

Approaches to Global Sustainability, Markets, and Governance
Series Editors: David Crowther · Shahla Seifi

Elena G. Popkova
Bruno S. Sergi *Editors*

Anti-Crisis Approach to the Provision of the Environmental Sustainability of Economy

 Springer

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Series Editors

David Crowther, Social Responsibility Research Network, UK

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Elena G. Popkova · Bruno S. Sergi
Editors

Anti-Crisis Approach to the Provision of the Environmental Sustainability of Economy

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Introduction: Anti-Crisis Approach to the Provision of the Sustainability of Economy, Markets, and Governance in the Decade of Action

Sustainable development is the overarching strategic guideline for economies, markets, and government and corporate governance in the Decade of Action. The essence of this benchmark is the systemic balance of all components of economic activity: current and long-term development; consequences for society, economy, and environment; traditions and innovations; internal and external activities; presence in domestic and world markets; interests of all stakeholders; the whole complex of 17 UN SDGs (Sustainable Development Goals adopted by the United Nations).

The complexity of managing sustainable development and its achievement in practice is due to the fact that the market environment is subject to dynamic changes. Along with this, there is a change in the phases of the economic cycle and the life cycle of products and organizations. That is why this book offers an anti-crisis approach to the sustainability of the economy, markets, and governance in the Decade of Action. The novelty of this approach is that it provides countercyclical management of sustainable development, which is carried out in three areas at once.

The first area is preventive crisis management to avoid stagnation. The meaning of management in the considered approach is not to ensure current sustainability but to guarantee sustainable development in the dynamics of economic systems. In this regard, it is necessary to find a balance of stability and development, the achievement of which is facilitated by the considered approach. In a changing market environment, staying in place means falling behind others. Consequently, sustainable development requires change management, which is provided in the crisis management approach.

The second area is managing sustainability in the current economic crisis. The applicability of the considered approach in crisis conditions favorably distinguishes it from alternative approaches to the management of sustainable development, which mainly focus on periods of stability in the upward phase of the economic cycle. The third area is preventing crises in sustainable development itself, particularly slowing down and even regressing implementation of the SDGs.

In developing and practicing a crisis management approach to the sustainable development of the economy, markets, and entrepreneurship, the special context of the Decade of Action must be considered. First, this context is due to the pronounced industry specificity of sustainable development. For example, in the COVID-19

pandemic and crisis, health care has become a key sector of the economy, determining its sustainable development. In the context of the worsening international sanctions crisis, the highest risks and threats to sustainable development have been created in export-oriented sectors of the economy.

The opportunities and priorities for supporting the SDGs in entrepreneurship depend significantly on its sectoral affiliation. In industry, for example, the most important SDGs are those related to environmental protection and combating climate change. In the service sector, the SDGs related to sustainable human resources management and corporate social responsibility come to the fore. In knowledge-intensive, IT, and high-tech industries, the most important SDGs are those related to innovation and economic growth.

Second, the context of the Decade of Action includes the specific risks and new opportunities presented by the digital economy. The sustainable development of economies, markets, and enterprises is affected by digital competition, the increasing role of technological resources in the system of production factors, and the digitalization of goods, services, and communications.

Third, the Fourth Industrial Revolution and smart automation technologies make it possible to improve sustainability management with a crisis-response approach. Artificial intelligence (AI) enables better management of sustainable development at the level of economies, markets, and enterprises. Intelligent decision support contributes to the rationalization of economic activity. Simultaneously, the information society faces increased threats to economic security, in particular its new manifestation—cybersecurity.

Fourth, when considering the context, it is important to consider the financial provision of crisis management of sustainable development. Attracting investment determines the financial sustainability of economic systems and business entities. Accordingly, the outflow and shortage of investment can cause a crisis of sustainable development. Therefore, it must be prevented.

The issues of state tax regulation, including administration and control, deserve special attention. This regulation is designed to ensure the transparency of economic systems, prevent the development of the shadow economy, and create favorable conditions and market incentives for the development of economic entities. This regulation determines the replenishment of the state budget and, consequently, the possibility of state support for sustainable economic development.

The above features of the context of the Decade of Action are systemically considered in this book, which aims to summarize the gained experience and develop scientific, methodological, and practical recommendations for improving the anti-crisis approach to ensure sustainable development of the economy, markets, and entrepreneurship. The book's structure is divided into four parts.

Part I focuses on the issues of anti-crisis management of sustainable development of entrepreneurship by sectors of the economy. It pays considerable attention to environmental and, in particular, climate sustainability. The sectors examined include agriculture, science and higher education (universities), health care and pharmaceuticals, retail trade, and services.

Part II reveals the digital tools of crisis management for the sustainable development of the economy. Several chapters are devoted to IT as a promising sector of the digital economy. Digital tools for human resource management and organization of the labor market, public services, electronic document management, etc., are presented.

Part III identifies the place and role of artificial intelligence (AI) in managing sustainable development and economic security. The part considers the issues of information security and economic security of territories in terms of digitalization, as well as the fight against the shadow economy and entrepreneurship through smart technology and the improvement of the management and control of economic systems and business entities using AI.

Part IV explores corporate finance and public crisis management (governance) to support the sustainable development of the economy. Particular attention is paid to issues of financial literacy, tax administration and control, labor migration, territorial development, and regulation of international trade. Special chapters are devoted to the issues of crisis management of sustainable development on the example of banks.

The book is intended for scholars who study issues related to sustainable development. For them, the book formed the scientific basis for applying the crisis management approach to the sustainable development of the economy, markets, and enterprises. The book will also be of interest to practitioners (business and government regulators) interested in the issues related to sustainable development. In the book, they will find examples from international practice and applied solutions to improve the management of sustainable development of economies, markets, and enterprises through the crisis management approach in the Decade of Action.

Elena G. Popkova
Bruno S. Sergi

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Part I
**Anti-Crisis Management of Sustainable
Development of Business by Industry**

Chapter 1

Environmental Sustainability of the Agricultural Economy with Reliance on Climate-Smart Agriculture



Elena G. Popkova 

Abstract The research aims to investigate the prospects for environmental sustainability of the agricultural economy in the Decade of Action based on climate-smart agriculture (using crop production as an example). To achieve the research goal, the author applies the method of regression analysis to carry out econometric modeling of the contribution of climate-smart agriculture to the environmental sustainability of the agricultural economy based on international experience. The sample includes all 113 countries covered by the Economist Impact food security statistics in 2022. As a result, it is substantiated that climate-smart agriculture plays an important role in ensuring the environmental sustainability of the agricultural economy, significantly increasing the resilience of agriculture to the risk of water scarcity and declining water quality, as well as to the risks of land degradation and declining soil fertility. However, the persistence of horizontal agriculture constrains the development of climate-smart agriculture and limits its contribution to the environmental sustainability of the agricultural economy. The prospects for environmental sustainability of the agricultural economy in the Decade of Action based on climate-smart agriculture are related to the transition to vertical farming. The practical and management implication of this research is that the new approach to climate-smart agriculture developed through the creation of vertical farms will make it possible to achieve systemic environmental sustainability in the agricultural economy.

Keywords Environmental sustainability · Agricultural economy · Climate-smart agriculture · Sustainable development goals (SDGs) · Decade of actions

JEL codes O13 · O31 · O32 · O33 · Q12 · Q13 · Q16 · Q01 · Q54 · Q56 · Q57

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1.1 Introduction

Environmental sustainability is one of the most important priorities of the agricultural economy because it largely determines food security in the Decade of Action. Climate change poses high natural and climatic risks to agriculture, which must be managed. Climate change is being actively addressed through the United Nations (UN) global initiative on Sustainable Development Goals (SDGs).

The problem is that combating climate change has a narrow focus and is limited to the implementation of SDG 13 (Marcos et al., 2022). This provides considerable results in reducing production and consumption waste, as well as reducing the resource intensity of the economy, generally reducing the environmental costs of economic growth. However, the direct contribution of combating climate change to the economy is limited and insufficient for its full-scale environmental sustainability.

Climate-smart agriculture is a promising solution to this problem. It involves using smart technologies (automation tools based on artificial intelligence) in agriculture to manage natural and climatic risks (Popkova, ; Popkova & Shi, 2022). Nevertheless, these risks continue to be quite high even in the leading countries in terms of food security.

For example, in Finland, which occupies the first place in the Economist Impact food security rating (Economist Impact, 2022), the activity of using climate-smart technology in agriculture (indicator “early-warning measures/climate-smart agriculture”) is the highest (estimated at 100 points). Simultaneously, the risk of air temperature change (indicator “exposure”: 71.4 points) is 28.6% (100–71.4). The risk of water scarcity and deterioration of water quality (indicator “water”: 86.2 points) is 13.8% (100–86.2). The risk of land degradation and reduced soil fertility (indicator “land”: 75.9 points) is 24.1% (100–75.9). The risk of eutrophication and insufficient melioration (indicators “oceans, rivers, and lakes”: 64.1 points) is 35.9% (100–64.1).

This research seeks to strengthen the scientific and methodological support for the problem posed. The research aims to investigate the prospects for environmental sustainability of the agricultural economy in the Decade of Action based on climate-smart agriculture (using crop production as an example). The set goal determined the organization of this research, which sets and consistently solves the following two tasks:

1. To model the contribution of climate-smart agriculture to the environmental sustainability of the agricultural economy;
2. To develop a new approach to climate-smart agriculture through the creation of vertical farms.

1.2 Literature Review

The theoretical basis of this research is the concept of environmental sustainability of the agricultural economy. According to this concept, the environmental sustainability of the agricultural economy is understood as the ability of agriculture to withstand the

adverse effects of the environment through the management of natural and climatic risks.

