Analysis of Competitive Strategy Development in an Innovative Company

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Abstract. This paper presents a thorough analysis of the factors that determine the development of competitive strategy in an innovative company. The study is based on the data of "Nanotechnology center of Samara *oblast*" Limited Liability Company for the period up to 2025. The "Strategy for Spatial Development of the Russian Federation" provides for the acceleration of scientific, technological and innovative development of the Russian Federation via the promising large centers of economic growth. This strategy and other national projects in the country require specific instruments for their implementation. Application of modern technologies represents one of such instruments and thus, there is an urgent need to explore them in details. The aim of this study is to analyze the factors that determine the development of competitive strategy in an innovative company. The methodology applied in the paper includes the tools and methods of strategic planning. The strategy development stages of the innovative company (Nanocenter) are investigated. The forecast of the company's key economic indicators is made. The transition to the new "innovation pipeline" model is justified in this study.

Keywords: Forecasts · Innovative company · Startup · Strategic planning

1 Introduction

Central to the constant growth in the RF innovative development is the creation of high-tech companies, implementation of innovative activities bundled up with R&D and aimed at commercialization, alongside with the modernization of existing production facilities and organization of new ones [8]. The concept of technological breakthrough encompasses these and various other tasks. Indeed, it is impossible to create competitive advantages for industries without developing and implementing technological innovations, developing modern infrastructure, and organizing cooperation and collaborations. Along with these, the accompanying tasks of companies are to survive in a crisis, reduce risks, increase sustainability, strengthen the role of Intellectual Property (IP), improve the competence and skills of personnel, invest capital, change the structure of production, etc.

The development of key industries and areas that can bring Russia to a new level of technological development is possible through the formation of a multi-industry

complex based on modern and globally competitive technologies, and the activation of the development, implementation and commercialization of innovations. All these activities require the development of methods and tools for the strategic development of both existing traditional industries and modern newly created companies. The trends of the country's economy to move along the innovative path of development determined the setting of strategic planning tasks at the federal and regional levels, as well as at the level of companies and industrial enterprises [10].

This strategic planning process is essential for innovative business. Undoubtedly, the pace of economic growth in this country is largely dependent on innovative companies. The study of the processes of forming competitive strategies in innovative companies is one of the most relevant and paramount both in economic theory and in economic practice. The aim of this study is to analyze the specific factors that determine the development of competitive strategy in nanotechnology center.

It should be noted that most of the research is based on foreign data and evidence and systematizes the concepts that were formed in foreign companies, which, in some cases, makes it difficult to apply it to the domestic business environment [5, 6]. This is caused by the specifics of the organizational structures of large enterprises and limited information about the market [1].

Although the solution to many theoretical, methodological and applied problems in the subject area under study has been found, still the key characteristics of strategic development of innovative companies engaged in serial creation and development of startups, the importance of which for the economy has been empirically proven, nave not been sufficiently studied and justified [3].

2   Methodology

This study uses methodological approach based on the following methods of strategic planning.

1. External audit, which implies collecting information about the macro-and meso-environment in order to identify trends in the development of the industry, especially the relationships of participants in production chains.
2. Internal audit, which implies conducting an analysis of the company's own capabilities for strategy formation, i.e. management analysis, analysis of internal resources and capabilities using the method of expert assessments, economic and statistical forecasting methods.

The investigation is concerned with "Nanotechnology center of Samara *oblast*" Limited Liability Company, which represents a set of business units and business processes aimed at commercializing technologies in the field of nanoindustry, based on the combination of real estate, laboratory and technological equipment, as well as a set of marketing and business support services for innovative companies through technology transfer and the creation of new companies.

3   Results

Nanotechnology centers are among the range of companies that form the framework of the RF innovative ecosystem. Such centers are often defined as venture construction companies and their objectives are determined as follows:

– transfer and commercialization of new technologies – creation of innovative startups,
– identification of advanced technologies,
– support the startups at the initial stage,
– research and development procedures,
– business formation.

To provide venture construction and guarantee an innovative way for development of the economy in the region, "Nanotechnology center of Samara *oblast*" Limited Liability Company (Nano center, NC S*O*) was founded in 2015. Currently, the stage of the regulatory documents pooling alongside with logistics, and partner networks formation has finished and the team building stage has been completed. The development of the company's medium-term strategy for the period up to 2025 is now on the agenda of "Nanotechnology center of Samara *oblast*" Limited Liability Company. As NC S*O* is one of 15 nanocenters, its mission flows organically from the objective of the whole network. The mission of the NC S*O* is to commercialize innovations in nanotechnology and nanomaterials through the serial hatching of high-tech companies and their launch on global markets. Following its mission, NC S*O* aims to become a leading Russian technology center by investing in high-tech projects and bringing them to global markets. NC S*O* strategy 2025 is divided into 2 stages.

STAGE I. Ecosystem V 1.0 in 2015-2019
This stage of NC S*O* development 2015–2019 is characterized by the accumulation of competencies in certain areas and the formation of the first portfolios of small innovative companies. By the end of the stage, 8.86 million rubles were invested. Out of more than 160 projects proposed by the applicants and partners, a total of 22 investment projects (with incorporation) were approved for financing by the NC S*O* Board of Directors in coordination with the Investment Committee.

Based on the results of the V 1.0 ecosystem analysis, the main objective for 2020–2025 was determined, namely to create conditions for the serial launch of startups. Based on this objective, the following tasks were set:

– to create the "perfect" projects under the revised and approved specialization,
– to set up the contract productions of composite nanostructured reinforcing elements for drilling bits (PDC-cutters) and metal dentures with nanocoating,
– to enlist global technology companies' cooperation in the discussion of joint ideas and projects,
– to arrange the designing and launching of a technology platform (TP) in the approved areas that will accumulate competencies, share the risks of participants and can be used as a base for a serial launch of startups in the chosen direction.

Based on the results of solving the tasks set at stage 1, the NC SO ecosystem was upgraded from the version 1.0 to the version 2.0.

STAGE II. Ecosystem V 2.0 in 2020–2025

The ecosystem of NC SO in 2020–2025 is characterized by the development of previously created project companies (including building the logic of development in accordance with the new concept of the "innovation pipeline"), as well as the creation of new small innovation company (SIC) and TP based on the accumulated competencies. In contrast to the V1.0 ecosystem, there is a percentage redistribution of the sources for project portfolio generation: 60% of projects are created "inside" the NC SO, 30% of projects are created together with the network of nanocenters, and only 10% come from external sources. The difference between the V2.0 ecosystem and V1.0 is the transition to a new level of interaction between projects. This creates the following project relationships:

– "Technological Platform to Startup",
– "Technological Platform to Technological Platform",
– "Startup to Startup".

The stage of 2020–2025 is characterized by the complete formation of NC's SO position as one of the elements of the innovation pipeline. There should be a self-sustaining reaction to the creation and development of startups, which, in turn, will provide the basis launching of other startups [2].

The main goal for 2020–2025 is to ensure the launch of the maximum number of startups within the technological platforms, as well as to provide the foundation for the implementation of the nanotechnology center as a serial technological entrepreneur.

Strategic goals and objectives of the company in 2020–2025

1. To ensure constant sequence of businesses creation:

   – launching of five technological platforms until 2025,
     launching of 7 startups in 2020 and subsequent annual launch of not less than 8 startups.

2. To increase the qualitative constituent of startups:

   – increasing the share in the partnership with NC network to 30% to 2025,
   – incorporating technological platforms in partnership with global technological companies,
   – hunting and recruiting partners for international agreements,
   – enlisting international partners in project company's equity participation.

3. To ensure survival and high yield from investments:

   – investment startups at the "Seed" stage – 30% survival, 26% expected return,
   – investment startups at the "Round A" stage– 80% survival, 24% expected return,
   – "Cash cow" startups – 100% survival, 23% expected return.
   Survival desired assessment is an expert one, which is based on venture investment experience and analysis of high tech startups' survival. Expected return is set by NC

S*O* as the minimum rate of return, which allows positive assessment of investments in the project.

4. To ensure the efficiency of NC's project activity:

   – annual exit with a set return from startups in accordance with the plan shown in the table below.

5. To ensure the integration of NC S*O* in the economy of Samara *oblast*:

   – job creation (not less than 580 jobs to 2025),
   – premises rented (not less than 500 m2 to the end of 2019, not less than 3000 m2 to the end of 2025).

The new key indicators of NC's S*O* efficiency are in compliance with the new approved Strategy of the Fund for infrastructure and educational programs until 2025 (*FIOP*) until 2025 [9] (Table 1).

Table 1. Key economic indicators of NC S*O* for 2020–2025

Indicator	Measuring unit	2020	2021	2022	2023	2024	2025
NC S*O* and SIC revenue	mln. rubles (for the period)	210	250	270	400	550	900
Number of employees in NC S*O* and SIC	people (progressive total at the end of the period)	190	220	285	380	490	580
Performance of contractual R&D	units (for the period)	2	2	2	2	2	2
Creation of intellectual property objects	units (for the period)	8	8	9	9	9	10
Number of legal entities founded within NC S*O* framework	units (progressive total)	44	52	60	68	76	84

Source: authors.

In 2020 the main revenue stream is expected from contract productions organized within the framework of projects in the field of oil development and dental technology. The rest of the revenue in 2020 will be generated by startups CASH COW, PRE SEED and SEED stage.

It is forecasted that in future 10% of revenue will be generated by startups of the PRE-SEED and SEED stage, 20% - by startups of the ROUND A stage. Contract production at full load will generate up to 30% of revenue, and CASH COW projects will account for up to 40% of total revenue (Table 2).

Providing the environment for the serial launch of "perfect" projects should become the main result of the strategic activities of NC SO.

Table 2. NC S*O* revenue forecast in 2020–2025, mln.rubles

Indicator	Total	2020	2021	2022	2023	2024	2025
Investment startup PRE SEED and SEED	311	21	25	27	40	55	90
Investment startup ROUND A	536	42	50	54	80	110	180
CASH COW startup	1 072	84	100	108	160	220	360
Contractual production	804	63	75	81	120	165	270
Total revenue	**2 723**	**210**	**250**	**270**	**400**	**550**	**900**

Source: authors.

4   Discussion

Currently, Russian companies operate in a constantly changing environment, which requires fundamentally new approaches to business management. The instability of the economic environment, tougher competition, increasing consumer demands for the product, and shortening the product life cycle significantly complicate the management process, thus the prospects for development are becoming less predictable. In these conditions, the implementation of strategic management ideas and technologies into the practice of enterprises is of special importance.

The main goal of the company's development strategy is to achieve long-term competitive advantages that will ensure its survival, sustainable operation and development. The scope of strategic solutions is extensive: the choice of areas of activity, justification of priorities in the use of resources, search for long-term partners, organizational forms of management, opportunities to use the strengths of the enterprise, reducing the negative consequences of the weaknesses and threats from the external environment. A strategic approach to solving company management problems makes it possible to form alternatives for its development [11]. Innovation is the main competitive advantage for sustainable development of companies. At the same time, the growth of the market for successful startups can become a driver for the development of priority sectors of the economy [7].

5   Conclusion

According to the Strategy of the Fund for infrastructure and educational programs until 2025 [9], the model "Innovation Pipeline" constitutes the basis for nano centers activities, including NC S*O* among others.

The new proposed model of work for NC S*O* is based on the transition from the "project funnel" (consideration of incoming applications to the nanocenter) to the generation of projects directly "inside" the center. This model involves analyzing the requests and needs of the existing and potential industrial partners, and creating technological solutions in accordance with the analyzed requests and with the possibility of subsequent implementation of these technologies on the market.

Today, currently the activities of NC SO, which are driven by trends described, are aimed not only at creating startups focused on their basic technology. They also strive for creating companies that specialize in popular services in the field of technological entrepreneurship (prototyping, manufacturing, engineering, marketing and sales), thereby forming a block of infrastructure companies. The most important part of such services will be combined within separate contract productions, while the other part will be distributed among other startups. Thus it will open up various opportunities for solving individual tasks by combining elements among themselves. The process of managing, analyzing and prioritizing technological trends and creating components of technological infrastructure will allow startup teams and technology entrepreneurs to focus on the underlying technology [4].

References

1. de Oliveira, L.S., Soares Echeveste, M.E., Cortimiglia, M.N., Gularte, A.C.: Open innovation in regional innovation systems: assessment of critical success factors for implementation in SMEs. J. Knowl. Econ. **10**, 1597–1619 (2019)
2. Eroshenko, E.P.: Development of the business ecosystem in the regions of the Russian Federation as the basis for creating successful startups. Econ. Bus. Law **9**(2), 123–134 (2019)
3. Ershova, A.E., Kuznetsov, A.N.: Strategy competitive development of the company BMW group. Bus. Strategy **5**(61), 26–28 (2019)
4. Feki, C., Mnif, S.: Entrepreneurship, technological innovation, and economic growth: empirical analysis of panel data. J. Knowl. Econ. **7**, 984–999 (2016)
5. Fink, T.M.A., Reeves, M., Palma, R., Farr, R.S.: Serendipity and strategy in rapid innovation. Nat. Commun. **8**, 2002 (2017)
6. Senior, M.: Europe's biotech renaissance. Nat. Biotechnol. **38**, 408–415 (2020)
7. Sergeeva, I.G., Orlova, O.P.: Analysis of high-tech companies formation and development. Russ. Econ. Bull. **3**(1), 156–161 (2020)
8. Sokolov, A.P., Kabannik, E.A.: Economic conditions and priority directions of innovative development of the Russian economy. Vestnik Altai Acad. Econ. Law **1**, 86–94 (2020)
9. Strategy of the Fund for infrastructure and educational programs until 2025. https://fiop.site/o-fonde/strategiya-razvitiya/. Accessed 20 Apr 2020
10. Trofimova, O.E.: Investment of venture capital in Russia as an important element of transitioning to an innovative economy under sanctions. Stud. Russ. Econ. Dev. **28**(4), 398–405 (2017)
11. van Someren, T.C.R., van Someren-Wang, S.: The instrument: strategic innovation as a new foundation for Russian innovation system. In: van Someren, T.C.R., van Someren-Wang, S. (eds.) Strategic Innovation in Russia, pp. 81–161. Springer, Cham (2017)

Demand for Engineering Qualifications in the Transformation Period

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Abstract. The study analyzes the situation on the labor market in four regions of the Volga Federal District of the Russian Federation in the context of a professional group of engineering and technical specialties. The analysis was performed to identify the conformity of training volumes, the structure of employment by education, the structure and dynamics of active resumes and vacancies. The purpose of the research is to identify trends in demand for engineering qualifications in a strategic perspective and to overcome the consequences of the coronavirus pandemic. The authors revealed the tendency to increase and equalize the expenditures of regional budgets on education, and to reduce output in the studied group of specialties. The structure of supply and demand in labor markets of the Volga Federal District, which is characterized by a highly competitive situation among applicants and a decrease in job offers, is determined. The necessity of advanced training of engineering and technical specialists with basic digital skills is justified.

Keywords: Digital skills · Supply and demand in the labor market · Technical engineers · Transformation · Qualification

1 Introduction

The period of global transformations around the world leads to irreversible consequences in many sectors of the economy, destroys the structure of interconnections in the global economic system. There is a real prospect of mass unemployment, which was recently discussed, but in another aspect – it happens because of automation and robotization of production [9]. The imposition of these processes will have consequences for the entire labor market, including for the specialized labor market oriented to industry [10].

During and after the crisis, it becomes obvious that many formats of the digital economy will not be able to continue to develop or die, such as a bloated financial

sector, many types of services built on entertainment and consumer industries. The sphere of real material production of necessities, communications, global infrastructure projects aimed at the domestic consumer in the country will come to the fore. To realize such a strategic perspective, human and labor resources are required that are professionally oriented to fulfill technical tasks in the first place. Basic technical skills become strategic capital, which is not subject to devaluation and has a reproducible base on which new technologies and systems can be created [7]. In this situation, the technical orientation of the labor potential in a particular territory, the regional profile of the correspondence of the labor market and the education system in engineering specialties will be of decisive importance [6].

Consumption, as it has evolved over the past decades, will have to undergo significant changes related to both the forced restriction of consumption and the restructuring of the system of economic relations. In this regard, the structure of the labor market will change significantly. One of the main segments of labor markets in the coming years will most likely be industrial production, by which we mean the production of real consumption products based on digitalization of all processes, these are precisely technical, engineering and economic competencies. One of the trends identified in scientific research in recent years has been the reduction of employment in the sphere of material production and the increase in the services sector, while industrial production has moved into the category of fully automated and almost eliminating human presence [5]. The onset of the global economic crisis provoked by the coronavirus can dramatically change both the structure of the global economy and, accordingly, the labor market. In this situation, industrial production, initiated by regional and national interests, can become the driver that will allow bringing the scale of employment to optimal values. In addition, automation and robotization of routine operations can reduce jobs in the production process, but at the same time creates entire segments of new jobs associated with servicing the technological cycle, designing, programming and organizing labor according to the design principle [1]. In this situation, the basic engineering skills acquired in the vocational training system and the adaptive development and mentoring system at the enterprise are priorities.

2 Methodology

Employment in the region is determined by the development of traditional or priority sectors of decisive national economic importance [15]. Most often, workers live in the region where the production is located. Therefore, the development of the labor potential of the production location is crucial for commercial success of the enterprise. As an example, we consider local relationships in neighboring regions of the Federal District; these are the Samara region, Republic of Tatarstan, Saratov and Ulyanovsk regions. For the analysis, we selected indicators of the education system, demand and supply on the labor market, statistics on employment and unemployment, as well as data presented on one of the most popular online work resource [11].

The indicated regions are in the Volga Federal District. They are comparable in size and population, they are in the same climatic zone near each other and are adjacent to the most important waterway of Russia - the Volga River. However, the regions differ

in economic and labor potential, which is characterized, inter alia, by quantitative indicators of the system of professional and higher education. When assessing the region's labor potential by educational characteristics, both quantitative and qualitative indicators are important, for which, in our analysis, the following were taken: the number of organizations and graduates of higher and secondary specialized education in the region, the share of unemployed in the total number of employees, the share of employees with vocational education in the total number of employees and the growth rate of expenditures of the regional budget on education. It should be borne in mind that the costs of local budgets on education have a limitation, since only general and secondary vocational education is financed from them, higher education is provided by the federal budget. The most relevant and dynamic information about vacancies and job seekers is job sites, which have become the most accessible and sought-after employment tool that responds to changes in the situation in almost real time. A joint analysis of statistics and data on the number and structure of resumes and vacancies can show the state of the specialized labor market oriented to industry.

3   Results

The share of specialists with higher and secondary vocational education in the total number of employed and unemployed shows demand for qualified specialists and the possibility of finding a person with vocational training. An assessment of the general situation in regions with the training of specialists can be carried out by graduation dynamics of young specialists with vocational training. For the possibility of comparing data, we took expenditures on education in relative units, taking 2009 as the base value from which we calculated the annual growth rate. However, a comparison of absolute indicators of expenditures of regional budgets is also significant. The comparison was carried out according to the following indicators, indicated in Fig. 1 for each region:

1. Growth rate of regional budget expenditures on education, %.
2. Number of organizations of higher and secondary vocational education, units.
3. Number of graduates of higher and secondary vocational educational organizations, thousand people.
4. Unemployed population with higher and secondary vocational education, in % of the total number of employees.
5. Employed population with higher and secondary vocational education, in % of the total number of employees.

   The most significant growth rate of regional budget spending on education is observed in the Saratov and Ulyanovsk regions. However, in absolute terms, the cost of education in these regions remains almost two times lower than in the Samara region and the Republic of Tatarstan. This largely depends on the development of the economy and budget revenues in the whole region, however, we can note the tendency to equalize differences in the cost of education in neighboring regions.

   The reduction in the number of educational organizations training workers and specialists, as well as in the number of graduates in all the regions under consideration

is indicative, which can only partially be explained by the decline in the demographic wave. An alarming trend may also be associated with the outflow of promising youth in capital regions. This requires additional measures to develop regional education systems and create attractive jobs. An increase in the share of specialists with education in the total number of employees is observed in the Republic of Tatarstan and the Samara region, which shows higher qualification requirements. Accordingly, we can assume that the economic structure of these regions allows us to create more efficient jobs. At the same time, it is also necessary to note an increase in the share of specialists with education among the unemployed, in contrast to the Saratov and Ulyanovsk regions. The situation may be characterized by trends in economic digitalization, when the creation of a new type of jobs increases the requirements for education and qualifications, unskilled labor remains in demand due to low profitability of automation of many processes, and staff with average qualifications are put out of jobs. Thus, development trends of educational components of regions' labor potential can characterize the economic situation and the directions to develop labor markets.
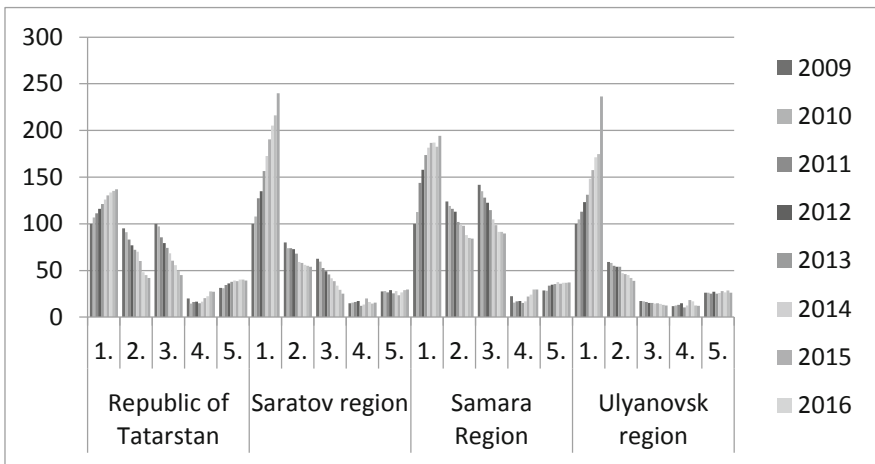
Fig. 1. Analysis of educational components of regions' labor potential of the Volga Federal District (Source: authors).

The growth of qualification requirements is especially noticeable in high-tech sectors of the economy, in which there are high requirements for technical education and special engineering skills, the development of which occurs when receiving basic education in undergraduate, specialty and master's programs. Using the example of the Samara region, we analyzed the region's provision with graduates of several common technical training areas - Heat and Power Engineering, Electric Power and Electrical Engineering, Power Engineering, Construction, as these specialties are the most popular in the region's labor market. To assess the state and identify the trend, we calculated the share of the number of graduates in the total number of graduates of the Samara region and compared with the share of graduates in this specialty in the Russian Federation (Table 1).

Table 1. The proportion of graduates of technical specialties in the Samara region

Name of training (specialty)	2015	2017	2018	2019
Heat power engineering and heat engineering, people	58	116	143	112
Power industry and electrical engineering, people	288	569	529	270
Power engineering, people	31	93	93	62
Construction, people	383	835	825	573
Number of graduates of the Samara region in 4 training programs, people	760	1613	1590	1017
Number of graduates of the Samara region in all training programs, people	11913	19337	19596	19743
Share of graduates of the Samara region in 4 training programs of the total number of graduates of the Samara region, %	6,4	8,3	8,1	5,2
Number of graduates of the Russian Federation in 4 training programs, people	36855	55810	53270	54855
Share of graduates of the Samara region in 4 training programs from the total number of graduates of the Russian Federation, %	2,1	2,9	3	1,9

(Source: authors).

The number of graduates was calculated as the sum of graduates in 3 levels of higher education – undergraduate, specialty, master's degree. In 2019, there was a significant drop in the number of graduates in all the areas of training programs considered, which is characterized by a decrease in both absolute indicators and the share in the total number of graduates. At the same time, in 2017–18 there was an increase in all specialties, after which the number of graduates decreased to a value less than it was in 2015, with a steady increase in the total number of graduates of higher education in the Samara region and in the Russian Federation. The share of graduates of the studied areas in the Samara region is almost three times higher than the share of all graduates in the country, since energy and construction are one of the priority sectors of the Samara region and the education system must correspond to the structure of the local economy. The number of graduates in the Samara region and in the Russian Federation is growing quite proportionally to each other.

The entry of new specialists into the labor market is accompanied by redistribution of labor resources in accordance with economic, professional and personal needs that characterize supply and demand in a territory. Crisis situations are characterized by instantaneous dissonance in the number of resumes and vacancies in the labor market. Reliable distributed data can be estimated at the end of the year, but even now you can evaluate the dynamics and structure of supply on the labor market, which cannot change as quickly as the number of vacancies. Employment in the Russian Federation is regulated by the state to a rather high degree, as shown by previous crises of 2008 and 2014. We analyzed the number of resumes and vacancies in the labor market of the regions of the Volga Federal District to identify labor market conditions and determine employment trends in the industrial sector. The number of resumes and vacancies was estimated over several periods – the total number of active resumes and vacancies not currently filled, including the number of resumes and vacancies posted within the last week (as of 04.25.2020), within the last month, within the last year. Since the professional group with the qualification of Engineer is quite extensive, we compared the number of resumes for all resumes with the mention of the word Engineer in the title and allocated a group of resumes specializing in Industry and Construction (Table 2).

Table 2. Comparative characteristics of engineering specialties resumes in the regions of the Volga Federal District

Number of resumes		Samara		Kazan		Saratov		Ulyanovsk	
		Engineer (all professions of the region), units	Engineer (production, construction), units	Engineer (all professions of the region), units	Engineer (production, construction), units	Engineer (all professions of the region), units	Engineer (production, construction), units	Engineer (all professions of the region), units	Engineer (production, construction), units
Total for the entire period		18271	9999	21868	12628	6884	3742	4588	2885
Number of resumes within the last week		990	588	1028	570	352	191	167	107
Number of resumes within the last month		1999	1124	2110	1179	706	369	380	249
Number of resumes within the last year		6087	3317	6846	3921	2254	1189	1302	836
Expected salary, thousand rubles	Below 20	2171	1033	3640	1952	947	454	751	395
	20–40	7378	4060	9546	5518	2736	1553	2031	1264
	40–60	4333	2647	4801	3104	1203	737	941	674
	60–80	1546	932	1553	998	503	280	271	186
	80 and higher	1298	834	1445	786	594	268	185	105
Work experience, years	More than 6	13328	7639	14225	8651	5084	2901	3443	2247
	3–6	2131	1157	3222	1927	827	434	510	339
	1–3	1193	631	1877	1049	454	239	271	150
	no	1626	574	2553	1001	526	170	363	149
Key skills	PC user	3299	1847	3615	2205	1417	749	861	592
	AutoCAD	1950	1428	2651	1916	661	512	468	383
	Teamwork	1915	1029	2254	1320	792	416	477	321
Age, years	18–30	5522	2557	8008	3987	2013	852	1280	717
	30–40	8422	4653	10340	6195	3039	1682	2126	1359
	40–50	3181	1860	2912	1810	1250	720	752	472
	50–60	1736	1143	1527	1075	829	546	578	413
	More than 60	686	522	593	461	293	230	199	159
Gender	Male	14206	7736	16408	9431	5602	3019	3717	2372
	Female	4012	2231	5402	3155	1277	720	863	509

(Source: authors).