The current approach to climate-smart agriculture involves horizontal land use. Agriculture remains fully exposed to the influence of natural and climatic factors, similar to pre-digital agriculture (Do & Huang, 2022; Jacob-John et al., 2022). The purpose of climate-smart technology is to predict natural and climatic risks and monitor climate change to make agriculture more predictable (Kabir et al., 2022; Memarbashi et al., 2022).

The effect of using climate-smart technology on the environmental sustainability of the agricultural economy is short term: Current adaptation to prevailing natural and climatic conditions is provided with the need for new adaptation when these conditions change (Huang et al., 2023; Pamuk et al., 2022).

Many published works on the topic of climate-smart agriculture indicate a high degree of elaboration on the problem. Simultaneously, the role of climate-smart agriculture in the environmental sustainability of the agricultural economy and the prospects for its development in the Decade of Action remain poorly understood and uncertain. This is a gap in the literature that this article seeks to fill.

The research poses the following research question (RQ): “What role does climate-smart agriculture play in the environmental sustainability of the agricultural economy, and what are the prospects for its development in the Decade of Action?” Drawing on the numerous works, including Jones et al. (2023) and Pal et al. (2022), which note the benefits of climate-smart agriculture, this research hypothesizes that climate-smart agriculture contributes to the environmental sustainability of the agricultural economy. This hypothesis is tested in the research through econometric modeling of the contribution of climate-smart agriculture to the environmental sustainability of the agricultural economy based on international experience.

1.3 Materials and Methods

To test the hypothesis, the research uses the method of regression analysis to perform econometric modeling of the contribution of climate-smart agriculture to the environmental sustainability of the agricultural economy based on international experience. The information-empirical base of the research is the materials of the report “Global Food Security Index” for 2022 (Economist Impact, 2022). The sample includes all 113 countries covered by the statistics of the Economist Impact (2022).

The factor variable in econometric modeling is the activity of using climate-smart technology in agriculture, measured by the indicator “early-warning measures/climate-smart agriculture” ($AgroTech_{ClSm}$). The following variables, reflecting the environmental sustainability of the agricultural economy, were chosen as resultant variables:

- Agricultural resilience to air temperature risk, as measured by the indicator “exposure” ($Temp_{EnvSustAgr}$);

- The resilience of agriculture to the risk of water scarcity and degradation, as measured by the indicator “water” ($\text{Water}_{\text{EnvSustAgr}}$);
- The resilience of agriculture to the risk of land degradation and loss of soil fertility, as measured by the indicator “land” ($\text{Land}_{\text{EnvSustAgr}}$);
- The resilience of agriculture to the risk of eutrophication and under-irrigation, as measured by the indicator “oceans, rivers, and lakes” ($\text{Eutro}_{\text{EnvSustAgr}}$);
- The resilience of agriculture to the risk of natural and environmental disasters, as measured by the indicator “disaster risk management” ($\text{Disast}_{\text{EnvSustAgr}}$).

The evidence base of the research is combined into a single table and published in the author’s dataset in the open-access public repository “Mendeley Data” (Popkova, 2023). The hypothesis is considered proven if most of the resulting variables show positive dependence (positive values of regression coefficients) and reliable relationship (Fisher’s F-test is passed) with the factor variable.

1.4 Results

1.4.1 *Modeling the Contribution of Climate-Smart Agriculture to the Environmental Sustainability of the Agricultural Economy*

Econometric modeling of the contribution of climate-smart agriculture to the environmental sustainability of the agricultural economy based on Popkova’s dataset (2023) resulted in the following system of paired linear regression equations:

$$\begin{cases} \text{Tempr}_{\text{EnvSustAgr}} = 67.2183 + 0.0147 * \text{AgroTech}_{\text{CISm}} \\ \text{Water}_{\text{EnvSustAgr}} = 32.3033 + 0.2021 * \text{AgroTech}_{\text{CISm}} \\ \text{Land}_{\text{EnvSustAgr}} = 58.6049 + 0.6004 * \text{AgroTech}_{\text{CISm}} \\ \text{Eutro}_{\text{EnvSustAgr}} = 49.4655 - 0.1790 * \text{AgroTech}_{\text{CISm}} \\ \text{Disast}_{\text{EnvSustAgr}} = 51.3564 + 0.0981 * \text{AgroTech}_{\text{CISm}} \end{cases} \quad (1.1)$$

According to the system of Eq. (1.1), the following results are obtained when the activity of using climate-smart technology increases by one point:

- The resilience of agriculture to the risk of changing air temperature increases by 0.0147 points;
- The resilience to the risk of water resources deficit and quality increases by 0.2021 points;
- The resilience to the risk of land degradation and soil fertility increases by 0.6004 points;
- The resilience to the risk of natural and environmental disasters increases by 0.0981 points.

No positive impact of climate-smart technology on the resilience of agriculture to the risk of eutrophication and insufficient melioration has been identified. Detailed results of the regression analysis and equation reliability tests are shown in Table 1.1.

The results obtained in Table 1.1 demonstrate a moderate contribution of climate-smart technology to the management of natural and climatic risks in agriculture. F-test is passed for all regression equations. The greatest contribution of climate-smart technology has been identified in terms of increasing the resilience of agriculture to the risk of water scarcity and declining water quality and to the risk of land degradation and declining soil fertility.

Most resulting variables showed a positive correlation and a reliable relationship with the factor variable. This proves the hypothesis and confirms that climate-smart agriculture contributes to the environmental sustainability of the agricultural economy. Nevertheless, this contribution is limited; the potential for accretion of this contribution is far from fully disclosed.

Table 1.1 Regression analysis of the contribution of climate-smart agriculture to the environmental sustainability of the agricultural economy

Regression statistics	Regression equation for the following resultant variables				
	Tempr _{EnvSustAgr}	Water _{EnvSustAgr}	Land _{EnvSustAgr}	Eutro _{EnvSustAgr}	Disast _{EnvSustAgr}
Correlation coefficient	0.0722	0.4234	0.2197	0.4131	0.1252
Observations (n)	113	113	113	113	113
Number of factor variables (m)	1	1	1	1	1
Significance of F	0.4473	3*10 ⁻⁶	0.0194	5.4*10 ⁻⁶	0.1863
Level of significance (at $k_1 = m = 1$; $k_2 = n - m - 1 = 111$)	0.5	0.01	0.05	0.01	0.2
Observed F	0.5815	24.2448	5.6311	22.8390	1.7681
Tabular F	0.4579	6.8688	3.9266	6.8688	1.6621
Fisher's F-test	Passed	Passed	Passed	Passed	Passed
Standard error at AgroTech _{CISm}	0.0193	0.0410	0.0255	0.0375	0.0738

Source Compiled by the authors

1.4.2 A New Approach to Climate-Smart Farming Through the Creation of Vertical Farms

Vertical agriculture is a promising alternative to horizontal agriculture. Although vertical agriculture is growing rapidly (according to Fortune Business Insights (2022), it is to increase by 25.9% by 2029), its share in the agricultural economy is still very small. Thus, the Business Research Company (2023) estimates the global agricultural market at \$12,245.63 billion in 2022. According to Fortune Business Insights (2022), the global market for vertical agriculture is estimated at \$4.16 billion in 2022, which is 0.03% of agriculture in 2022.

To fully realize the potential of supporting the environmental sustainability of the agricultural economy, this research proposes a new approach to climate-smart farming involving the creation of vertical farms. The new approach proposes growing plants in hydroponics rather than in soil, which will improve mineral nutrition and optimize reclamation.

The author's approach proposes to use climate-smart technology for automated phytomonitoring (using big data collection technology) aimed, first, at measuring the vital signs of plants: height, growth rate, number of leaves, yield, and signs of wilting. Second, it is aimed at monitoring the ecosystem on the smart vertical farm and indicators of plant care: temperature and humidity, watering and fertilizing plants, pest control, and lighting.

Third, it is aimed at monitoring the natural environment outside the vertical farm: lighting, humidity, and temperature. Fourth, it provides the smart analytics of collected big data and selects the increasingly optimal technology for growing hydroponics using machine learning technology. Fifth, it ensures smart optimization of its ecosystem using agrobot: by turning off artificial light during the day and turning it on at night, by increasing the temperature of humidity in rainy weather by opening windows, etc.

The new approach will reinforce the advantages and overcome the disadvantages of the current approach of climate-smart agriculture, ensuring that it significantly contributes to agricultural resilience to air temperature risk, the risk of eutrophication and under-migration, and the risk of natural hazards and environmental disasters.

1.5 Discussion

The contribution of the research to the literature consists of the development of scientific provisions of the concept of environmental sustainability of the agricultural economy through clarification of the role and prospects for the development of climate-smart agriculture. A comparative analysis of the existing and proposed new approach to climate-smart agriculture is presented in Table 1.2.

According to Table 1.2, as opposed to horizontal farming discussed by Do and Huang (2022) and Jacob-John et al. (2022), the new approach to climate-smart

Table 1.2 Comparative analysis of the existing and proposed new approach to climate-smart agriculture

Criteria for comparing approaches	Approaches to climate-smart agriculture	
	Horizontal agriculture	Vertical agriculture
Exposure of agriculture to natural and climatic factors	Full: similar to pre-digital agriculture (Do & Huang, 2022; Jacob-John et al., 2022)	Reduced due to the autonomy of smart vertical trusses
Purpose of climate-smart technology	Predicting natural and climatic risks and monitoring climate change to improve the predictability of agriculture (Kabir et al., 2022; Memarbashi et al., 2022)	Creating an artificial climate on the smart vertical farm that is favorable for crop production
Effect of climate-smart technology on the environmental sustainability of the agricultural economy	Short-term effect: current adaptation to the existing natural and climatic conditions with the need for a new adaptation when these conditions change (Huang et al., 2023; Pamuk et al., 2022)	Permanent long-term effect: the creation of a stable artificial ecosystem on the vertical farm

Source Calculated and compiled by the author

farming through the creation of vertical farms reduces the exposure of agriculture to natural and climatic factors due to the autonomy of smart vertical farms.