Quantitative characteristics for all periods are comparable and allow dividing resumes into two groups according to quantitative indicators – Samara and Kazan in one group and Saratov and Ulyanovsk in another, in which the number of resumes differs by 3–4 times. Great attractiveness is justified by a significant difference in salary expectations of applicants. The largest number of applicants in all four regions expects to have salary in the range of 20–40 thousand rubles, which shows approximately the same standard of living in the studied regions, but the probability of finding a qualified specialist from employers in Kazan and Samara is much higher. Analysis of the structure of applicants by age shows that the most dynamic age group, prone to changing professional and official position, is a group of 30–40-year-old specialists who have received education, professional experience and have a desire to find more decent working conditions. As age increases, the number of resumes decreases and after 40 years the largest number of resumes, compared to other cities, is posted in Samara, and Kazan is the leader in the number of resumes under the age of 40 years. In general, for all the cities studied, the most active part of the workforce is the age category up to 40 years. The key skills for engineers are the ability to use a computer and specialized programs, the less important is the ability to work in a team, which is determined by the nature of engineering work.

The number of vacancies for engineering positions decreased in all the studied regions (Fig. 2).
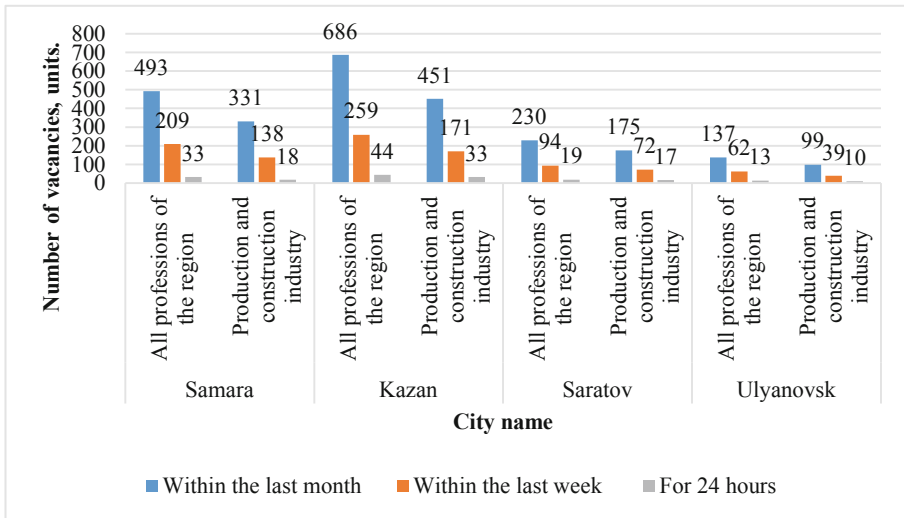
Fig. 2. The dynamics of the number of vacancies posted in the regions of the Federal Volga District (Source: authors).

The increase in vacancies within the last month shows a negative trend, the largest decrease in the number of posted vacancies occurred in Ulyanovsk by 6%, only in Saratov there is a slight increase of 1%. At the same time, in all cities under

consideration there is an increase in the number of resumes by 5–13%, the largest in Kazan. The labor market remains highly competitive, 7–9 people per vacancy, this situation in the short term will tend to increase until the end of the pandemic. When implementing the strategy for domestic consumption and national investment projects, the situation may change in the direction of increasing the number of vacancies, competition in the labor market will decrease, and to meet the needs of the new economy in qualified personnel, their preparation should begin at a faster pace.

Salary offers far exceed the expectations of applicants, qualifications and areas of responsibility are of great importance (Fig. 3).
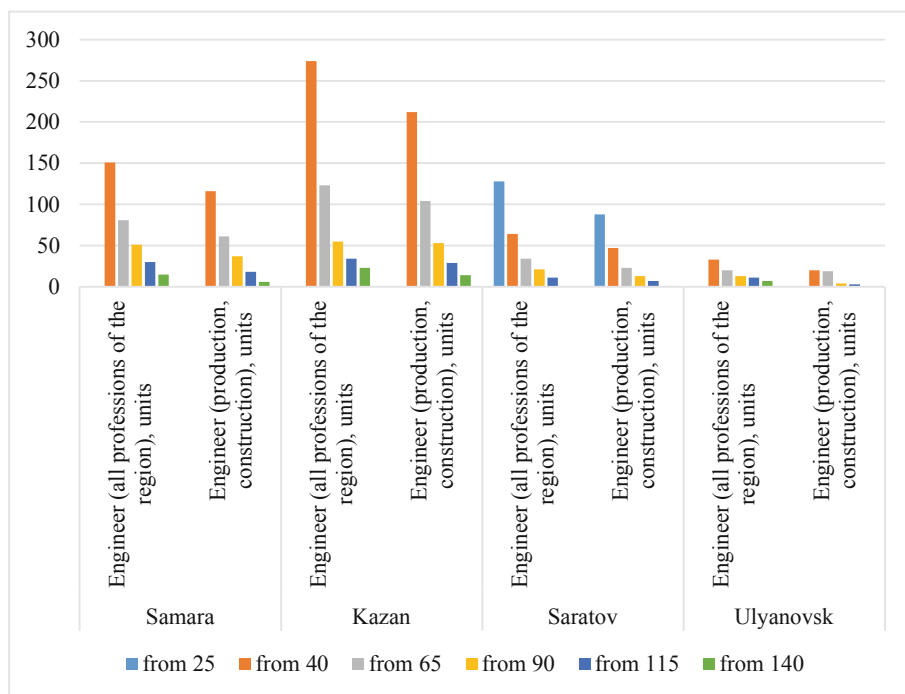
Fig. 3. Salary offers in the posted vacancies of the regions of the Federal Volga District (Source: authors).

There is a significant difference in salaries offered in vacancies in different cities. In Samara, Kazan and Ulyanovsk, there are no vacancies with salary below 25 thousand rubles, such a salary is offered only in Saratov. In Samara and Kazan, the largest number of vacancies with salary of 40–65 thousand rubles, in Saratov from 25 to 40 thousand rubles, in Ulyanovsk with a small total number of vacancies, the proposed level of salary is in the range of 40–65 thousand rubles.

4   Discussion

The relationship between the requirements for applicants, the proposed remuneration and qualifications of applicants has been a debated area of science for many years [8]. Recent years of discussion have been around the impact of competence and qualifications on the level of remuneration, the ratio of "soft" and "hard" skills to form a successful career [3]. Many researchers, in our opinion, unreasonably overestimate the importance of "soft" skills, often to the detriment of basic, fundamental knowledge.

In our opinion, this specificity is more characteristic for leadership, managerial positions, which are crucial for leadership qualities [12]. Our studies show the priority of technical and informational knowledge, which is given by both job seekers in resumes and employers in vacancies. The qualification characteristics and level of job positions are of great importance, when personal qualities practically do not matter in low-skilled positions [4]. Interregional labor market research conducted in our country confirms the trends of a stable technical and technological stratum of specialists with both technical and digital skills in many regions [13].

In recent years, qualification requirements have grown across the entire spectrum of engineering and technical jobs, often in vacancies one can note clearly overstated requirements that do not correspond to the regional labor market. But this situation encourages applicants to increase their competence and to increase competitiveness in the labor market [14]. This primarily concerns the skills associated with the use of artificial intelligence [2]. Such skills become basic for all technical specialists.

5   Conclusion

Studies have shown general trends in engineering qualifications in neighboring regions with a significant difference in absolute terms. The training in the selected group of specialties is carried out in enough volume, but the reduction in output is worrying when the labor market has long-term demand for advanced engineering, technical and digital skills.

The authors analyzed the number of graduates in the group of training areas corresponding to the most demanded qualifications in the regional labor market. They have noted the equalization of regional spending on the formation of local budgets, a gradual increase in the share of employees with vocational education. Based on the identified trend of reducing the number of graduates of the required specialties, it is necessary to develop targeted training of young specialists in educational organizations.

The analysis of the correspondence of the number and structure of resumes and vacancies showed that the labor market in the studied regions of the Federal Volga District is highly competitive, with a significant advantage in favor of the interests of employers and unsatisfied demand of applicants in the most developed regions of the Samara region and the Republic of Tatarstan. The labor market of the Saratov and Ulyanovsk regions is more balanced, although less attractive to applicants.

An alarming situation is when there has been a decrease in the number of vacancies in economically more developed regions within the last month, due to the epidemiological situation. In implementing the strategic goals of the country's economic growth,

based on national projects and the development of domestic consumption, we need accelerated growth in the training of engineering and technical specialists with basic digital skills.

References

1. Albuquerque, P.H.M., Saavedra, C.A.P.B., de Morais, R.L., Peng, Y.: The robot from Ipanema goes working: estimating the probability of jobs automation in Brazil. Latin Am. Bus. Rev. **20**(3), 227–248 (2019)
2. Alekseeva, L., Azar, J., Gine, M., Samila, S., Taska, B.: The demand for AI skills in the labor market. SSRN Working Paper (2019). https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3526045. Accessed 29 Apr 2020
3. Alpaydın, Y.: Identifying higher-education level skill needs in labor markets: the main tools usable for Turkey. Kuram ve Uygulamada Egitim Bilimleri **15**(4), 945–967 (2015)
4. Beblavý, M., Mýtna Kureková, L., Haita, C.: The surprisingly exclusive nature of medium- and low-skilled jobs: evidence from a Slovak job portal. Pers. Rev. **45**(2), 255–273 (2016)
5. Börner, K., Scrivner, O., Gallant, M., Ma, S., Liu, X., Chewning, K., Evans, J.A.: Skill discrepancies between research, education, and jobs reveal the critical need to supply soft skills for the data economy. Proc. Natl. Acad. Sci. U.S.A. **115**(50), 12630–12637 (2018)
6. Büth, L., Blume, S., Posselt, G., Herrmann, C.: Training concept for and with digitalization in learning factories: an energy efficiency training case. Proc. Manuf. **23**, 171–176 (2018)
7. Darabi, H., Karim, F.S.M., Harford, S.T., Douzali, E., Nelson, P.C.: Detecting current job market skills and requirements through text mining (2018). https://www.semanticscholar.org/paper/Detecting-current-job-market-skills-and-through-Darabi-Karim/10bd61ee3b72c8003b5f6446e865c9a958c424aa. Accessed 29 Apr 2020
8. Karmaeva, N.: The Oxford handbook of skills and training. J. Econ. Sociol. **20**(4), 114–125 (2019)
9. Maresova, P., Soukal, I., Svobodova, L., Hedvicakova, M., Javanmardi, E., Selamat, A., Krejcar, O.: Consequences of industry 4.0 in business and economics. Economies **6**(3), 46 (2018)
10. Reinhold, M., Thomsen, S.: The changing situation of labor market entrants in Germany. J. Labour Mark. Res. **50**(1), 161–174 (2017)
11. Rosstat: Socio-economic indicators (2019). http://gks.ru/storage/mediabank/Region_Pokaz_2019.pdf. Accessed 29 Apr 2020
12. Sopegina, V.T., Chapaev, N.K., Simonova, M.V.: Integration of pedagogical and technological knowledge in forming meta-competencies of a modern worker. Int. J. Environ. Sci. Educ. **11**(15), 7836–7846 (2016)
13. Simonova, M.V., Sankova, L.V., Mirzabalaeva, F.I., Shchipanova, D.Y., Dorozhkin, V.E.: Assessment problems and ensuring of decent work in the Russian regions. Int. J. Environ. Sci. Educ. **11**(15), 7608–7626 (2016)
14. Vu Anh, T.L., Le Quoc, T.: Development orientation for higher education training programme of mechanical engineering in industrial revolution 4.0: a perspective in Vietnam. J. Mech. Eng. Res. Dev. **42**(1), 71–73 (2019)
15. Yıldız, F.: The role of education in the participation of Turks living in Europe in labor Markets. Proc. Soc. Behav. Sci. **186**, 1179–1187 (2015)

Social and Environmental Competence as a Component of University Graduate's Competitiveness

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Abstract. In the modern world of innovative and digital technologies, one of the priorities of the country's strategic development is the transition to environmentally friendly and resource-saving energy, where research of the development of technological systems for climate and ecosystem management is particularly relevant. However, before starting a particular research in this scientific field, it is necessary to solve the main task of organizing professional training of specialists in the field of environmental education. It is important to create a set of measures for the effective formation of socio-environmental competence among students of higher education institutions. Based on our previous research of practical pedagogical experience in developing a competitive specialist with certain professional knowledge and skills in the field of their professional activities, we have developed and implemented in the educational process a model for the formation of socio-environmental competence of students. Within the framework of this model, a set of diagnostic measures was carried out to identify interdisciplinary knowledge in students, including environmental knowledge, as well as their further relationship with the formation of a professionally successful career.

Keywords: Competitiveness · Professional education · Social and environmental competence · University students

1 Introduction

The Ministry of economic development of the Russian Federation created a document of strategic planning of the country's socio-economic development in the long term until 2030. This document provides implementation of strategies and target programs under conditions of dynamic development of the key scientific and technological trends in the field of life sciences, information and telecommunication systems, environmental management, transition to an innovative economy, which determines the relevance of training of highly qualified, competitive specialists to ensure the sustainable economic

growth. In the Presidential Decree "On the strategy of scientific and technological development of the Russian Federation" one of the priorities is "the transition to environmentally friendly and resource-saving energy", and "in the long term, the research in the field of nature-like development technologies, man-machine systems, climate and ecosystems management" become particular urgent [3]. Higher education plays a fundamental role in the formation of a competitive graduate, "who is able to demonstrate formed general cultural, professional and meta-subject competencies (including socio-environmental ones), as well as integrative personality qualities (that provide individual, industrial and social needs) the most effectively in unstable working conditions" [11].

2   Methodology

In the works of foreign scientists, it is noted that taking into account principles of sustainable development is an integral part of training specialists in the field of innovative technologies [2], and improving the quality of life of every person in the country is both the goal and responsibility of specialists around the world [1]. According to them, new generations need a different view of the environment, free from technocracy and aimed at preserving and increasing natural resources [4].

Based on our previous research, practical pedagogical experience in environmental training of future specialists, a theoretical model for the formation of socio-environmental competence in students of technical training direction has been designed and is still being implemented. In this sphere, the Samara State Technical University annually conducts diagnostics of socio-environmental competence of graduates, using multi-level tools, one of which is a test to determine the ability to self-management (according to the method of Peisakhov [5].

3   Results

Documentary analysis of the legal base in the sphere of education, the country's socio-economic development, policies, national projects and federal programs, as well as domestic and foreign scientific literature shows that modern enterprises pay great attention to the realization of new approaches, implementation of lean production models, the development of green technologies, green economy, that ensure social and environmental safety, reduce human impact, environment improvement, rational use of resources. This means that there is a need for competitive specialists with environmental training in the labor market.

Thus, the federal state educational standards of higher education, including in the field of training "Engineer in industry and production", indicate the need for students to have knowledge in the sphere of environmental safety and environmental protection.

In this regard, an important task of universities is the formation of the graduates' socio-environmental competence which is understood as the ability (readiness) of individuals to perceive the surrounding reality in the unity of natural and socio-cultural relations, based on the formed knowledge, skills, experience and personal qualities, to organize their professional activities from the position of the environment management and environmental conservation, to adequately assess, analyze, predict and find effective ways to solve tasks and problems arising in a situation of uncertainty by the interaction of our society and the nature [7].

Based on the above, we conducted a survey at the engineering, economic and machine-building faculties of the Samara State Technical University (SamSTU), in order to identify opinions of students of different gender groups about requirements of the modern labor market to them as future professionals who have knowledge and skills not only in the field of their profession (Fig. 1).
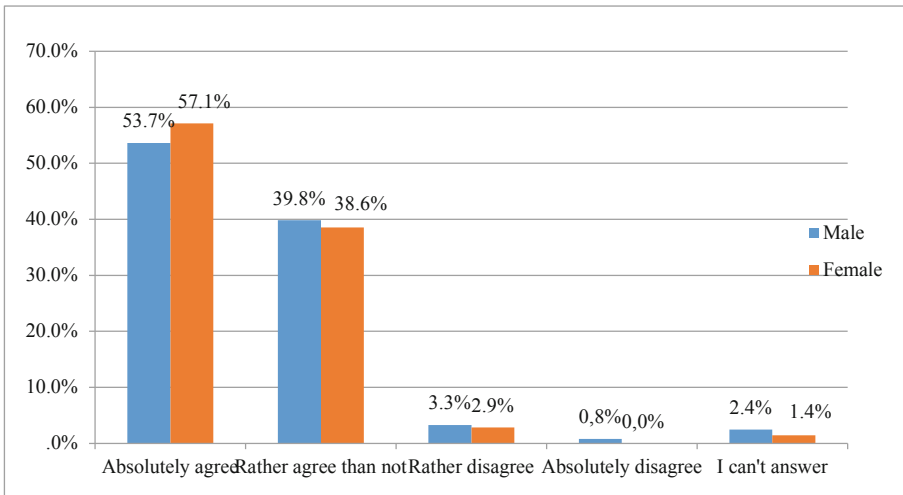
Fig. 1. Indicators of students' agreement on the availability of knowledge not only in the field of their profession (Source: authors).

Figure 1 shows that more than 53% of students absolutely agree with the opinion that it is necessary to have interdisciplinary knowledge, including environmental knowledge. To the question of "how much the possession of professional knowledge and skills, social and environmental competence will help to build a successful career as an engineer" (Fig. 2), the majority of respondents (82.4%) answered positively, and only 1% of university students deny this fact.
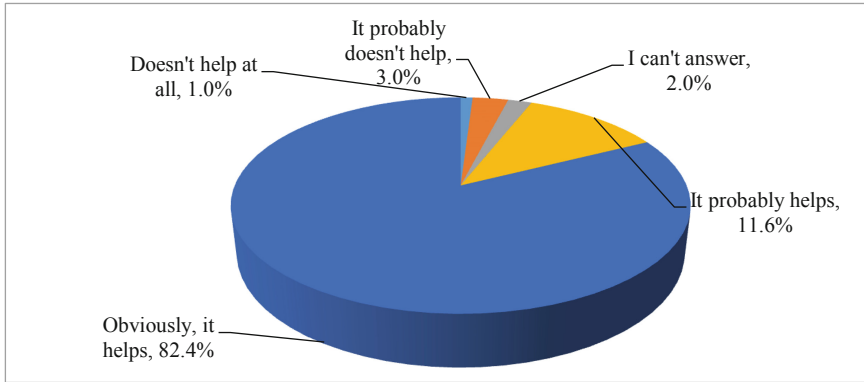
Fig. 2. The opinion of students about competencies that contribute to a successful career (Source: authors).
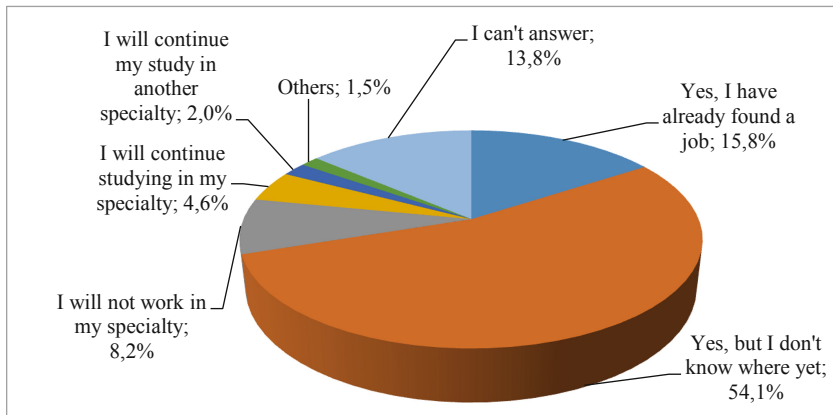
Fig. 3. Distribution of students' answers about their professional future (Source: authors).

An important aspect of the competitiveness of university graduates is that more than half of students (54.1%) expect to work in their specialty after the graduation, but, unfortunately, they do not know where exactly, 15.8% have already found a job and are working. However, 8.2% of respondents do not intend to work in their specialty (Fig. 3).

4   Discussion

Programs developed by Russian universities to improve the competitiveness of future specialists are of particular interest. For example, in the "road map" of the St. Petersburg State Electrotechnical University "LETI" named after V.I. Ulyanov (Lenin), consider-able attention is paid to "the implementation of new competitive educational programs at

the university together with leading foreign and Russian universities and scientific organizations" [10, p. 8], which in the future will ensure the competitiveness of graduates in the domestic and international labor market. The strategic goal of the Perm National Research Polytechnic University is "to form a world-class engineering research university that trains competitive specialists for high-tech sectors of the regional economy" [6, p. 14]. The mission of the Samara State Aerospace University named after academician S.P. Korolev is to "provide world-class training of personnel with interdisciplinary key competencies" for various sectors of the economy" [8, p. 9]. The effectiveness of the Samara State Technical University in the quality management field is based on such an approach as "an organic combination of research activities with the educational process, which allows to significantly expand opportunities for high-quality training of highly qualified personnel" [9, p. 4]. Based on the above, it can be stated that domestic universities, including higher schools in Samara and the Samara region, consider the formation of a competitive specialist that meets international educational standards to be one of the most significant indicators of their professional activity.

5   Conclusion

In our opinion, the identification of students' ability to control themselves in various life situations is of significant importance in their further professional activities, in ensuring social and environmental safety. Their professional success depends on the organization of the self-management system and the formed abilities of future specialists to forecast, set goals, plan, control, and make decisions.

Thus, in the first year of students' training (83%) at the university, the level of their self-management abilities was lower than the average one, while the graduates' indicators were significantly higher (at the average and high levels), which indicated the effectiveness of our continuous socio-environmental education at the university (Table 1).

Table 1. The formation level of the self-management system among university students

Year	Levels of self-management ability				
	Low <50%	Below the average	Average <70%	Above the average	High >75%
2015	4,5%	83%	9%	3,5%	–
2016	1%	49%	32,5%	16%	1,5%
2017	–	27%	46%	23%	4%
2018	–	11%	50,5%	28%	10,5%
2019	–	–	43%	31%	26%

Source: authors.

Thus, the development of social and environmental competence among high school graduates is one of the most important components of their competitiveness in the labor market, thereby contributing to their successful organization of their professional activities from the position of finding effective ways to solve the tasks set in the field of environmental management and conservation.

References

1. Borkovskaya, V.G., Roe, R., Bardenwerper, W.: Sustainability risk management: the case for using interactive methodologies for teaching, training and practice in environmental engineering and other fields. In: Solovev, D.B. (ed.) Smart Technologies and Innovations in Design for Control of Technological Processes and Objects: Economy and Production. FarEastCon 2018. Smart Innovation, Systems and Technologies, vol. 138, pp. 251–260. Springer, Cham (2020)
2. Chekanushkina, E.N., Mikhelkevich, V.N.: Heuristic methods of developing students' creative potential in the process of forming socio-ecological competence. Acad. Bull. ELPIT **3**, 95–100 (2019)
3. Decree of the President of the Russian Federation No. 642 of December 1, 2016 "On the strategy of scientific and technological development of the Russian Federation". https://www.garant.ru/products/ipo/prime/doc/71451998/. Accessed 25 Apr 2020
4. Kuznetsova, N.V., Soloviev, A.A., Botasheva, L.Kh., Lebedev, I.A., Sarkisyan, K.S., Kurdyumov, V.I., Chistyakov, K.A., Prokopyev, A.I.: Bachelors safety culture formation in the field of environmental protection. EurAsian J. BioSci. **12**(2), 157–166 (2018)
5. Peisakhov, N.M.: The Problems of Individual Differences Psychology. Kazan State University Publishing House, Kazan (1974)
6. Perm National Research Polytechnic University: The program of competitiveness increase for 2016–2025 (2016). https://pstu.ru/files/file/2016_anna/programma_povysheniya_konkurentosposobnosti_pnipu_06_07_16.pdf. Accessed 25 Apr 2020
7. Quadrado, J.C., Ferreira, E.P., Pokholkov, Y., Zaitseva, K.: Higher education institutions as key players to ensure sustainable development goals. In: Petrie, M.M., Rivera, L.F.Z., Aranzazu-Suescun, C. (eds.) Proceedings of the 17th Latin American and Caribbean Conference for Engineering and Technology, pp. 1–5. Latin American and Caribbean Consortium of Engineering Institutions, Montego Bay (2019)
8. Samara State Aerospace University named after academician S.P. Korolev: The program of competitiveness increase (2013). https://ssau.ru/files/info/official_docs/ppk.pdf. Accessed 25 Apr 2020
9. Samara State Technical University: Policy in the field of quality management (2019). http://smk.samgtu.ru/node/1. Accessed 25 Apr 2020
10. St. Petersburg State Electrotechnical University "LETI" named after V.I. Ulyanov (Lenin): The program of competitiveness increase (2019). https://etu.ru/assets/files/university/normativnye-dokumenty/programma_5-100_etu.pdf. Accessed 25 Apr 2020
11. Timoshchuk, N.A.: The concept of forming a competitive engineer as a strategy for the educational policy of technical universities. Doctor thesis. SamSTU, Samara (2019)

Legal Regulation of Remote Work in Russia

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Abstract. Labor law in Russia is expected to change in order to make this sphere more attractive to employers, more accessible to employees, and more effective for the state. The practice meets expectations of optimists for the implementation of progressive reforms, which also affect problems of the labor regulation. Business has long been interested in using this tool, but the lack of skills in new technologies among a wide range of employees and the inertia of the current legislation hindered the process. Currently, there is a clear tendency to overcome all the indicated obstacles to the widespread use of remote work in Russia. This article investigates the current legislation and practice of the remote work application, recent changes in the sphere, as well as development trends in the remote work regulation, taking into account the changing needs of the population.

Keywords: Interaction of labor and civil law in Russia · Labor law reform in Russia · Registration of labor contracts with employees · Remote work · Technology impact on labor law

1 Introduction

At the end of the XVIII century. the increased use of collective labor in the first industrial enterprises led to a paradoxical situation: the state was interested in the industrial development; industry and entrepreneurs needed to use labor; people needed to work. But relations regulated in terms of the long-established principle of freedom of contract (which has always worked well as a natural regulator) stalled.

As a result, all participants were dissatisfied: employees were suffocating from appalling working conditions, employers were dissatisfied with the quality of work and the constant threat of aggravation of relations at the enterprise, the state expected a social explosion.

Labor law arose and formed as an independent branch at that time when all participants in labor management relations came to the conclusion that the situation could not remain so it was. It is interesting that employers and large industrialists initiated the creation of a special regulation of labor relations at enterprises They were the first to realize that the society had reached a new stage of its development.

It seems that labor law is currently experiencing something similar. More and more people talk about the need for reforms in the sphere of regulation of labor relations [9],

and there are opinions that the traditional idea of employment – a 40-h working week, mandatory presence in the office – is becoming outdated [8].

It is much more effective to give more freedom to the employer in choosing the form of employment that he is ready to provide, and more freedom to the employee in matters of regulating the labor regime, switching to remote employment. The ongoing technological changes also have a strong impact on the process of performing the labor function. Representatives of many professions can perform their work from anywhere in the world, if they have access to the Internet and a laptop or smartphone.

Even before the coronavirus pandemic, this fact meant that the growth of the number of remote workers around the world, the development of flexible forms of employment re trends of the near future. Currently, the advantages of remote work and the need for it are undeniable. When the peak of the pandemic is passed, the trace effect of the months of work experienced on the remote mode will continue to affect and will inevitably correct the attitude of the legislator to this institution.