As opposed to horizontal farming discussed by Kabir et al. (2022) and Memarbashi et al. (2022), the new approach applies climate-smart technology not to predict natural-climate risks and monitor climate change to increase the predictability of agriculture but to create an artificial climate in the smart vertical farm, favorable for crop production.

In contrast to horizontal agriculture, as described by Huang et al. (2023) and Pamuk et al. (2022), the new approach provides not a short-term but a permanent long-term effect of climate-smart technologies on the environmental sustainability of the agricultural economy. The effect is expressed in the creation of a stable artificial ecosystem on a vertical farm.

1.6 Conclusion

The key conclusion of this research is that climate-smart agriculture plays an important role in ensuring the environmental sustainability of the agricultural economy, significantly increasing the resilience of agriculture to the risk of water scarcity and declining water quality and the risk of land degradation and declining soil fertility.

However, the persistence of horizontal agriculture constrains the development of climate-smart agriculture and limits its contribution to the environmental sustainability of the agricultural economy. The prospects for environmental sustainability of the agricultural economy in the Decade of Action based on climate-smart agriculture are related to the transition to vertical farming.

The theoretical significance of these results lies in clarifying the causal relationship between the environmental sustainability of the agricultural economy and the development of climate-smart agriculture. The practical and management implication of this research is that the new approach to climate-smart agriculture developed through the creation of vertical farms will make it possible to achieve systemic environmental sustainability in the agricultural economy.

The author's approach will ensure overcoming the disadvantages of horizontal farming and make it possible to achieve resilience of agriculture to the risk of changing air temperature, the risk of eutrophication and insufficient melioration, and the risk of natural disasters and environmental catastrophes. The social implication of the research findings and results is that they formed a systemic view of the prospects for implementing SDG 2 and SDG 13 in the Decade of Action.

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Chapter 2

Information Risks of the Educational Activities of Universities Under Digitalization



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Abstract Digitalization of educational activities in universities is based on the use of the latest telecommunication technologies, the Internet, intelligent systems, big data analysis, information services to form education space, and flexible approaches to learning. Along with positive factors, digitalization creates different information security risks in educational processes. It is necessary to identify and analyze such risks and plan the activities to neutralize them. The analysis of risks requires the development of models to assess the impact of these risks on the educational process in the university. In the development of models, the factors that determine the risks of information security in the university's educational process are characterized by considerable uncertainty. The research proposes an approach to develop the risk analysis model based on fuzzy logic. While developing the model, the authors identify the parameters that determine the risks and develop a production model and fuzzy rule base. Mamdani's algorithm is the basis of the fuzzy conclusion. The example of the information security risk modeling of the educational process in the university is considered.

Keywords Educational process · University · Digitalization · Risks · Information security · Fuzzy models

JEL Codes D81 · I23 · M15 · C02 · C63

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2.1 Introduction

One of the conditions for increasing the competitiveness of universities in the digitalization of education is the use of advanced information and telecommunication technologies, the Internet, and information servers to form the educational space, distance learning, and intelligent systems to form individual learning paths and educational services provided.

The digitalization of the educational process in universities significantly expands the possibilities of the application of flexible and adaptable forms of learning, the formation of individual learning paths, the use of the digital multimedia content application, easy access to necessary information, information support, and consultations on the studied disciplines remotely through specialized platforms and the Internet.

Simultaneously, the digitalization of universities poses various information security (IS) risks to the educational process. These risks can be connected with a violation of the integrity of educational content, the relevance of learning process data, harmful external influences, and technical aspects of the server and network resources and data storage systems. It is necessary to identify and analyze these risks and plan measures to reduce them.

In these conditions, the task of analyzing the risks of the educational process of the university and the formation of control actions to reduce them becomes relevant.

Research are devoted to digitalization and the risks of the university's educational activities. Raanan (2009) singled out many university-specific risks: academic risks (scientific, educational, and quality reduction risks), ethical and political risks, and risks associated with the activities of students (academic failure, employment, etc.). Raanan (2009) also singled out the risks that universities take from other organizations (financial risk, personnel risk, reputational risks, etc.).

It is proposed to use methods applicable in the commercial sphere and deal with risks, including identification of risks, their classification, analysis, assessment, and solutions (i.e., to take risks, mitigate consequences, transfer risk, or avoid risks).

Sum and Saad (2017) consider the established practice of risk management in universities. The authors analyze the established practices and organizational structures to manage risks. It is noticed that the activity of universities is a complex and large-scale business. There are three most significant risks for universities: regulatory, economic crisis, and reputation risks. Let us note that risk assessment is the most problematic stage in all schemes under consideration.

Lavrisheva (2017) analyzes the classification of risks of educational institutions. She primarily focuses on the risks associated with the violation of performance monitoring. She singled out the following risk groups: educational activity, scientific and research activity, personnel, financial, etc. A set of solutions is proposed to reduce risks. In our opinion, the main notes are as follows:

- The administrative nature of the measures taken;
- The actual lack of a positive attitude toward the risk as an opportunity;
- The conservative schemes to deal with risks;

- The lack of a risk assessment model.

The issues of operational risk management in the university are considered by Syamsia et al. (2021). The possible reasons for such risks are mentioned, including inadequate processes, inadequate people, inadequate information systems, and external factors. The risks are detailed. The Likert scale is used to assess risks.

The risks connected with the digitalization of higher education are analyzed by Strekalova (2019). Among the highlighted risks are the risks associated with a possible breach of personal data and a decrease in confidentiality. Nevertheless, the author does not consider qualitative characteristics of risks and their management.

Khrapov and Baeva (2020) analyze possible risks connected with the digitalization of educational processes in universities according to the following scheme: source, risk (threat + vulnerability), implementation (intruders' attack or the negative impact), and consequences. The authors mainly consider various difficulties of the educational process and understanding the material when students use digital and mobile educational technologies.

Enterprise risk management (ERM) applicable to higher education is explored by Perera et al. (2020). The concept offers a complete and transparent analysis of risks with their aggregation and alignment with the organization's goals, where special departments are responsible for risk management. According to the researchers, even though universities face all risks inherent in business (i.e., strategic, operational, financial, reputational, etc.), the ERM has not been used efficiently enough in higher education.

Safuanov et al. (2019) considered the issues of the digitalization of higher education. According to the authors, digitalization means creating an efficient process to deliver information and knowledge to students, creating a new educational environment, translating the main part of the curriculum into a distance format, and changing the role of the faculty in the educational process. The authors emphasize that the digital environment of the university includes various information components: technical resources, educational software, educational portals, cloud resources, digital libraries, webinars, teleconferences, personal accounts in the cloud, e-mail, and others. It should be mentioned that all information components considered in the research require the provision and monitoring of information security.

Cheung (2014) notes that the information security of the university educational process involves the protection of the information space and personal data of students and faculty from accidental or intended penetration to steal data or make any changes in the system configuration. The authors present the main indicators of the information security of the university educational process: data integrity, confidentiality, accessibility, and credibility.

Protalinskiy and Azhmukhamedov (2009) analyzed the interaction of information in all main spheres of the university's activity and considered qualitative and quantitative criteria, information interaction models, as well as the role and place of the information security policy in managing the information resources of a university.

According to Malyshev and Maksin (2012), in the context of digitalization, the common practices of universities are as follows:

- The introduction of telecommunication technologies in all areas of the learning process and scientific research;
- Large volumes of circulating information with different requirements for its security;
- A large number of external users, students, and teachers who have different access levels;
- The fast development of different forms of distance learning;
- The availability of the information with different levels of secrecy.

The growing use of distance e-learning systems testifies to their popularity. The security of these systems is a global issue because thousands of users access and manage these systems using the Internet. Bandara et al. (2014) reviewed the security problems in online learning. As distance e-learning systems are open, distributed, and interconnected, security is an important task to ensure that the concerned and authorized users have access only to the information they need at the right time. Protection from data manipulation, fraudulent user authentication, and maintaining privacy are major security concerns in distance e-learning.

Chen and He (2013) discuss a new generation of distance e-learning as a more secure and personal learning environment, which requires a universal authentication solution, enhances network security, and balances security and usability. The authors note that the number of threats to information security is growing rapidly in the context of digitalization. Because teaching is provided via the Internet, each element in the distance learning environment is inevitably exposed to regular security threats, risks, and attacks. It might result in the unauthorized alteration or destruction of educational resources (Zuev, 2012).

Nickolova and Nickolov (2007) name the following assets that can be targeted by intruders in university e-learning: e-learning content, cryptographic keys, various membership data, network bandwidth, message integrity, and message availability. The authors also proposed a conceptual framework, which, according to the designers of the distance learning system, can reduce the number of overlooked security vulnerabilities at the design stage.

Rabai et al. (2012) classified the security requirements in distance education into six aspects, including authentication confidentiality, integrity, accessibility, inviolability, and information confidentiality.

Glushenko (2013) offered to use a fuzzy production model to assess the organization's information security. The author considered the factors and indicators of the organization's information security risks; a set of linguistic variables and the system of fuzzy production rules to analyze the organization's information security risks were proposed. According to the author, fuzzy production models make it possible to consider qualitative and quantitative factors influencing information security risks. Simultaneously, the author does not consider the specific features of the university educational process.

Korablev (2015) focuses on the issues of the application of fuzzy estimation algorithms to analyze the information risk of cloud technologies widely used by universities during digitalization. The author uses the scales of measurements and Harrington desirability functions (Harrington, 1965) to analyze information risks. Simultaneously, the estimation of the significance of information risks is carried out on several scales: criticality, integrity, availability, value, impact, the vulnerability of external borders, risk, and damage.

Zhilina et al. (2020) proposed to use a neuro-fuzzy network and Sugeno's algorithm to predict the risk of university information security for several factors (unauthorized access to confidential and personal information, password guessing, DDOS attacks, and virus and malware infection). In the example considered by the authors, the fuzzification and normalization of input variables and the structure of fuzzy production rules belong to fuzzy.