2   Methodology

To solve the research tasks, the author used both general scientific methods: dialectical method, methods of analysis and synthesis, and special methods of legal science: formal legal method, comparative legal method, historical legal method, methods of grammatical and logical interpretation of legal norms. A structural and functional method was used in relation to the development of trends in the field of labor law in Russia. These methods allowed us to create a more complete and comprehensive view of the considered problem.

3   Results

At present, we have successfully passed the time when the very possibility of recognizing relations using remote technologies as labor relations was denied. The question was raised by the freedom of the employee from the direct control of the employer arising from the use of remote work. Now we are talking about expanding the scope of labor law to non-standard areas, including remote work and relations in the field of professional sports.

Such positive changes (for the purposes of this study, we consider it appropriate to focus on changes dedicated to remote work), which could be compared with a small revolution in the field of labor law, occurred in 2013, when the text of the Labor Code was added with Chapter 49.1 "Specific features of regulating the work of remote workers" [12]. Similar changes have been made to labor regulations in many foreign countries. In particular, "telework" has been considered in the Labor Code of France, starting from the Article L1222-9 [11].

Part 1 of Article 312.1 of the Labor Code of the Russian Federation provides an official definition of remote work, which is recognized as the performance of a certain function of the employment contract outside the location of the employer [12]. In general, it is not currently possible to say that the issue of remote work is not legally

regulated. An employment contract with a remote employee can be concluded by exchanging electronic documents. This situation has significantly facilitated the practice of hiring remote workers, but the situation is far from ideal at the moment.

A mandatory condition for electronic document management, which is clearly established by law, is the use of enhanced qualified electronic signatures of the parties to the employment contract when exchanging electronic documents. The enhanced qualified electronic signature is the strictest type of electronic signature in the opinion of the legislator [5]. Using only such a signature will eliminate problems for the parties with proof of the existence of an employment relationship between them.

Remote work relations that are registered with violations may not give the parties protection under the Labor Code [12]. For example, the Definition of the Moscow City court in 2017 stated that an employment contract concluded between parties, as it follows from the requirements of Article 312.1 of the labor code of the Russian Federation, with the inclusion of a condition for remote work, signed by both the plaintiff and the defendant, is not concluded. However, the presence of electronic correspondence between the parties does not indicate the remote nature of the work [4].

There are obvious difficulties faced by the practice with an overly formal approach to regulating relations within the framework of the labor legislation. In addition to the difficulties that arise at the stage of registration of labor relations, there are issues related to the proper performance of labor duties by the employee.

A lot of researchers and practitioners draw attention to the lack of control available to the employer. It seems that remote mode is not suitable for all forms of employment, but if the employer initially assumes this possibility, the main problem is not the lack of ability to control employees, but ensuring effective communication with them and the ability to receive timely results of high-quality work. This goal can be achieved by more detailed procedures and conditions for interaction between the employee and the employer, including by defining the procedure for obtaining assignments, reporting procedures, technical capabilities for rapid communication between the parties, and so on.

In itself, the possibility of more detailed regulation of labor relations within the framework of individual labor contracts is another trend and urgent need of modern labor law. Judicial practice convinces parties of the need (for security purposes) to use standard labor contracts and other typical documents in the framework of labor relations, however, only individualized labor contracts can give a sense of vividness and effectiveness the labor law, which is so necessary for all the parties.

Continuing to cite examples of unpleasant complications that parties face when using remote work, we will cite several court decisions.

According to the Appeal ruling of the Sverdlovsk regional court of 14.08.2018, if the personnel department is located in one city, and the dismissed employee is in another, the employer should ensure that the employee's work recordbook is issued on the day of dismissal at his place of work [2]. This harmless definition reveals a problem of possible abuse by employees, as well as contradictions between the document management requirements in relation to labor relations in paper form, while the relationship between the parties is based on remote interaction. In the above case, the claim was filed by an employee who considered that the work record book was issued to him untimely and won the dispute. Taking into account the ongoing transition to electronic

workbooks, it seems that this practice can also have a positive impact on solving problems of registration of hiring and firing of remote employees.

Another difficult practical problem is a possibility of combining traditional employment and remote work. Based on the analysis of court decisions, we have to conclude that the practice does not allow such a combination [1].

There are problems with determining grounds for dismissal of remote employees. In particular, an employee cannot be dismissed for his absence at the workplace if he performed their work remotely based on the agreement with the employer. This conclusion was reached by the Supreme Court of the Russian Federation in the Definition of 16.09.2019 N 5-KG19-106 [3].

It seems that the Definition was made because of the fact that the agreement between parties did not specify how the parties would carry out the communication necessary in the opinion of the employer for the effective performance of the employment function. In our opinion, an employee's violation of the agreements established in the contract may give a completely different picture in court.

It should be noted that the legislation and legal practice of foreign countries on the considered subject also do not imply that the regulation of remote work has reached its highest development level. The reforms in the sphere of labor law that have been carried out in France in recent years also relate to issues of remote workers. The French legislator proposes collective agreements as the main regulation source of this type of labor relations and establishes in the law a list of issues to be discussed during negotiations. Among them, there are conditions for transferring an employee to "télétravail" and terminating the transfer agreement, provisions concerning methods and the procedure for expressing consent to the transfer, provisions on working hours, frequency of communication and working hours, and the employment regime for persons with disabilities. Thus, two tasks are solved at once. The appropriate method of regulation is proposed, taking into account the specifics of a particular enterprise, which removes the task of the legislator to regulate areas that can not be subject of effective state regulation. A list of issues is also proposed, that are the most difficult from the point of view of the subsequent implementation of relations.

We can conclude that the legal regulation of remote work in Russia currently needs special attention and gentle adjustment. It should also be taken into account that the use of remote work significantly expands the possibility of protecting the employees' rights, is an effective means of combating unemployment and staff turnover, seasonal epidemics and force majeure, and indicates the socially-oriented nature of the regulation norms. However, in such legal relations, the employer is a weak side, which bears both the problem of the inability to implement full control over the employee's compliance with the labor discipline, and all the difficulties associated with the legal uncertainty of registration and notification of employees.

4   Discussion

Currently, there is no shortage of articles on practical issues related to the use of remote work, which give advice to employers on the correct registration of employees, their proper notification, taking into account a significant number of recent bylaws.

However, there are few academic papers on the considered subject. Examples include the work of Lyutov "Remote work: The experience of the European Union and the problematic aspects of its legal status in Russia" [7] and Shuraleva "Distance work: A comparative analysis of the laws of the EAEU member states" [10]. Both works draw attention to the lack of regulation in this sphere.

This position could be accepted if it were not the obvious impossibility to regulate thoroughly the use of remote work at the legislative level. Clarification is required, but in view of the obvious trend away from a centralized regulation. It is necessary to make more active use of local acts and collective agreements in order to create the most effective and flexible labor regulation.

5   Conclusion

The text of this article has collected examples of practical difficulties when using distance labor. In our opinion, it would be wrong to conclude that the considered institute is not viable in Russia. On the contrary, it is precisely such non-standard forms that can give a positive impetus to the effective application of institutions of such an ingenious invention as labor law, which is now completely undeservedly perceived by the parties as an unnecessary burden.

A possible solution to this problem is to abandon the formal approach practiced by the parties in the formation and registration of labor relations in general, and distance labor in particular. It would also be wrong to assume that, in the end, labor law aims at a complete transition to flexible and atypical forms of employment, such as distance work. Flexible forms of employment (temporary work, distance work, and loan work) do not replace traditional employment, but are intended to complement it.

It is only important that these forms are recognized by the legislator and effectively protected in the courts. World practice shows that there is a direct correlation between the effectiveness of legislation on flexible forms of employment and the level of informal employment in the country.

It seems that the state authorities of the Russian Federation also feel the need to choose a more liberal approach to regulating atypical forms of employment in general, and remote work in particular. An example is a letter from the Ministry of Labor dated March 2020 [6]. According to the Letter, a transfer to a remote (distant) job is allowed as a temporary measure without a special reissue of the employment contract. It is necessary to obtain the consent of the employee, the wording of which can be included in the order for temporary transfer to remote work. The employee has to be familiar with the order. It is also needed to make an additional agreement.

We can hardly hope that the procedural nature and algorithmization of labor relations will soon weaken its influence in practice. In the end, these features of the legal technique of labor law were conceived to facilitate the situation for employees in case of violation of their rights. For a similar purpose – more complete realization of the interests of employees, the institute of remote work was also conceived.

References

1. Appeal ruling of the Moscow city court of 04.04.2019 in the case N 33-14969/2019. http://www.consultant.ru/cons/cgi/online.cgi?req=doc&ts=11205907310872566176266 8853&cacheid=503D9F4BB8CC611F982BF4E35478E9C3&mode=splus&base=SOCN&n=1127700&rnd=60135401FA2DC70E4A13661EF422A9C7#xe7ziah0xq. Accessed 07 May 2020

2. Appeal ruling of the Sverdlovsk regional court of 14.08.2018 in the case N 33-14260/2018. http://www.consultant.ru/cons/cgi/online.cgi?req=doc;base=RASVR;n=160666;dst=100053#011187480356378776. Accessed 07 May 2020

3. Definition of 16.09.2019 N 5-KG19-106. https://legalacts.ru/sud/opredelenie-sudebnoi-kollegii-po-grazhdanskim-delam-verkhovnogo-suda-rossiiskoi-federatsii-ot-16092019-n-5-kg19-106/. Accessed 07 May 2020

4. Definition of the Moscow city court of 14.04.2017 N 4G-2443/2017. http://www.consultant.ru/cons/cgi/online.cgi?req=doc&base=SOCN&n=855332#06766297269837012. Accessed 07 May 2020

5. Federal law of 06.04.2011 N 63-FZ (as amended on 23.06.2016) "About an electronic signature" (from ed. and add., Intro. effective from 31.12.2017). http://www.consultant.ru/document/cons_doc_LAW_112701/. Accessed 07 May 2020

6. Letter of the Ministry of Labor of 27.03.2020 N 14-4/ 10/P-2741. http://www.consultant.ru/document/cons_doc_LAW_348752/. Accessed 07 May 2020

7. Lyutov, N.L.: Remote work: the experience of the European Union and the problematic aspects of its legal status in Russia. Lex Russica **10**(143), 30–39 (2018)

8. Munz, A.: Social innovation and the work of the future. HR Digest **14**, 5–7 (2019)

9. Orlovsky, YuP: Is labor law reform necessary? Law **11**, 39–46 (2019)

10. Shuraleva, S.V.: Distance work: a comparative analysis of the laws of the EAEU member states (part 1). Labor law Russia Abroad **4**, 41–44 (2019)

11. The Labor Code Of France. https://www.legifrance.gouv.fr/affichCode.do?cidTexte=LEGITEXT000006072050. Accessed 22 May 2020

12. The Labor Code of the Russian Federation of 30.12.2001 N 197-FZ (as amended on 16.12.2019). http://www.consultant.ru/document/cons_doc_LAW_34683/. Accessed 07 May 2020

HR Training in Digital Economy: Innovative Investment Projects

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Abstract. In the context of the training system transformation and the digital economy development, an important problem is personnel training for a specific requirement from enterprises. Employers are interested in young professionals, but they are not satisfied with the lack of their practical experience. At the same time, universities are not able to take into account all the 'requirements' to employees when developing basic educational programs. One of the solutions to this problem is to invest funds of industrial partners in the process of training students and introduce new forms of practice-oriented project training, taking into account the employers' requirement. The aim of this research is to analyze the practical experience of interaction between universities and industrial partners in the process of personnel training for enterprises. The authors used the five-factor model by J. Phillips and the calculation of ROI indicator to evaluate the investment effectiveness in educational programs, methods of absolute and relative values, retrospective analysis, and a grouping method to analyze statistical and analytical information. The research results show the interest of corporate industrial partners in investing funds for training students at the individual request if they will see the economic effect of this investment.

Keywords: Economic impact of investment · Investment in education · Training

1 Introduction

Digital economy transformation currently meets new challenges to economic relations. The problem of personnel training for enterprises is really crucial now as the personnel has to be flexible, able to adapt to new conditions quickly, to respond to new social tasks. Process of generation of innovative decisions and introduction of innovative elaborations, that facilitate enterprises' investment actualizes a problem of producing new personnel who has creative vision for problems' solving and skills to work in a project team.

The consortium of universities with industrial corporations can become one of the possible solutions. The university in this consortium functions as a fundamental transmitter of competencies and knowledge. Enterprises are stakeholders who are interested in training. An essential aspect in this process is practical orientation in

training, which allows the employer to assess not only the knowledge of future personnel, but also practical skills and abilities. Project competencies are really significant and greatly influences successful implementation of innovation projects.

Personnel training is quite cost-intensive process compared to the classical university education in Russia if the HEI (higher educational institution) wants to meet company's challenges and account practical-oriented training based on project approach. Such HEI has such customers as enterprises that have sufficient investment resources and can participate in co-financing.

2   Methodology

Over the years, enterprises highlight a number of major shortcomings in university education: unreasonable theoretical training with a reduced practical component; too general outdated knowledge with an insufficient professional focus; poor research and creativity skills; and low level of teamwork [9]. So now these requirements are new challenges for the university professor and success of his professional tasks' implementation.

Numerous research suggests project-based studying as the most appropriate means to achieve effective competency education in HEI that combines knowledge, skills, and values. Project activities are those ones that create conditions for meta-subject competencies and project teamwork skills, promote practice-oriented learning, and increase motivation [10]. Educational models that integrate project-oriented learning present high practical involvement of students: the transition from a passive knowledge recipient to an active researcher-practitioner.

Project-based learning demonstrates an improvement in teaching and studying quality, supports cognitive development at a higher level, involves students in solving complex, innovative problems, teaches them modern technologies and processes, and generates interest in applied research and self-tuition. The main achievements in project activity in teaching process are the following ones:

- assertive developing the need to acquire new knowledge;
- demand for knowledge and practical skills, based on the need to solve real professional problems;
- mastering professional competences as educational results of main curriculum (hardskills);
- students' professional and personal skills, ensuring developing of universal competencies.

Educational technology aimed at involving business and enterprises of the real economy sector in projects' implementation, training specialists who are ready to introduce technological innovations, becomes the core of the educational model. From the point of view of personnel training technology development, problem-oriented project-based training is a short form of "problem-oriented, interdisciplinary and participant-oriented project work", which creates the basis for the educational approach known as "The Roskilde Model" [1].

The key conceptual aspect here is John Dewey's empirical learning system, which implies the necessity to base education on student's own life experience and specific competencies for each student, the education has to be based on the theory of the American teacher Carl Rogers about "self-targeted education," that differs from Dewey's theory, but comes to similar conclusions [7].

The employers whose requirements are to develop project teamwork skills consider the formation of an innovative university as the basis for HR potential of the economy to be the most successful world practice. The examples of such universities are The Hong Kong University of Science and Technology, The Singapore University of Technology and Design, Ecole Polytechnique Federale de Lausanne, Open University Skolkovo and others [4].

For universities, interaction with corporate customers brings several substantial development factors into the classical education system. Firstly, it is the opportunity for additional funds for the development of individual educational trajectories, taking into account the customer's requirements. Secondly, the involvement of industrial partners into education process provides an opportunity for practical cases and tasks to implement a practice-oriented approach. Thirdly, it is possible to involve employees with unique competences who can level the gap between university theoretical base and practical tasks of the enterprise.

However, industrial partners have the following difficulties. In the conditions of significant reduction of economic growth rate, it is vitally important for enterprises to understand the efficiency of investments in HR development. The clear projection of this effect stimulates stakeholders' activity.

The authors suggest using ROI (return on investment) to show investments efficiency and to evaluate the investments in the process of personnel training taking into account individual corporate needs [8]. The methodology is founded on the four-level model by Kirkpatrick [5], but its main disadvantage is the lack of training effect assessment in money equivalent. In the five-level model of Jack Phillips ROI allows fully assessing the effectiveness of training students within 4–6 years at the university. In addition, this model takes into account an important aspect: the relevance of the educational program to the strategic goals of the enterprise.

3   Results

The result of interaction of university techniques and corporate industrial partners is personnel training system that accounts enterprise's requirements and digital economy development. Samara State Technical University realizes practice-oriented training in three modes: interdisciplinary project communication (IPC), project-educational intensity (PEI) and cross-cutting practice-oriented project-based training (POP), integrated into the main curriculum educational program (CEP) at all levels and degree programs of university preparation [11]. The main stages of assessment methodology and the role of corporate customer, considering training form are presented in Table 1. This table is formed on the basis of investment efficiency evaluation for the industrial partner.

Table 1. Stages of methodology of ROI assessment in Samara State Technical University with the participation of corporate stakeholders

Stages of methodology assessment	IPC	PEI	POP, CEP
Planning:			
Programs goals	Development of a product project team for a specific assignment (MVP of the project)	Creation of a team who can solve specific project tasks (based on the assignment)	Development of competencies for project work on specific cases (cases are provided by stakeholder companies)
Development of an assessment plan and basic data collection	Creation of an assignment, assessment criteria for MVP project	Creation of an assignment	Case studies for project training implementation
Data collection:			
Data collection during studying	Participation in the project work (individual experts and supervisors from the industrial partner), participation of experts in the reporting project analytical sessions, acceptance of project work results	Conducting master-classes in the course of face-to-face and intercontact period of intensity, participation of experts in the reporting project analytical sessions, acceptance of the project work results	Participation of experts in the assessment of case solutions and final defense of the project work
Data collection after the education	Performance assessment on the basis of students' employment	Performance assessment on the basis of students' employment	Performance assessment on the basis of students' employment
Analysis:			
Assessment of material effect	Specific product result in the course of training according to the technical assignment	Specific result in the course of training that solve certain task according to the technical assignment	Multi-optional solution of a case study relevant for an industrial partner
Assessment of nonmaterial effect	Creation of a team oriented for further work on the projects of the industrial partner, promoting industrial partner at scientific events, exhibitions, in	Creation of an effective team oriented for further work in the form of an interdisciplinary project team	Staff recruitment during training that best meets enterprises' requirements

<div align="right">(continued)</div>

Table 1. (*continued*)

Stages of methodology assessment	IPC	PEI	POP, CEP
	the public information space during the project work		
Converting of assessment into value indicators	The converting is made accounting total evaluation of economic effect		
Training costs	Training costs include investment costs for project implementation, taking into account the existing material and technical base of the university, as well as compensation of project risks	Training costs include the cost of organizing and conducting master classes based on university's facilities	Training costs include the cost of developing case studies
Calculation of ROI	Calculation and evaluation of the indicator based on the analysis		
Report:			
Individual reports	Reporting on individual projects and forms of training		
Final report	Final report for industrial partner		

(Source: authors)

Such enterprises as PJSC Oil Company Rosneft, PJSC KAMAZ, PJSC T Plus and other companies act as industrial partners investing in personnel training. As project tasks, participants in the educational process are given real innovative project tasks that are relevant for industrial partners. Urgent problems requiring practical solutions are described in case studies. Reports are made in the following way:

1) response to the training program (taking into account reflection on all training stages);
2) relevance of the training program content to the strategic goals and objectives of the industrial partner;
3) practical application and significance for the consumer;
4) extent of results' achievement;
5) evaluation of investments' effectiveness (ROI).

4   Discussion

The success of personnel training process for corporate customers is evaluated not only in the process of studying, but also at the stage of creation of personnel enterprise reserve and the transition of students to permanent employment at the enterprise. The ROI model which is used on the basis of the university by corporate customers to evaluate training effectiveness is not universal. There are alternative options of training efficiency evaluation, such as Mincer method [3], system of integrated evaluation indicators [6], "Human Economic Value Added" (HEVA) indicator [2]. It is crucial to know that none of the methods is universal. Thus, the use of the Mincer method is widespread in evaluating investments in personnel training. This is due to sufficient simplicity of this model. But often mistakes can occur when this method is used due to lack of all information about the volume of investment costs and knowledge applicability. The system of integrated indicators takes into account the cost of investment, but it is directly related only to labor productivity, without evaluating the additional intangible investment effect. Calculation of "Human Economic Value Added" (HEVA) by Fitzenz' method is simple enough, but it doesn't offer the possibility to evaluate the result of the project activity regarding the MVP project result (minimum viable product), as well as the effect from case studies and project tasks and the image component of this training [2].

Certainly, ROI is not a universal indicator. But it gives the chance to evaluate adequately investments' efficiency into personnel training to confirm the efficiency of enterprise and university interaction. Figure 1 shows the process of forming a project funnel taking into account possible forms of training students with active participation of corporate customers.

The number of projects forms the project funnel. At the stage of integrated project training via the courses "Innovative Economics and Technological Entrepreneurship" and "Practical Project" the number of projects related to the solution of project tasks is large. As the investment costs of industrial partners interested in training are not high at this stage due to the integration of these courses into the educational process of the main educational program.

The project-educational intensity includes fewer projects, as it is a rather new form of interaction between the university and the industrial partner. And this form of education is quite expensive in comparison with classical education. The number of projects at the stage of interdisciplinary project teams is not high due to quite large investments from all participants of the educational process. Table 2 presents a comparative analysis of the main indicators characterizing the cost of training for the investor and the effectiveness of investment in forms of training (in comparison with the cost of training in the basic educational program).

Of course, there are risks that students will leave for competing companies, as these forms of training do not imply the conclusion of a contract that requires the student' consent and obligation to work a certain number of years at the enterprise. But, getting the economic effect at the expense of solving project tasks allows compensating investments.
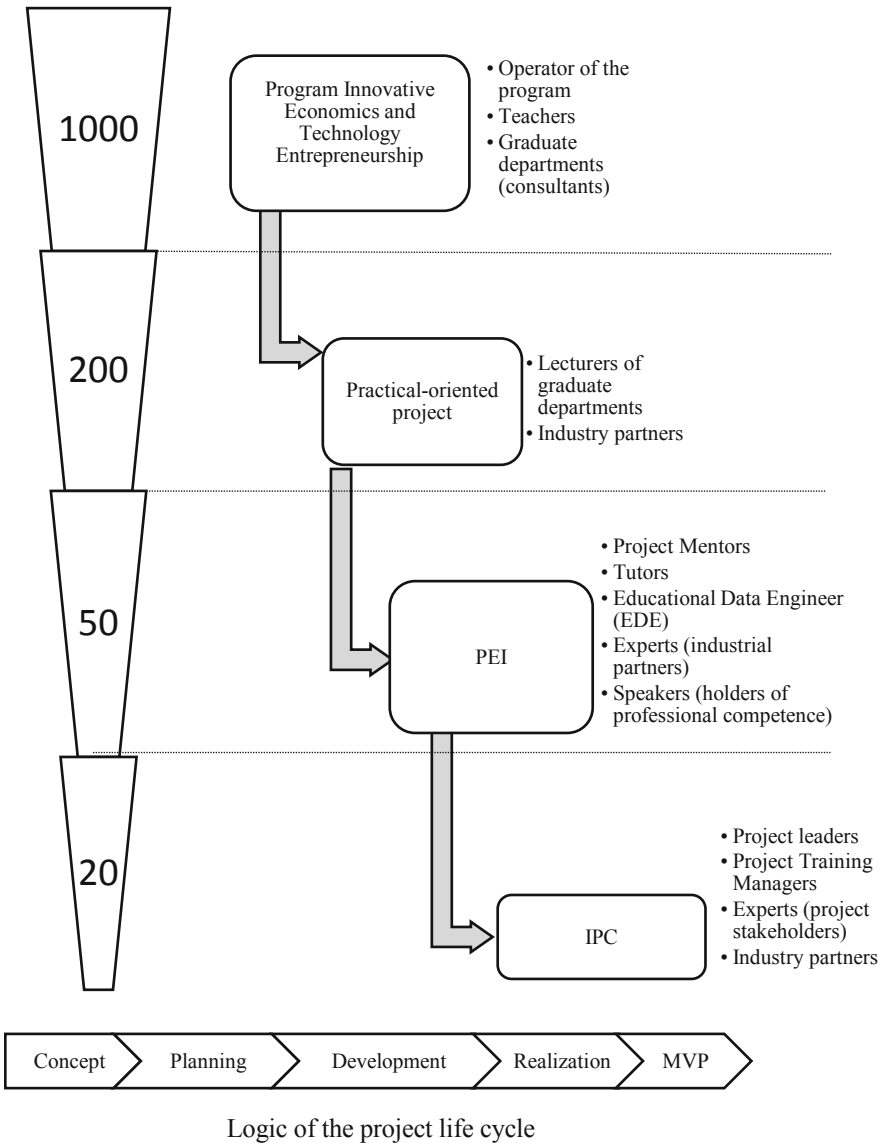
Fig. 1. A funnel of projects in the training implementation with the participation of industrial partners in Samara State Technical University (Source: authors)

Table 2. Stages of methodology of ROI assessment in Samara State Technical University in the implementation of training with the participation of corporate stakeholders (in relative measurement units to the cost of education in the basic education program)

Assessment indicators of investment in personnel training	IPC	PEI	POP, CEP	CEP
Investments	3	1,3	1,1	1
Profit from investing in staff training	4,3	1,6	1,3	1
ROI	43	23	18	0

(Source: authors)

5 Conclusion

Analyzing the practical experience of Samara State Technical University interaction with corporate industrial partners, the following conclusions can be drawn. Corporate customers are interested in investing in training and development of promising students in order to attract them to work for their enterprises. Classical forms of the main educational program do not have time to adapt to constantly changing demands of employers. The process of formation and development of the digital economy sets new challenges for employers and universities. Employers are ready to invest into expensive forms of training if they are clearly aware of the economic benefits. The best way to evaluate investment in training is to calculate the ROI based on Phillips' five-factor model. Practice confirms that industrial partners actively participate not only in investment into training, but also as a carrier of competencies necessary for personnel training [8].