The conducted analysis of the publications demonstrates that the available approaches to assessing the risks of information security in the university educational process make it possible to consider various factors and processes influencing the risks. Nevertheless, the uncertainty inherent in informational educational processes is not fully reflected, nor is the possibility to integrate the description of qualitative and quantitative indicators affecting risks into the models. This fact substantiates the relevance of the development of risk assessment of the educational process of the university in the context of digitalization, which gives more opportunities to describe complex functional dependencies and uncertainties and accounts for quantitative and qualitative indicators.

2.2 Materials and Method

It is expedient to use fuzzy sets and fuzzy logic (Dolzhenko, 2009) to develop models that consider the uncertainties of different processes and incorporate qualitative and quantitative indicators into the model.

The fuzzy model of assessing the risks of the educational process of the university includes input linguistic variables describing model parameters, a set of production rules for fuzzy inference, and output linguistic variables—information security indicators.

The educational process can be evaluated by the integral indicator (R) and local indicators, such as information data integrity (R_1), their confidentiality (R_2), accessibility (R_3), and credibility (R_4).

The risk factors of the educational process of the university that determine the main threats to information security reduction are the infrastructure, university information system, data, software, local and data servers, and the actions of users and service personnel.

It is possible to describe indicators and factors of risks in the fuzzy model with three term-sets of linguistic variables: $T = \{\text{Low } (L), \text{Middle } (M), \text{High } (H)\}$.

If it is necessary to increase the accuracy of the fuzzy model, the number of term-sets can be increased to five. At the initial stages of modeling the risk level of the information security of the university educational process, it is expedient to use typical L-R membership functions of the triangular type that simplifies the formation of knowledge about the system by experts. It is easier for the expert to find whether a certain factor has a low, medium, or high impact on the considered risks of the system. Some researchers (Piegat, 2001) argue that triangular membership functions can fully describe the behavior of the modeled systems. In the future, when refining the model, one can apply Gaussian, sigmoidal, or polynomial membership functions.

The production rules define the activation of fuzzy inference rules and generate the resulting value of the output linguistic variables. The task of risk analysis of information security of the university educational process is to obtain an answer to the question if the risk level on a certain indicator is low, medium, or high and if the user is certain about the risk level. This problem belongs to the problem of fuzzy classification of the system, and it is advisable to apply Mamdani's fuzzy inference algorithm to solve this problem (Piegat, 2001).

When building a model to analyze the threats to the university's information security, it is necessary to focus on the purpose of the analysis, which will determine the set of input and output linguistic variables and the composition of production rules. Thus, while analyzing infrastructure factors, it is important to emphasize the use of own, leased, or cloud servers, data storage systems, and communication channels.

2.3 Results

Let us consider the process of developing the risk analysis fuzzy model connected with the availability of information resources for the educational process of the university. Table 2.1 shows the risk factors of information security in the educational process of the university.

The linguistic variable (Y_D), which describes the risk of reducing the information accessibility of the educational process of the university, is set by information granules "low" (L), "medium" (M), or "high" (H).

A fuzzy production rule base is formed by engineers on an expert information processing basis. Table 2.2 presents a fragment of the base of fuzzy production rules.

The rule base for a certain infrastructure of the university information system can be modified in accordance with the used architectural, technical, and program solutions and administration policy.

A fuzzy model can be adapted for a certain system by changing the number of granules of linguistic variables and setting the parameters of membership functions.

Table 2.1 Risk factors for the availability of educational resources

Name	Linguistic variable name	Term-sets and interpretation of factor levels
× 1	Enterprise servers	L—Servers experience critical load (up to 70%); performance is insufficient; M—Servers experience medium load (up to 50%); performance is sufficient; H—Servers experience low load (up to 30%); there is a performance reserve
× 2	Cloud servers	L—Server has 1 processor, 3.5 GB memory, and 7 GB SSD; M—Server has 4 processors, 14 GB memory, and 28 GB SSD; H—Server has 16 processors, 3.5 GB memory, and 112 GB SSD
× 3	Storage system	L—90% of corporate data storage accessibility declared by the manufacturer; M—99% of corporate data storage accessibility declared by the manufacturer; H—99.9% of corporate data storage accessibility declared by the manufacturer
× 4	Channels of connection	L—Accessibility is assessed as 90%; M—Accessibility is assessed as 99%; H—Accessibility is assessed as 99.9%
× 5	Corporate services	L—Accessibility is assessed by the administrator as 90%; M—Accessibility is assessed by the administrator as 95%; H—accessibility is assessed by the administrator as 99%
× 6	Cloud services	L—90% of cloud data storage accessibility declared by the provider; M—99% of cloud data storage accessibility declared by the provider; H—99.9% of cloud data storage accessibility declared by the provider

Source Developed by the authors

Table 2.2 Fuzzy production rules of the risk assessment model for the accessibility of the educational process of the university (fragment)

Rule	Antecedent	Consequent
R1	$(x_1 = L \vee x_1 = M) \wedge (x_2 = L) \wedge (x_3 = L) \wedge (x_4 = L) \wedge (x_5 = L \vee x_5 = M) \wedge (x_6 = L)$	$Y_D = H$
R2	$(x_1 = M \vee x_1 = H) \wedge (x_2 = M) \wedge (x_3 = M) \wedge (x_4 = M) \wedge (x_5 = M \vee x_5 = H) \wedge (x_6 = M)$	$Y_D = M$
R3	$(x_1 = H) \wedge (x_2 = M \vee x_2 = H) \wedge (x_3 = M \vee x_3 = H) \wedge (x_4 = M \vee x_4 = H) \wedge (\vee x_5 = H) \wedge (x_6 = M \vee x_6 = H)$	$Y_D = L$

Source Developed by the authors

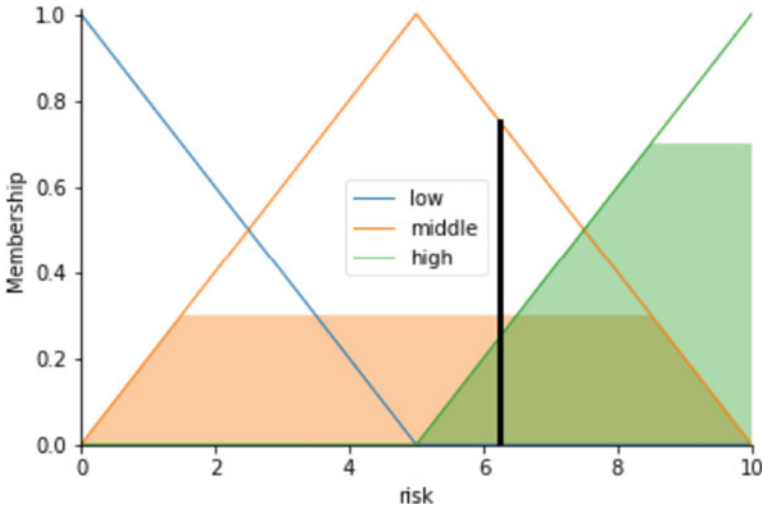


Fig. 2.1 Risk assessment. *Source* Developed by the authors

The software implementation of the production model is made in Python using the fuzzy systems modeling library SKFuzzy. Risk assessment of the university’s educational process information resources accessibility is based on the constructed model with the following values of linguistic variables:

- Enterprise servers $x_1 = L$;
- Cloud servers $x_2 = M$;
- Storage System $x_3 = H$;
- Channels of connection $x_4 = M$;
- Enterprise servers $x_5 = M$;
- Cloud servers $x_6 = H$.

The university’s educational process information security risk is assessed as medium (6.24 on the scale [0, 10]) with a confidence level of 0.77 (Fig. 2.1). The model allows us to build a response surface for fuzzy inference. Figure 2.2 presents the response surface for the input variables x_2 and x_6 .

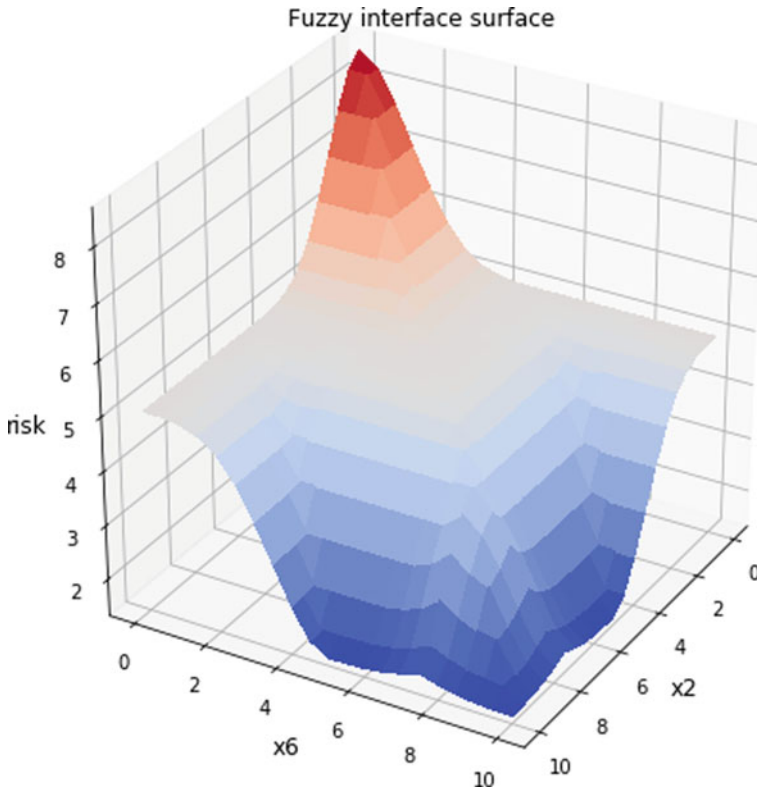


Fig. 2.2 Response surface. *Source* Developed by the authors

2.4 Conclusion

The research proposes an approach to risk analysis of the educational process of the university using fuzzy production models. The identification of the list of factors and parameters of risk of the university’s educational process, which is characterized by significant uncertainty, as well as the development of fuzzy rules base, are the result of the research. The fuzzy inference algorithm is based on the Mamdani method. The fuzzy model is implemented in Python and the SKFuzzy library. The results of modeling the system are presented.