References

1. Andersen, A.S., Kjeldsen, T.H.: Theoretical foundation of PPL at Roskilde university. In: Andersen, A.S., Heilesen, S.B. (eds.) The Roskilde Model: Problem-oriented Learning and Project Work. and Change in Professional Education, vol. 12, pp. 3–16. Springer, Heidelberg (2015)
2. Fitzenz, I.: Profitability of investments in personnel: measuring the economic value of personnel. Vershina, Moscow (2006)
3. Giziene, V., Simanaviciene, Z., Palekiene, O.: Evaluation of investment in human capital economic effectiveness. Econ. Eng. Decis. **23**(2) (2012). https://doi.org/10.5755/j01.ee.23.2.1541
4. Huisman, J., Smolentseva, A., Froumin, I. (eds.): 25 Years of Transformations of Higher Education Systems in Post-Soviet Countries: Reform and Continuity. Palgrave Studies in Global Higher Education, London (2018)
5. Kirkpatrick, D.L., Kirkpatrick, J.D.: Implementing the Four Levels: A Practical Guide for Effective Evaluation of Training Programs. Berrett-Koehler Publishers, Oakland (2007)
6. Milost, F.: Investments in human capital: elements of investments, their valuation, a true and fair view of financial statements compiled by using the classical approach, and the related financial performance ratios. In: Russ, M. (ed.) Management, Valuation, and Risk for Human Capital and Human Assets, pp. 137–159. Palgrave Macmillan, New York (2014)

7. Nielsen, N.M.: Problem-oriented project learning as a first year experience: a transformative pedagogy for entry level PPL. Educ. Sci. **10**, 6 (2019). https://doi.org/10.3390/educsci10010006

8. Phillips, P.P., Phillips, J.J., Stone, R.D., Burkett, H.: The ROI Fieldbook: Strategies for Implementing ROI in HR and Training (Improving Human Performance). Butterworth-Heinemann/Elsevier, Massachusetts (2006)

9. Ríos, I.D.L., Cazorla, A., Díaz-Puente, J.M., Yagüe, J.L.: Project-based learning in engineering higher education: two decades of teaching competences in real environments. Proc. Soc. Behav. Sci. **2**(2), 1368–1378 (2010). https://doi.org/10.1016/j.sbspro.2010.03.202

10. The regulation on the project activities of students at Federal State Budgetary Education Institution of Higher Education "Samara State Technical University". http://cpo.samgtu.ru/sites/cpo.samgtu.ru/files/polozhenie_p_-_405_ot_29.03.2019.pdf. Accessed 18 May 2020

11. Veis, Y.V., Eremicheva, O.Y., Ilyina, L.A., Tikhonov, V.S.: Efficiency evaluating of project training investing as a method of private investors involvement. In: Mantulenko, V. (ed.) Proceedings of the 17th International Scientific Conference "Problems of Enterprise Development: Theory and Practice" 2018, SHS Web of Conferences, vol. 62, p. 04004 (2019). https://doi.org/10.1051/shsconf/20196204004

Formation Mechanism of Industrial Policy for Improving Regional Food Security

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Abstract. As a result of the pandemic, both the internal needs of the territory (country, region) and the importance of providing humanitarian assistance to the countries with food shortages may grow significantly. The food security assessment and the application of measures to improve it, should be carried out in advance. The reorientation of import substitution policy to export-oriented one should also be based on the competition development in the industry. In the article, the authors suggest to calculate a new type of Herfindahl-Hirschman index, which characterizes the level of producers' concentration at the market by the share of gross profit of economic entities. The research purpose is to provide scientific justification of practical recommendations for the development of food markets in the region, taking into account the level of their concentration. Based on multidimensional statistical calculations, the authors analyze the hypothesis of a positive impact of large economic entities (including monopolies) development on the provision of local food products to the population; consider tools for forming the vector of industrial and competitive policy based on matrix positioning, as well as conduct correlation and regression analysis on the example of the regional beef market.

Keywords: Competition policy · Food security · Industrial policy · Local markets · Regional development

1 Introduction

The current epidemiological situation in 2020 (the pandemic) has shown possible failures in ensuring food security and means of subsistence, preventing a panic reaction that can exacerbate failures and worsen food security. In such conditions, it is particularly important to maintain the functioning of food supply chains both within the country and at the regional level [3]. Russia is the largest country in the world, located in the Eastern part of Europe and Northern Asia, so it is safe to say that its food security is formed based on administrative and territorial division.

The formation of legal foundations in the field of food security in the Russian Federation is rooted in the XIX century [8]. However, in our opinion, the key stage in the history of legislation development, aimed at achieving the goals of providing the

population with their own food begins with the Decree of the President of the Russian Federation from 30.01.2010 № 120 "On approval of the Food Security Doctrine of the Russian Federation" [12]. However, taking into account changes in external and internal conditions due to the geopolitical situation, Russia's accession to the WTO (World Trade Organization) and the deepening of integration processes in the EAEU (The Eurasian Economic Union), the Ministry of Agriculture and other departments have developed a project of a new Food Security Doctrine [12], which was adopted in January 2020. The new Doctrine has undergone a number of key changes (for example, in changing the range of a food products set), but the key aspect is still the procedure for calculating of the food independence indicator. It is defined as the level of self-sufficiency of the territory in percentage terms, calculated as the ratio of the volume of domestic production of agricultural products, raw materials and food to the volume of their domestic consumption and has threshold values. Thus, the main principle is the state responsibility for ensuring a guaranteed level of the population food well-being.

In a number of regions of the Russian Federation, the regional authorities, with the help of Federal legislation, have developed a strategy for the food security development, taking into account their natural, climatic and national characteristics. Some of the Russian Federation subjects that can be classified as economically developed regions have legislated their own regulations to ensure food security (Moscow, Saint Petersburg, Tatarstan, Bashkortostan, Nizhny Novgorod, Sverdlovsk, and Ulyanovsk regions).

Moreover, food security in the economic aspect is often considered only at the level of budget allocations amount determining, the dynamics of which is not always based on quantitative and qualitative planning.

The above has led to the purpose of the study, which is to scientifically substantiate the theoretical approach and development of practical recommendations for the development of food markets in the region based on the regulation of their concentration level. Therefore, the analysis of regional food markets is very promising, taking into account the new principles of the formation of the Food Security Doctrine.

2   Methodology

In the economic literature and public policy, usually in all sectors (except for the military and natural monopolies), the preference is given to the competition development. However, the works of the famous economist J. A. Schumpeter indicate that highly competitive markets do not always form the conditions for organizing the more effective resources redistribution. Thus, a positive impact of large farms on the population's food supply due to economies of scale, reduced production costs and the formation of a product with a high degree of processing is possible. To refute or confirm this food market hypothesis, we conducted an empirical analysis using mathematical and statistical analysis tools, we revealed the influence of the Herfindahl-Hirschman index calculated by three parameters (natural indicators, revenue, profit) on social and economic indicators that form the economic and physical availability of food (according to the region local markets).

The study used comparative analysis and statistical methods (the method of regression analysis using the Gretl software product) [5]. For the purpose of economic and statistical analysis, data from the Russian Federal State Statistics Service and data from the Republic of Tatarstan Ministry of Agriculture were used. Together, these methods allowed us to solve the tasks set in the study.

Based on the made in 2020 change in methodology of calculation of food security indicators, in particular the introduction of a new indicator, which reflects the degree of internal market needs meeting through domestic production, the authors calculated the coefficient characterizing the physical security of the population with −i product:

$$F_i = \frac{V \cdot k_{recalculation}}{P \cdot N_{use}} \tag{1}$$

F_i – where is the coefficient of physical supportability of the population with i-food product;

V – the volume of food production in the study area;

$k_{recalculation}$ – coefficient of raw materials conversion into the finished food;

P – average annual population of the study area;

N_{use} – the minimum rational rate of the product consumption according to medical standards (recommendations on rational norms of food consumption that meet modern requirements of healthy nutrition approved by the order of the Ministry of Health of the Russian Federation of 19 August 2016. N 614).

As a result of calculating this coefficient (F), it is possible to compare the market capacity of the studied product according to the established rational medical standards of its consumption, taking into account the population of the territory (on average for all population groups) and the actual production volume of the product in the studied territory.

As a result of calculations there will be two options:

a) F > 1-indicates that the volume of production by commodity producers in the study area is sufficient and fully covers the population demand;
b) F < 1-indicates the lack of production of the product in the study area.

At the same time, it should be understood that economic analysis in the agricultural sector has some features: the raw material does not always fully acquire the form of a finished product for sale, as it can be used for agricultural unit's own consumption. Thus, we agree with the point of view presented in the scientific literature - to evaluate economic entities from the position of full commodity production, therefore, we will consider all manufactured products of the company as a commodity [7]. We will test this approach on the example of the beef market in the regional market of the Republic of Tatarstan - which forms one of the 85 subjects of the Russian Federation, and also conduct a matrix analysis to determine the vector of industrial and competitive policy of the region.

3   Literature Review

The destabilization of the world oil market and large-scale quarantine measures, that made the products delivery complicated, have led to some countries restricting food exports, while others risk of agricultural works disruption. The head of the FAO (Food and Agriculture Organization) notes that strict isolation and movements restriction can disrupt the production, processing, wholesale supplies and sale of food both at the national and international level [1]. For example, due to the borders closure for seasonal agricultural workers, a significant part of the crop may be lost, and difficulties are expected due to labor shortages in a number of industries. Large food suppliers reduce or completely stop supplying the market with certain food products due to a lack of working capital to perform current activities. Such an imbalance in the world market of raw food products leads to prices increasing at both the global and regional levels. In rich countries, the rise in food prices leads to decreasing of the population level and quality of life. In poor countries, it results in an acute shortage or even unavailability of essential food for broad population, which results in socio-political upheavals of massive proportions [2, 9, 10]. According to Gurkov, one of the main causes of the revolutions and uprisings series that broke out in late 2010 in North Africa and the Middle East and is known as the "Arab spring" was the rise in world food prices in 2007–2008 [2].

According to prognosis, by 2050 the world population will increase to 9.6 billion people [14]. In this regard, to satisfy the overall demand, food production should increase by 70–110% [14].

Under these conditions, the economic assessment and implementation of the agro-industrial complex strategic potential is a key goal of state regulation for the last two decades, and has become a central strategy for the governmental and non-governmental programs development [10]. Evaluation of region sustainable development, covering economic, environmental and social aspects of the territory development, is inextricably connected with economic indicators such as food demand and population growth, and increasing the total productivity of production inputs in the region [6, 11].

From an empirical point of view, in the context of agricultural development, the number of studies supporting small business (farming) has grown significantly over the past decade [4]. However, competition and industrial policy directions in the agri-food sector within even one state should take into account regional differences. Differences are manifested both in the population living standard and in economic potential differentiation.

4   Results

The supply assessment in the food market should also include the indicator of the economic availability of food to the population. Such social and economic indicators as the purchasing power of beef by the population, the share of expenditures on beef, the price index, average producer prices, and average consumer prices characterize the economic availability of the analyzed product for the locals. Table 1 shows the values of the above-mentioned indicators in the Republic of Tatarstan.

Table 1. Coefficient of physical accessibility and values of social and economic indicators that form the economic accessibility of beef for the population according to the Republic of Tatarstan records (Territorial body of the Federal State Statistics Service of the Republic of Tatarstan)

Year	Coefficient of physical supportability of beef meat	Consumption per caput "meat and meat products", (on meat basis), kg.	Purchasing power of the population "Meat and meat products", kg.	Share of expenditures on "Meat and meat products", percentage out of 100	Price indices "raw meat of cattle", in %	Average producers prices "live cattle", rouble/tn	Average consumer prices "beef, except boneless meat", rouble/kg	Consumer price indices "Meat products", in %
2013	0.96	73	109	11.8	141.0	49701	171.25	104.4
2014	0.94	74	98	8.9	85.9	59354	223.35	120.9
2015	0.94	78	101	8.4	101.7	69993	240.16	105.4
2016	0.96	80	110	6.9	150.2	71079	240.47	97.8
2017	0.82	80	120	7	103.1	73997	260.51	116.1
2018	0.90	79	104	7.2	100.2	89433	305.1	108.5
2019	0.96	81	109	8	120.9	96447	299.09	100.6

Source: authors.

The regional market of meat products has an internal potential, despite the fact that the level of self-sufficiency is reached almost annually (at least 85%) %. This conclusion can be justified by the fact that the indicators are close to the boundary value set by the Doctrine, and the calculation was made based on statistics that form the indicator value of beef meat production in live weight.

During the study period, the local people' beef supply of agricultural organizations and peasant farms in the republic averaged 92%.

We calculated the correlation coefficients between the concentration level indicators (Herfindahl-Hirschman Index (HHI) and market concentration (CR) on revenue, volume of production in kind and gross profit) and the main social and economic indicators that affect the availability of meat and meat products for the population. Statistically significant correlation coefficients obtained in the course of research on the beef market are shown in Table 2.

Table 2. The revealed relationships between social and economic indicators that form the economic availability of beef meat and the level of producers' concentration according to the Republic of Tatarstan for 2013–2019

No.	Indicators	HHI by natural indicators of Cattle meat	HHI by Cattle meat revenue	HHI by Cattle meat profit	CR3 by natural indicators of Cattle meat	CR3 by Cattle meat revenue	CR3 by Cattle meat profit
1	Share of expenditures on Meat	✅ 0.89	✅ 0.89	0.41	✅ 0.89	✅ 0.86	0.44
2	Average consumer prices of Cattle meat	-0.65	✅ -0.72	-0.13	-0.59	✅ -0.70	-0.18
3	Share of cash expenditures on food	✅ 0.79	✅ 0.74	✅ 0.74	✅ 0.84	✅ 0.74	✅ 0.73

Source: authors.

Since the HHI values for the beginning of 2019 are 0.02–0.04 units and CR3 values are equal to 0.16–0.26, then we can say with confidence that the beef market of the Republic of Tatarstan has a stable dynamics of forming a structure close to the perfect competition. The values of concentration indicators also characterize the fact that in 2018, the three largest producers of the study area accounted for 16% of the total volume of production (or 26% of profit). For further analysis, the indicators "share of expenditure on meat" and "share of money expenditure on food" can be considered identical. Considering the fact that the indicator "share of population expenditure on meat" is more close to the object of analysis, and also has higher values of correlation coefficients, let's analyze the influence of the concentration level directly on it (2).

$$y = 5,91 + 145,34 \cdot x_9 \tag{2}$$

where y is the indicator of the share of population expenditure on meat;

x_9 – Herfindahl-Hirschman index of the beef market (in natural values).

This regression equation is statistically reliable and allows us to draw some economic conclusions. Thus, an increase of producers concentration in the market will negatively affect the availability of meat to the population. A graph of the observed and calculated values confirms the quality of the model (Fig. 1).