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Chapter 3

Mechanisms for Implementing Managerial Innovations at the University



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Abstract The authors propose to classify managerial innovations according to the management cycle model, highlighting innovations related to goal setting, forecasting, planning, organization and coordination, motivation, and control. The authors emphasize that managerial innovations meet opportunities and limitations when implemented and suggest considering them based on a new theory of production factors in combination with K. Lewin’s force field model. It gives the possibility to anticipate the upraise of negative factors and make timely management decisions aimed at finding and using the necessary resources for innovation. Using examples from the practice of implementing innovation at the university, the research substantiates the conclusion about the possibility of synergetic coexistence of two mechanisms for implementing innovation—“top-down” (on the initiative of management) and “bottom-up” (on the initiative of employees). The advantages of the first approach are high manageability and a clear relationship with the strategic goals of the university. Its disadvantage is the high duration of the process. The advantages of the second mechanism are its flexibility and implementation time. The disadvantage is possible inconsistency with the goals of the university’s strategic development.

Keywords Management functions · Innovations · Factors of production · University · Management

JEL Codes I21 · I23

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3.1 Introduction

In the contemporary economic conditions of ever-increasing innovations and new standards developed within the framework of Industry 4.0, the question of how traditional, bureaucratic organizations (e.g., Russian state universities) can respond to the challenges and opportunities presented by the processes and results of the Fourth Industrial Revolution is becoming increasingly acute. Not only technological and product innovations are becoming increasingly important, but also those innovations that, at first glance, are purely internal but affect the organization's behavior in the external environment (Berseneva et al., 2020). We are talking about innovations of a special kind—managerial innovations, the mechanisms of which have not yet been sufficiently studied, but the need for which is dictated by a high level of environmental turbulence and challenges to which university management needs to respond promptly. Consideration of these mechanisms is at the junction of several organizational and managerial disciplines—organization theory, management theory, innovation theory, change management, strategic management, and others.

3.2 Methodology

The authors propose a classification of managerial innovations related to management functions in the organization based on the management cycle model. The research describes the industry opportunities and limitations of managerial innovations through the prism of the new (evolutionary-genetic) theory of production factors.

3.3 Results

In fact, managerial innovations are developments in the field of management that have been introduced into management practice. In this sense, management can be understood as a classical management cycle consisting of goal setting, forecasting, planning, organization and coordination, motivation and stimulation, and control. As a rule, we can talk about managerial innovation when a new way of performing managerial functions and a new management technology have been developed and implemented. Thus, the implementation of managerial innovations is possible in the following forms:

- Implementation of new methods of strategic management responsible for setting long-term goals, forecasting trends and their consequences, developing strategic plans, and risk assessment (e.g., technologies of foresight sessions, scenario planning, objectives and key results, balanced scorecard, and others);

- Formalization of new ways of organizing and coordinating the work of the university staff (e.g., agile technologies, organizational structure improvement, and opening new main and auxiliary units);
- Indoctrination of new forms of the labor motivation and organizational culture regulating the role and over-role behavior of personnel (e.g., value management technologies);
- Introduction of new technologies for monitoring the activities of employees (e.g., technologies of total quality management, lean production, six sigma, and others).

Knowing the type of managerial innovation is useful for detailing the program of its implementation and describing the parameters of the desired result. When developing such programs, it is advisable to consider special measures to turn entropic tendencies of resistance to change on the part of personnel into useful energy of constructive and creative support for innovation. For such purposes, management innovations in the field of change management are usually used paradoxically, for example, technologies of participatory management, management according to the model of J. Kotter, ADKAR, and others.

However, it is useful to study the driving and opposing forces of change in practical terms not only in the intra-organizational but also in a broader industry context, which will give a fuller picture of the opportunities and limitations of implementing managerial innovations at the university. In this regard, it is possible to consider the specifics of the educational industry through the prism of the new theory of production factors. As is known, this evolutionary-genetic economic theory suggests considering a firm from the standpoint of a resource approach, namely as a set of production factors in their broad interpretation: human (A), technical and technological (T), natural and material (M), institutional (Ins), organizational (O), and informational (Inf) (Inshakov, 2006). The company's activity represents a complex set of actions of the actor in a "dance" with the influences of the external environment. On the one hand, companies experience the pressure of the external environment on decision-making, determining the firm's behavior. On the other hand, the company, to some extent, forms its niche by influencing the configuration of the external environment (Knyazev, 2010). Reciprocal conditionality of activity forms a complex ensemble of decisions and consequences.

An educational firm uses human capital (A) largely formed outside this organization. Literature calls this coordination mechanism standardization of skills and knowledge. Its predominance determines such a configuration of the organizational structure as "professional bureaucracy." For the firm, this means that the ability to coordinate the direct activities of the operational core is largely limited by externally established standards for faculty activities.

The technical and technological factor (T) is also largely set from the outside by well-described instructions for using certain pedagogical technologies. Additionally, due to the significant autonomy of the direct activity of the operational core in the workplace, the choice of a specific pedagogical technology remains with the lecturer. The university has much more freedom in developing and applying the technical and technological factor in the field of R&D. This theoretical possibility of innovation

in this area can be supported by numerous practical examples. For example, we can mention the development of exoskeletons in the Volgograd State Medical University (VolgSMU), seconded at the federal level, as well as other innovations. If we consider the educational and, in a broader perspective, the social activities of the university, there are also much more opportunities for using new technologies than in educational activities. For example, the interregional youth educational forum of social projects “Projectorium” is annually held in the VolgSMU, according to the results of which students defend their projects, raising funds at various sites, including grants from the Federal Agency for Youth Affairs. Additionally, Boiling Points (platforms for various innovative initiatives) are being created throughout Russia in close cooperation with the university environment.

The material–natural (M) factor finds its embodiment in the form of material and technical support of the university. On the one hand, universities organize purchases based on the needs dictated by the existing technologies (e.g., to support the educational process of medical students, it is necessary to purchase chemical reagents, computer equipment, various kinds of simulators, etc.), experiencing restrictions from federal legislation on public procurement. On the other hand, by focusing on certain trends in technology development, universities can lay the material and technical basis for using these technologies in advance, making appropriate investments in constructing new facilities (if necessary) and their equipment. For example, there is a Scientific Center of Innovative Medicines and an Electronic Medical Education Center at VolgSMU, confirming the orientation of the university’s leadership to sustainable trends in the technological development of health care, such as personalized medicine, simulation training, telemedicine, etc.

The institutional factor (Ins) is the impact on companies and the use within the company of norms, rules, and customs regulating the ways of the actor’s activities. In the field of education, we observe the dual nature of this factor: The university is strongly influenced by the customs and traditions associated by society with this institution. Perhaps, due to this factor, there was some resistance to distance learning formats during the pandemic restrictions; this format contradicted the attitudes of some parts of society toward personal contact between teachers and students. However, not all external norms serve as constraints for the university. For example, as a value for a significant part of society, higher education is precisely what determines the existence of universities to a sufficiently large extent (Shkarin et al., 2021). Within the educational firm, some interaction procedures of the firm’s participants are also institutionalized.

In terms of the use of the organizational factor of production (O), public universities are also largely limited by the procedure for granting permission to implement decisions by the founder (either the Ministry of Science and Higher Education or line ministries, such as the Ministry of Health). However, Russian legislation provides universities with a fairly wide scope for organizational creativity. For example, Article 103 of Federal law “Education in the Russian Federation” (December 29, 2012 No. 273-FZ) allows universities to create small innovative enterprises that commercialize university developments. Universities can also conclude cooperation agreements with a wide range of organizations of various organizational and legal forms, for

example, opening basic departments, implementing a network form of education, etc. (Shkarin, 2020).

We can talk about the twofold nature of its influence on the introduction of managerial innovations in terms of the information factor of production (Inf). On the one hand, there is a constraint in the form of the existing scientific and organizational paradigm (in the sense that T. Kuhn puts it). Then, the university environment is quite conservative. For example, a source of resistance to change may be the general tendency of faculty members to oppose two mutually exclusive archetypal roles according to C. G. Jung—the role of the Sage, or “true scientist,” and the role of the Person, the Mask, which is “distracted” by various “low-level” tasks like the commercialization of R&D. On the other hand, due to the functional features of the higher education system (the production of new knowledge in research activities and the transfer of this knowledge in educational work), the university environment is also a favorable ground for the introduction of progressive innovations.

Let us present the opportunities and threats of the introduction of managerial innovations at the university considered through the prism of the new theory of factors of production (Table 3.1).

In the course of practical work on the introduction of managerial innovations, it is advisable to present these factors in the form of a K. Lewin force field analysis model (Fig. 3.1), where instead of designations of production factors, there will be specific elements, the content of which may vary depending on the temporal, spatial, and institutional features of the university functioning. As a rule, motivating factors are located on the left, and limiting factors are located on the right (Lomovtseva et al., 2021).

Table 3.1 Specifics of the educational sector in the context of the new theory of factors of production

Factors of production	The specifics of the educational sector	
	Promote innovation	Hinder innovation
Human (A)	Professional development opportunities	Setting of personnel qualification standards
Natural and material (M)	Availability of material and technical support in line with development trends	Regulatory and legal restrictions on purchases
Natural and material (T)	Availability of R&D and pedagogical innovations	Conservatism of pedagogical technologies
Institutional (Ins)	The important role of the university in society, the authority of universities	Conservatism of society in relation to the university’s format
Organizational (O)	Numerous horizontal links of universities with other communities	The need to obtain permits
Informational (Inf)	Discussions, conferences, and R&D	Paradigm constraints

Source Compiled by the authors

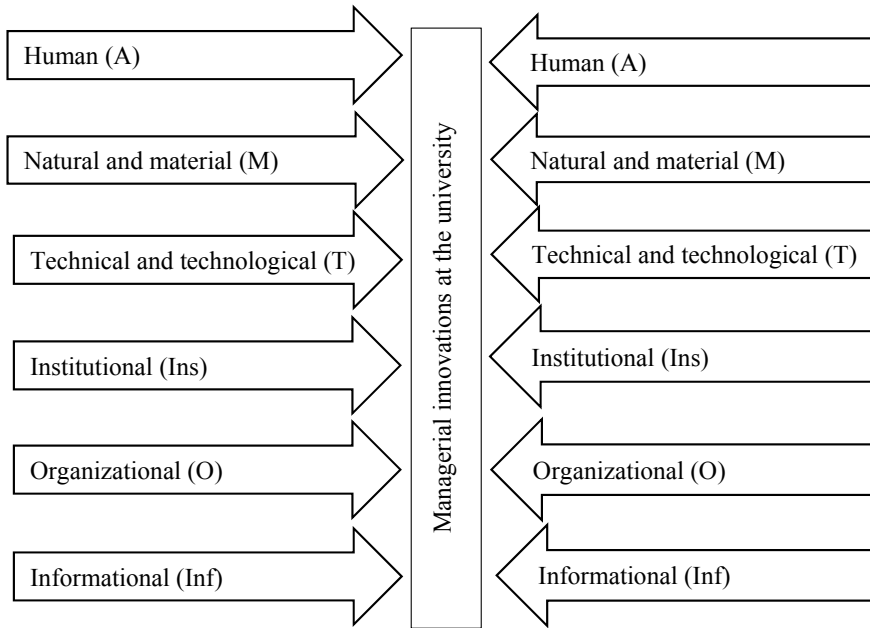


Fig. 3.1 Presentation of management innovation factors in the form of force field analysis. *Source* Compiled by the authors

The provisions of the new theory of production factors in relation to the educational sphere can be used in the application of mechanisms for introducing managerial innovations at the university. Let us consider two such mechanisms and their possible combination.

The mechanism of introducing managerial innovations “from top to bottom” is a classic change management scheme for professional bureaucracies, which can be described as a rational sequence of stages:

1. Setting the goal of innovative development in conjunction with the development strategy of the university. This stage may include such stages as holding a foresight session, where the main trends in the development of the field of activity will be considered, holding strategic sessions at which scenario plans for the development of the university will be drawn up, etc.;
2. Analysis of the innovative potential of the organization to identify existing promising R&D, which involves the collaboration of research teams, patent specialists, marketers, economists, and project managers;
3. GAP analysis, the result of which is the identification of gaps between the goals of innovative development and the existing innovative potential of the university;
4. Drawing up a pool of possible management innovations to overcome the gaps identified at the previous stage;

5. Drawing up a roadmap for the introduction of managerial innovations and benchmarks for their implementation;
6. Monitoring the achievement of innovative development goals and setting new goals.

The advantages of this approach are high manageability and a clear relationship with the strategic university goals. The disadvantages of this approach are the long duration of the process, during which the implemented innovations may lose their relevance, as well as a decrease in the feedback speed.

Another mechanism for introducing managerial innovations at the university is the “bottom-up” method when the initiator of changes is the ordinary staff of the organization. Such an approach can also be organically perceived in the management system of a professional and bureaucratic organization, which, according to G. Mintzberg, is a university, due to the relatively high autonomy of the actions of the university’s operational core (i.e., its teaching staff). Indeed, representatives of the teaching staff are the main staff units that directly conduct educational, scientific, and educational activities and, as a result of this maximum proximity to the main process of the university, have complete information about the needs of the environment (students, scientific sphere, etc.), the possibility of quick response to the challenges of the external environment, and often a sufficiently high motivation to initiate and implement innovations in the workflow.

The advantages of this mechanism are its flexibility and speed of implementation, and the disadvantage is possible inconsistency with the goals of the strategic development of the university.

Despite the opposite directions of implementing these mechanisms, it is quite possible to combine them within a single university management system. Let us consider some examples of implementing managerial innovations introduced at the VolgSMU using these two mechanisms (Table 3.2).

Table 3.2 Examples of the use of mechanisms for the introduction of managerial innovations in VolgSMU

Mechanism	Managerial innovation	Basic factors of production
“Top-down”	Scientific Center of Innovative Medicines	A, T, M, O
	Electronic Medical Education Center	A, T, M, O
“Bottom-up”	Process Factory	A, T, Ins, O
	Project Office	A, T, Ins, O, Inf
	Projectorium	A, O, Inf
	Personnel reserve (including the program “start a career at VolgSMU!”)	A, O, Ins, Inf

Source Compiled by the authors

The Scientific Center for Innovative Medicines (SCIM) was established to develop and introduce new highly effective medicines into clinical practice. The tasks of the SCIM are as follows:

- The implementation of scientific research aimed at developing new directions in pharmacology;
- The development and creation of new domestic medicines;
- Testing and introduction of effective domestic medicines into practical health care.

SCIM employees significantly contributed to creating several well-known Russian drugs used in medical practice: specific pharmacological activity, drug safety was studied, and clinical trials were organized and conducted. The results of the work in the form of reports and test reports were submitted to the Pharmacological Committee of Russia. Scientific laboratories of SCIM serve as a base for dissertations of graduate students and applicants of VolgSMU. Scientific papers are published in the field of pharmacology, toxicology, and pharmacy. SCIM of the VolgSMU actively participates in regional projects on the introduction of the paradigm of personalized medicine in the healthcare practice, which will make it possible to optimally use the resources of the healthcare system, improve the quality of medical care, and promote the rational prescription of medicines.

The infrastructure of the SCIM Pharmacokinetics laboratory allows for comprehensive research in the field of population and clinical pharmacokinetics, as well as the study of bioavailability and bioequivalence in accordance with current regulatory requirements and implemented quality policy.

The Electronic Medical Education Center (EMEC) provides practical training at all levels of education at the VolgSMU using simulation equipment and distance learning technologies, as well as organizational and technical support for the accreditation of clinical specialties. The structure of the EMEC includes the following:

- The organization's department of simulation training and primary accreditation;
- The organization's department of simulation training and specialized accreditation;
- The simulation center of obstetrics, gynecology, and perinatology;
- The simulation center for premedical care and accreditation of specialists (secondary special education level).

These divisions were created using the "top-down" mechanism. Implementing these managerial innovations mainly involved the following production factors:

- Human (creation of labor collectives of centers);
- Technical and technological (pharmaceutical, chemical, information and communication, pedagogical technologies);
- Material and natural (construction and equipment, capital facilities);
- Organizational (creation of the internal organizational structure of the centers).

Other production factors were involved to a lesser extent.

The following five examples of managerial innovations are implemented using a bottom-up mechanism. By and large, they are platforms for collecting a variety of initiatives from the university's rank and file.

For example, the Process Factory is a center for training project team managers and their specialists in the basics of a process approach to management, lean technologies, workflow optimization, etc. On the basis of the Project Office, working groups initiate various projects to improve the university's activities; the administration of the Project Office provides them with methodological support, coordinates, carries out general monitoring and control of the project portfolio, etc. the primary factors of production in these two managerial innovations were human (project teams), technological (lean manufacturing technologies, training technologies), institutional (indoctrination of lean culture), organizational (project portfolio coordination), and informational factors (wide awareness of employees about training opportunities and project creation).

For the Youth Educational Forum "Projectorium" on the basis of VolgSMU, whose tasks include training students in grant activities and methodological support in applying for grants, the main factors of production were human (creating a team conducting a "Projectorium"), organizational (coordination of teams applying for grants), and informational factors (the content of the educational program).

Let us consider the work with the personnel reserve on the example of the program "Start a career at VolgSMU," which opens up employment opportunities and career building at the university for students. To participate, graduate students need to choose the direction they are interested in and upload their application form to a special platform. The questionnaires are analyzed in detail, then students who show their best side in their studies receive an offer to find a job at a university and continue their education at the expense of the university in residency and postgraduate studies. Each participant of the project "Start a career at VolgSMU" is assigned a mentor who helps quickly master the necessary skills and knowledge. The state analysis of the personnel reserve of October 1, 2021, showed that 19 departments out of 79 departments need young specialists. "Start a career at VolgSMU" will solve this problem for a long time. In this case, the primary factors of production were human (personnel reserve), organizational (personnel reserve management activities), institutional (personnel reserve is built into the existing norms of the university's personnel policy), and informational factors (dissemination of information about the possibilities of the program).

The listed examples do not present the whole range of managerial innovations introduced at the VolgSMU because the scope of this research does not allow us to consider them in all their diversity (Shkarin et al., 2022).

3.4 Conclusion

Thus, considered mechanisms for introducing managerial innovations can be used simultaneously at the same university, forming a positive synergetic effect and contributing to the achievement of the goals of innovative development of the university. The new theory of production factors allows us to consider the opportunities and limitations of managerial innovations existing in the educational industry and set prospects for further improvements, for example, improving human capital management (e.g., through talent management technologies), increasing the material and technical base (e.g., equipping existing divisions, construction of new capital facilities), modifying various technologies (e.g., pedagogical, research, management, etc.), improving the institutional component (e.g., strengthening organizational culture, brand management of the university), optimizing the organizational structure (e.g., distribution of areas of responsibility and opening new divisions), and improving the university's information field (e.g., PR activities, SMM management, etc.).