The calculations results show that if the largest producers will increase production volumes to 1%, it will immediately lead to an increase in the share of population expenditure on meat. According to the 95% of confidence interval, calculated for the regression coefficient, the increase of the population expenditures share will be [0.6; 2.3] percent and more. Thus, the share of expenditures on meat is not sensitive to changes in the concentration of producers in the beef market, this fact is also confirmed by the elasticity coefficient (0.29%).
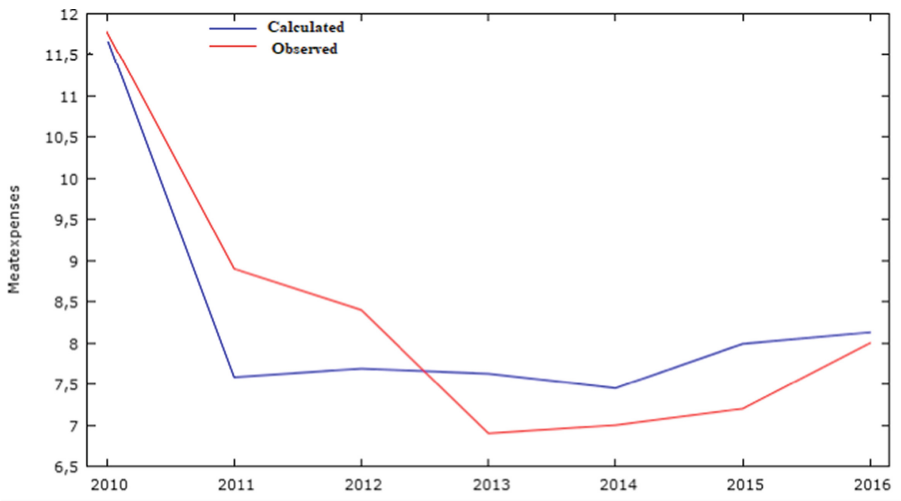
Fig. 1. Dynamics of observed and calculated values of the HHI impact on the beef market on the share of meat expenditures of the population of the studied territory (Republic of Tatarstan), 2013–2019 (Source: authors).

However, the share of population expenditures on meat will increase significantly if the beef market becomes medium-centered (HHI = 0.1). In this situation, the share of population expenditures on meat will reach on average 20.44% or, with a 95% reliability, will be [12.47; 27.92] percent.

If the beef market becomes highly monopolized (HHI = 0.2), then the average expenditures of the population on meat may be 34.98% or, with a 95% reliability, will be [19.20; 50.76] percent. This situation will definitely lead to a significant decrease in the level of well-being of the region's population.

Despite the fact that the results of calculations of correlation coefficients showed a high direct relationship between market monopolization indicators and average consumer prices on beef meat, the Durbin-Watson test characterizes the presence of autocorrelation in time series with a probability of 95% (Table 3).

Table 3. The least square method (T = 7) Average consumer prices for Beef = 287,18– 1261,06·HHIrevenueBeef

	Coefficient	St. error	t-statistics	P-value	
const	287.184	21.1343	13.5885	0.00004	***
HHIrevenueBeef	−1261,02	540.264	-2.3341	0.06687	*
Arithmetical dependent mean	248.5614		Arithmetical off. dependent mean		45.90070
Sum of squared errors	6049.661		Standard error of model		34.78408
R-square	0.521435		Cor. R-square		0.425722
F(1, 5)	5.447894		P-value (F)		0.066871
Log likelihood	−33,59904		Criterion of Akaike		71.19807
Criterion of Schwarz	71.08989		Criterion of Hannan-Quinn		69.86099
Rho parameter	0.645082		Durbin–Watson statistic		0.786981
Breusch-Pagan test for heteroscedasticity -					
The null hypothesis: heteroskedasticity is missing; Test statistic: LM = 0,615575					
p-value = P(Chi-square(1) > 0.615575) = 0.432696					
Durbin-Watson statistics = 0.786981; P-value = 0.0131824					
t(5, 0,025) = 2,571					
Variable		Coefficient		95% confidence interval	
const		287.184		(232,856, 341,512)	
HHIrevenueBeef		-1261.02		(-2649,81, 127,778)	

Source: authors.

The presented data characterize that the model is unreliable and is not subject to economic analysis. In general, the values of all HHI and CR3 indicators show that the beef market is structurally close to the perfect competition market. Our research also revealed the fact that state support in the form of subsidies in the beef market has a positive impact on the formation of their own food security (3).

$$y = 11390,9 \div x_{15} \qquad (3)$$

where y is the coefficient of physical security of the population with beef meat; x_{15} – average amount of subsidies allocated to the district;

Despite the fact that only 16% of the dependent variable is explained according to the hyperbolic function in the constructed model, Fischer's test allows us to say that the constructed equation is statistically reliable by more than 95%. In particular, the t-statistic confirms the statistical significance of the regression coefficient by more than 95%. The absence of heteroscedasticity (with reliability of more than 99%) is confirmed by the Breusch-Pagan test. In addition, the remainder of the equation has a normal distribution, p - value of the test statistics = 0.26 [5].

Also, in order to make managerial decisions for the formation of a regional food security strategy on beef meat, it is necessary to take into account the fact that the physical supply of the population with beef meat is not affected by the level of producer prices, the cost of 1 kg of beef meat and the profitability of production.

As a part of the region food security discussion, it should be noted that the development of the regional food market depends entirely on the development of its local markets [7]. At the same time, the economic literature does not clearly distinguish the understanding of this category [4, 7]. Taking into account the administrative territorial division of the Republic of Tatarstan, we have identified municipal districts of the republic as local markets [13]. Thus, this approach takes into account common business conditions for producers, as well as logistic aspects of products implementation [7].

5   Conclusion

Let's analyze the production of beef meat in the region, which is characterized by the following parameters: despite the fact that the market is marked by a loss of production (−25%) the meat and meat products market of the Republic of Tatarstan has a positive dynamics, since the production for 2 years increased by 16% (5 thousand tons), exports to other regions of the Russian Federation increased by 26% (30 thousand tons) on average, 1 ruble of revenue is 1 ruble of budget allocations.

We suggest formulating the definition of industrial and competition policy instruments, using the decision-making matrix. Since the studied territory (the Republic of Tatarstan, which includes many districts-hereinafter local markets), we will reflect in the matrix the ones that produce the beef meat. The diameter of the circle reflects the value of the HHI on the volume of implementation in natural expression, according to the X-axis (x) we can see the values of the local market average production profitability; on the Y-axis (y) we can see the values of product physical security coefficient on the local market. Since in the previously suggested formula of the physical security coefficient calculating (1), food security of the territory will be achieved if its value is higher than 1, the origin of coordinates on the ordinate axis (y) passes through the value equal to "1". We have made recommendations based on which quadrant of the matrix a particular local market will be assigned to (Fig. 2).

Describing the matrix, we should remember that "F" is the coefficient of physical security, and "R" is the profitability of production (calculated as the profit to cost ratio).
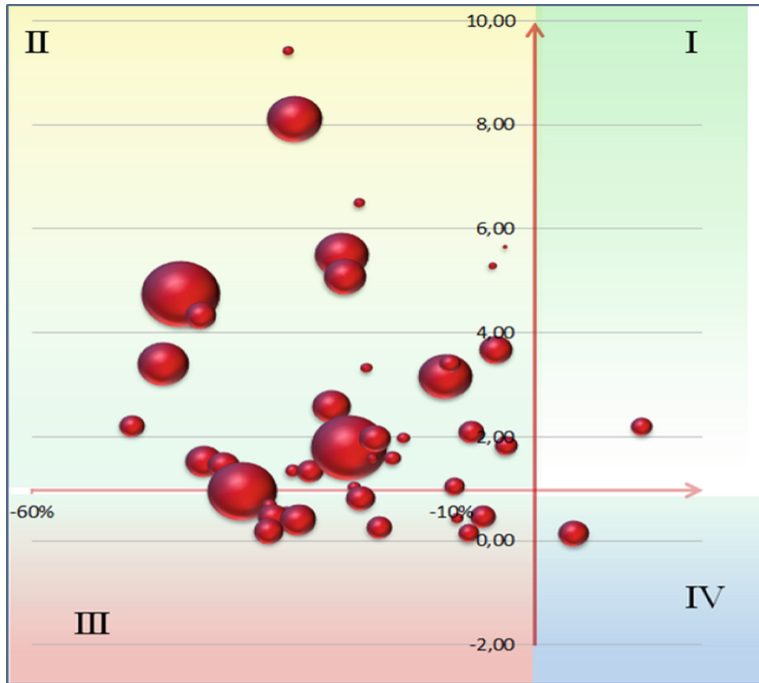
Fig. 2. Matrix for making strategic decisions in order to determine the development vectors of industrial and competitive policy of beef production in the Republic of Tatarstan (Source: authors).

In the region beef production is characterized by indicators of activity loss ratio (−20%). The I quadrant of the matrix (F > 1; R > 0) includes only one local market with 8 producers, so we consider it appropriate to develop competition among them using the tools of industrial and competitive policies.

The second quadrant (F > 1; R < 0) includes 68% of the local markets of the studied territory (255 producers out of represented in the sample 351). In these local markets, the population is provided with products of their own production above rational norms, the necessary level of food security is achieved, so it is necessary to increase the profitability of producers' activities. Producers of all local markets of the II quadrant are unprofitable (17 local markets out of 30 demonstrate a loss of production above 20%). We believe that these indicators were formed due to the sale of products at a below-cost price. To ensure that these companies do not stop their activities, direct and indirect government support should be provided to them, since their closure may increase the risk of food dependence and increase the level of the territory monopolization as a whole. This recommendation is acceptable, since the above-mentioned analysis shows that increasing of the beef market monopolization to the level of medium-concentrated does not significantly increase the share of population expenditures on the product.

Almost 30% of the producers of the III quadrant ($F < 1$; $R < 0$) are unprofitable and do not provide the population with enough products of their own production. However, food independence is almost achieved in three districts ($F > 70\%$). We recommend developing competition in these local markets, it will reduce product prices and improve the quality of products. In other local markets of the III quadrant, existing producers should be supported (protectionism policies, guaranteed price system, cost compensation system and others).

The IV quadrant ($F < 1$; $R > 0$) includes 1 local market (Zelenodolsk district), the value of F indicates that local producers cater for the population demand in accordance with established rational medical standards only by 15%. The activity of producers are inefficient ($R = 5\%$). Even if 2–3 producers are closed, monopolization in this local market will grow, so it is necessary to strengthen measures of large operating production support. This recommendation is confirmed by the fact that high monopolization in this food market will significantly increase the share of population expenditures on meat (see conclusions after Fig. 1).

Thus, the use of matrix positioning provides a new mechanism of planning soft government intervention in the industry. However, the interpretation of the findings requires special precautions; the reason is the data available for analysis and their spatial resolution were limited by the studied region. At the same time, the suggested approach can be successfully implemented based on data from other territories, including the state level.

By integrating indicators of assessing the competition level in the industry and social and economic indicators, we have developed tools that could be used to improve the level of food security in the region.

References

1. Food and agriculture organization of the United Nations: COVID-19 coronavirus outbreak (2020). http://www.fao.org/2019-ncov/ru/. Accessed 30 Apr 2020
2. Gurkov, A.: COVID-19 pandemic: The world will face the food shortages (2020). https://clck.ru/N6C2D. Accessed 30 Apr 2020
3. InterFax: The UN announced that COVID-19 is the threat for food markets (2020). https://www.interfax.ru/world/701158. Accessed 30 Apr 2020
4. International Fund for Agricultural Development: Smallholders, food security, and the environment (2013). https://www.ifad.org/documents/38714170/39135645/smallholders_report.pdf/133e8903-0204-4e7d-a780-bca847933f2e. Accessed 30 Apr 2020
5. Ismagilov, I.I., Kadochnikova, E.I.: Special models of econometrics in the Gretl environment: a textbook for students, pursuing a bachelor's degree in 38.04.01 "Economics". University of the Kazan, Kazan (2018)
6. Kudryashov, A.: Lean manufacturing. Implementation problems. Bulletin of UNIDO in Russia, 6 (2012). http://www.unido-russia.ru/archive/num6/art6_14/. Accessed 30 Apr 2020
7. Safiullin, A.R., Khairullina, A., Sabirova, A.I.: The impact of competition on the sustainable development of the regional food market. J. Soc. Sci. Res. **2018**9(5), 439–443 (2018)
8. Sklyarenko, S.A., Boltaevsky, A.A., Pryadko, I.P., Sharov, V.I.: History and modernity of the food security problem. Agriculture **1**, 27–39 (2016). https://doi.org/10.7256/2453-8809.2016.1.20267

9. Storozh, I.A.: Lean manufacturing implementation algorithms. Stand. Qual. **11**, 58–60 (2016)
10. Tan, H.: A food crisis looms as coronavirus forces farms to stay idle and countries hoard supplies. World Markets (2020). https://www.cnbc.com/2020/03/30/coronavirus-food-crisis-looms-as-farms-idle-countries-hoard-supplies.html. Accessed 30 Apr 2020
11. Teslenko, A., Chernukha, A., Bezuglov, O., Bogatov, O., Kunitsa, E., Kalyna, V., Katunin, A., Kobzin, V., Minka, S.: Construction of an algorithm for building regions of questionable decisions for devices containing gases in a linear multidimensional space of hazardous factors. Eastern-Eur. J. Enterp. Technol. **5**(10(101)), 42–48 (2019)
12. The "Food Security Doctrine of the Russian Federation" was approved by the Decree of the President No. 20 from January 21, 2020 "On approving the Food Security Doctrine of the Russian Federation» (2020). http://kremlin.ru/acts/news/62627. Accessed 30 Apr 2020
13. Turgel, I.D., Bozhko, L.G., Linshi, S.: State support for single-industry towns' development of Russia and Kazakhstan. Financ. Theory Pract. **2**(92), 22–32 (2016)
14. United Nations: World population prospects: The 2017 revision (2017). https://www.un.org/development/desa/publications/world-population-prospects-the-2017-revision.html. Accessed 30 Apr 2020

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