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Chapter 4

The Role of Medical Clusters in the Development of NBICS Innovations in Industry 4.0



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Abstract NBICS technologies are the driving force of today's innovation economy: the convergence of nano-, bio-, information, cognitive, and social innovations. As the core of Industry 4.0, the organizational design of NBICS technologies will require new types of structures. Divisional, project, and matrix structures are being replaced by clusters and network structures. The research considers a cluster as a group of interconnected and geographically concentrated companies with specialized suppliers, service providers, and other related organizations (including universities, research centers, etc.) in one or more industries. Based on the new theory of factors of production and the theory of the life cycle of an organization, the authors formulate the main problems that hinder the development of NBICS innovations, such as the inactivity of small businesses, the lack of a balance between risk and return, and others. The authors propose considering medical clusters as a way to solve these problems because the most successful NBICS convergence is possible in medical clusters.

Keywords Innovation · Clusters · NBICS technologies · Health care · Industry 4.0

JEL Classification I15 · O32

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4.1 Introduction

The concept of economic cycles has two widespread readings: conditionally static and conditionally dynamic. In the conditionally statistical interpretation, the economic cycle is perceived as a roller coaster—it has its ups and downs. Nevertheless, the structure does not move anywhere and does not change. Only by changes in the magnitude of macroeconomic indicators can we retrospectively determine “where” the economy is—in decline or on the rise.

In a conditionally dynamic reading, the economic cycle appears as a spiral rather than a sinusoid; the transitions along this spiral also reflect qualitative, not just quantitative, changes (e.g., the notion of economic patterns or long waves of development) (Beck & Cowan, 2010).

One of the important tasks of science is to perform a predictive function based on the available evidence and conceptual constructions. A new outline of innovative technologies is already emerging, affecting at least five areas where an innovative breakthrough is expected or has already occurred. These areas include nanotechnology, biomedical research, information technology, cognitive research and neuroscience, and social technologies. Already made and just announced breakthroughs in these areas show the convergence of these different directions, for which the acronym NBICS was created. Indeed, even at the current level of technology development, some of the “prophecies” of science fiction writers of the mid-twentieth century look quite realizable.

The organizational design of NBICS technologies as the core of the sixth technological mode will require new types of structures. Divisional, project, and matrix structures are replaced by clusters and network structures (Eisenhardt & Martin, 2000). Without this organizational design, the sustainable innovative development of NBICS will be extremely difficult. Medical clusters immanently have the potential to create NBICS innovations.

4.2 Methodology

The research aims to consider medical clusters as an economic system at the intersectoral level, which includes the possibility of producing innovations in the field of NBICS technologies.

Several interrelated approaches are used in this work. The authors believe that the cluster approach is a methodological basis for studying the development of NBICS technologies. In turn, the development of clusters has been studied using the theories of the life cycle and factors of production (Inshakov, 2006).

4.3 Results

Nowadays, the creation of NBICS innovations is the basis for sustainable competitive advantage in the international division of labor. Under these conditions, the national economy should be a network of clusters; that is, it should become a kind of meta-cluster (Inshakova et al., 2020).

The maximum use of the regional economic potential is the goal of the regional development management system, which, in turn, contributes to ensuring the positive dynamics of the national economy. This explains the existence of regionalization processes along with globalization processes. The study of the problem of regional development made it possible to establish the use of cluster technologies as one of the directions of its solution. The uneven territorial distribution of resources is typical for economic activity. Simultaneously, part of the territory turns out to be quite densely populated. Almost no significant economic activity takes place on the part of the territory. Only a close association in a single space can ensure innovative regional development. Apparently, the higher the degree of concentration of economic entities in a given territory and the more they correspond to each other in terms of the level of economic development, the higher the intensity of information flows between them and the higher the likelihood of innovation. Thus, economic activity depends on the concentration of people, firms, and regional and national communities and their interaction (Mitrofanova et al., 2017).

The choice of clustering should be made in favor of those sectors whose potential can ensure regional and national growth and consider current trends to achieve a balance of the national economy, reducing its dependence on commodity exports.

As a rule, cluster participants are four types of economic entities: enterprises, state structures, educational and research institutes, and financial institutions.

The mutually beneficial partnership of cluster members can lead to an increase in the production of scientific knowledge and innovation. A cluster is a favorable environment for this because all agents in the cluster can use knowledge assets for an unlimited number of times. It is impossible to exclude any participant from this process without damage to the entire cluster.

The mechanism of knowledge diffusion in clusters accelerates the introduction of an innovative product to the market. Moreover, without close intercompany cooperation in the medical cluster, it is impossible to create new NBICS technologies. Pay for the use of knowledge assets is collected from the market rather than from cluster members.

The territorial proximity of participants is not so important for the knowledge transfer within a cluster, unlike other types of resources. However, the following factors of unity and commonality are of great importance:

- Shared values and beliefs;
- Frequent communications between managers of cluster members (e.g., cross-participation in boards of directors);
- High degree of trust of participants in each other;
- Positive image and reputation;

- Activity in a unified institutional field;
- Technology compatibility.

Traditionally, a cluster is defined as a group of interconnected and geographically concentrated companies with specialized suppliers, service providers, and other related organizations (including universities, research centers, etc.) in one or more industries (Lomovtseva et al., 2017). The geographical proximity of cluster members may be favorable due to several factors:

- Qualified access to specialized factors of production and labor;
- Access to knowledge and competencies, including implicit knowledge;
- Complementarity of firms;
- High innovative activity of firms, including the diffusion of innovations;
- High speed of knowledge commercialization.

Due to these factors, the medical cluster acquires stability in its development.

Let us consider two components of the cluster that ensure its innovative development. One of them is infrastructural, and the other is structural. In the first case, we are talking about the market of scientific and technical products (STP). In the second case, it is about business incubators for the development of innovative small- and medium-sized enterprises (SMEs).

The concept of “scientific and technical products” means technical documentation, experimental industrial designs, experimental industrial batches, prototypes, models, samples, research reports, and certain types of work performed to order (tests, controlled maintenance, technical work, etc.). The NTP market is the basis for the creation of new technology platforms.

Nowadays, one of the urgent problems of the Russian economy is the task of conceptualizing ways to develop regional STP markets, focused primarily on improving the competitiveness of small- and medium-sized enterprises (SMEs).

The concept of “development of STP markets” implies, above all, the management of the development process, since we are actually talking about quasi-market conditions necessary to ensure the rapid introduction into an economic turnover of the results of scientific and technical activities.

Business incubators play an important role in today’s economy focused on the innovative development of NBICS technologies. Changes in the structure of production and the development of new production technologies have led to the fact that, on the one hand, many assets have been released. On the other hand, it is quite difficult for small businesses to survive in a highly competitive market. Business incubators solve the problem of coordinating the development and initial support of many promising small businesses in various industries. They are based on large universities or research centers and are part of large parks or function as an independent structure within regional government programs (Soboleva & Sobolev, 2015).

The activities of research centers and residents of business incubators in the institutionally developed NTP markets create the basis for the emergence, functioning, and development of NBICS clusters, the patterns of which can be traced within the framework of the lifecycle theory.

The metaphor of a living organism has long been used in economic and management research. It has been most vividly embodied in the life cycle theories of economic systems, which make it possible to describe the features of each stage of the process of the system's existence. Knowledge of these features also makes it possible to more accurately predict the conditions of the economic system and develop more effective management decisions aimed at solving the problems of each stage. In this regard, the task of adapting life cycle theories becomes relevant for solving the problem of ensuring the development of economic security of commercial organizations in the long term.

There are various life cycle models in the economic literature. All theories emphasize the qualitative changes in the economic system during the transition from stage to stage: At each stage, the crisis signals the adoption of innovative management decisions for organizational transformation. However, a certain set of functions characterizes each stage. Most models describe the characteristics of each stage from "birth" to "death."

Life cycle theories describe clusters in a dynamic way. We can use the new theory of factors of production to study medical clusters in a static aspect:

- The human factor—the development of the competencies of individual specialists and research and production teams;
- Technical and technological factors—invention and development of new NBICS technologies;
- Material factor—improvement of material and technical support of cluster participants;
- Institutional factor—increasing the importance of behavior formalization; implementation of organizational routines; hiring professional management (as opposed to the original teams of enthusiasts);
- Organizational factor—strengthening the role of formal and informal communications, creation of cross-organizational teams, implementation of integration mechanisms and positions;
- Information factor—the creation of common knowledge management systems for the whole cluster.

Combining the life cycle theory and the new theory of production factors (Inshakov, 2006), we can characterize the scarcity of certain resources as the cause of the crisis. For example, at the first stage of the medical cluster's existence, material, technological, and human resources will be abundant because financial resources will be invested in it. Most likely, there will be a shortage of institutional, organizational, and information resources because the cluster members have not yet created them in the process of joint activities. Only a harmonious combination of all six production factors at each stage of the medical cluster's existence will make it possible to obtain a positive synergistic effect and maximize the potential of the entire medical cluster in producing NBICS innovations. The harmonious configuration of these factors at each stage is the core competence of the medical cluster (Pralhad & Hamel, 1990). The ability to change key competencies when moving to the next stage is the dynamic capability of the medical cluster (Teece, 2007).

The following negative factors can hinder the sustainable innovative development of NBICS technology clusters:

1. The inaction of the small business underlying the innovation activity of the cluster.
2. The lack of an acceptable balance between risks and profitability often causes low business interest in implementing the project. In this case, the task of the state is to minimize risks. Additionally, free or preferential provision of infrastructure for private investors is possible.
3. Project security as a result of social problems in the region. A decrease in the unemployment rate and an increase in economic stability with cluster functioning will contribute to the interest of residents in the functioning of the cluster.
4. Underdevelopment of the system of formation of requests of domestic consumers for innovative products of the cluster.
5. Significant personnel shortage for high-tech clusters.

There are two stages in the development of medical clusters.

The first stage is associated with the support of the initial stage of the development of the regional medical cluster by state and municipal authorities by developing the legal framework for the development and functioning of such markets, creating favorable economic conditions in the form of benefits, providing loans, promoting networking between elements of innovative infrastructure, etc., as well as the stimulating public procurement schemes.

The second stage is characterized by the maturity of the cluster and the transition to independent sustainable functioning, that is, to the regime of economic homeostasis.

The medical cluster is intersectoral. On the one hand, it unites organizations from various spheres of the economy (medicine, pharmaceuticals, information technology, chemical industry, insurance, etc.). On the other hand, the medical cluster is the basis for creating NBICS innovations:

1. Innovations in the field of nanotechnology. Examples include such trends as the delivery of medicines in nanocontainers, the production of precise medical nanomanipulators, the use of nanopowders in the production of medical equipment and materials, etc.
2. Biomedical technologies. Many promising developments are being created in this area, such as self-replicating systems based on biosimilars (viruses and bacteria) and many others. Bioengineering is one of the most promising natural sciences.
3. Information technology. Bioinformatics is also among the most promising areas; it introduces innovations related primarily to genetic research into our economy and life.
4. Cognitive applied sciences. The development of artificial intelligence and neural networks that allow for the analysis of large amounts of data related to the health of individuals and groups of people is also most pronounced in medicine.
5. Social innovation. The COVID-19 pandemic has forced people to take a fresh look at the value of their health. This gave impetus to the development of vaccines and other medicines and accelerated the introduction of other social medical innovations, primarily related to the development of the so-called personalized

medicine. This can be the basis for other social innovations, for example, related to the sphere of insurance, credit, and others.

Thus, the medical cluster is the basis for the rapid and effective implementation of NBICS innovations largely due to the synergetic effect of the interaction of organizations located in the same medical cluster (Teece, 2007).

4.4 Conclusion

The paper considers the development of NBIC technologies within the framework of such an organizational form as a cluster. Clusters with research organizations and residents of business incubators, interacting in the markets of scientific, technical, and industrial products, are subject to the laws of development, which are considered within the life cycle concept. The possibilities of creating NBICS innovations within medical clusters by creating a synergistic effect are considered.



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Chapter 5

The Prospects for the Development of the Domestic Pharmaceutical Industry in the Context of Import Substitution



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Abstract The critical dependence of the Russian pharmaceutical market on imported medicines necessitated the industry's transition to an import-substituting vector. The priority of replacing imported medicines with domestic ones, the full production cycle of which is located on the Russian territory, was fixed in the Federal Target Program "Pharma-2020", the implementation of which made it possible to increase the production of domestic medicines significantly. However, there are currently certain problems in the industry, which are advisable to identify using SWOT analysis. The weaknesses of industry development include dependence on imported raw materials, primary pharmaceutical substances, commercialization of some technologies that are strategically important for the development of the industry, and the protracted transition of domestic enterprises to the good manufacturing practice (GMP) standard. The most significant industry challenge is sanctions and macroeconomic instability. Additionally, there are a number of personnel and infrastructure problems. To eliminate adverse factors, the Federal Target Program "Pharma-2030" is being developed.

Keywords Industrial organization · Industrial structure and structural change · Domestic pharmaceutical industry · Import substitution · Innovative medicines · Generics · Pharmaceutical technologies · Human resources · Good manufacturing practice · Standardization

JEL Codes L16 · L15

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5.1 Introduction

Until recently, the domestic pharmaceutical market was characterized by total import dependence. Therefore, one of the primary tasks stated in the “Strategy for the Development of the Pharmaceutical Industry of the Russian Federation for the period up to 2020” was to ensure “the priority of replacing imported medicines with domestic ones, the full production cycle of which is located on the territory of the Russian Federation”, as well as “the priority of the national pharmaceutical industry in the implementation of state programs in the field of providing medicines” (Ministry of Industry & Trade of the Russian Federation, 2009).

The tasks set out in this document, enshrined in the Federal Target Program “Development of the Pharmaceutical and Medical Industry of the Russian Federation for the period up to 2020 and beyond” (FTP “Pharma-2020”), were aimed at ensuring the national security of Russia and implementing an innovative model of development of domestic pharmaceuticals.

According to the current situation, the Federal Target Program “Strategies for the Development of the Pharmaceutical Industry of the Russian Federation for the period up to 2030” (FTP “Pharma-2030”) have been developed given the importance of the EAC member countries’ integration in the pharma sphere. Consequently, the orientation of Russian pharmaceuticals to import substitution should radically change the current trend of continuing import dependence on import substitution with access to export orientation in several positions in the markets of the EAEU member countries.

5.2 Methodology

The research on the prospects for the development of national pharma is based on the tools of general scientific methods: system analysis, scientific abstraction, empirical description, and comparative analysis.

Russian and foreign scientific publications on the development of domestic pharmaceuticals were used as theoretical material. Analytical data were obtained from the official Websites of major pharmaceutical manufacturers and reputable information and analytical publications.

The method of scientific abstraction made it possible to identify opportunities and threats to the development of national pharma under sanctions. As a result of the system analysis, the authors revealed the structure of the industry transformation under the influence of the implementation of measures within the framework of the FTP “Pharma-2020”, with a detailed study of the strengths and weaknesses of the industry. Comparative analysis was used to study industry development in the dynamics of the years. Statistical analysis is updated to identify the share of Russian pharma manufacturers.

The research result has been introduced as a SWOT analysis of the development of Russian pharma manufacturers in the realities of import substitution.

5.3 Results

The FTP “Pharma-2020” includes particular directions necessary to achieve within the framework of the import substitution policy. These directions have been developed in the form of the following groups of measures required for realization:

- Group 1 “Development of scientific and technical pharma potential”;
- Group 2 “Development of innovative pharma potential”;
- Group 3 “Development of human resources and information infrastructure of the pharma and medical industry”;
- Group 4 “Investments ensuring technological re-equipment, modernization, and transition of the domestic pharma and medical industry to an innovative improvement model” (“Portal of state programs...”, n.d).

The pattern and pace of the development of scientific and technological potential (group 1 of the FTP “Pharma-2020”) and innovation potential (group 2 of the FTP “Pharma-2020”) require priority study. Currently, the class of pharma technologies is expanding, which includes technologies for the development and production of initial pharmaceutical ingredients (substances), technological equipment, technologies for the production of therapeutically effective medicines (finished dosage forms [FDF]), and quality control technologies.

The technical re-equipment of 75 pharmaceutical production facilities was carried out from 2012 to 2015. The planned indicators of the FTP “Pharma-2020” for this indicator have been fully implemented. As for other indicators, the actual values of the indicators are close to the planned ones, except for the volume of production of medicines of domestic production according to the nomenclature of the list of strategically important medicines and the list of veterinary medicine (VEM) due to the commercialization of the created technologies (the planned indicator by 2016 is 64 billion rubles, actually achieved—45.7 billion rubles). The implementation of the set of the FTP “Pharma-2020” measures of group 1 allowed expanding domestic production in the nomenclature of the list of strategically important medicines and the list of VEM from 63% to 76.8% (Evstratov, 2018).

The volume of medicine production in value terms amounted to 185 billion rubles in 2014 and 485.75 billion rubles in 2020, which corresponds to an increase in production volumes by 162.6%.

An important factor for developing production competencies, creating additional high-tech jobs, and attracting foreign investment to the Russian economy is the localization of advanced developments of foreign pharmaceutical companies on Russian sites. Investments are aimed at organizing the production of pharmaceutical substances, including those not produced on the territory of the Russian Federation. Output growth of national pharma production and total consumption in monetary terms increased from 25.1% in 2014 to 34.9% in 2020 (“Portal of state programs...”, n.d).

The implementation of the FTP “Pharma-2020” has significantly increased the volume of exports of medicines. The indicators of the export activity of Russian

pharmaceutical industries amounted to \$0.5 billion in 2014. In 2020, these indicators exceeded \$1 billion. Currently, domestic medicines are exported to 135 countries worldwide.

According to forecasts, the increase in the volume of exports of medicines and medical products could amount to 180 billion rubles in 2024. The positive dynamics of domestic pharma production (in monetary terms), including through the commercialization of created technologies, is about 8% annually.

The realization of a set of measures for group 2 of the FTP “Pharma-2020” involves the increase in production and the development of scientific, industrial, and technological cooperation, including in related industries, by building integrated links, the realization of export potential, and ensuring the achievement of the indicator for the share of non-primary non-energy exports established by the national project “International Cooperation and Export”, as well as improving the instruments of state support of a financial and regulatory nature.

Currently, there is a growth in the number of organizations implementing technological innovations in the pharma and medical industries. This is facilitated, among other things, by measures of state stimulation of innovation activity and the measures of tax incentives and high-tech development.

According to the provisions of the FTP “Pharma-2020” strategy, the need for highly qualified personnel required to implement the innovative schedule of development of the pharmaceutical industry is insufficiently covered and is characterized by a shortage of 10 thousand new high-tech jobs. Thus, to implement group 3 of this document, the industry requires representatives of the following specialties: chemists and biologists, specialists in preclinical and clinical trials, technologists, and managers of innovation and scientific fields, including those with experience in industrial science at the international level.

The natural change in employee generations and the modernization of industry as a result of scientific and technological progress and the construction of new pharmaceutical enterprises have caused an acute shortage of personnel in several areas. This makes it necessary to attract additional attention to the industry’s needs in human resources for the long term. Experts believe that the real number of employees in demand in the industry, including additional human resources for R&D, may range from 20 to 25 thousand people in a ten-year perspective (Narkevich & Trofimova, 2011).

The parameters of the personnel order should be correlated with the possibilities of the educational sphere for its production, which is primarily carried out by such Russian universities as:

- D. I. Mendeleev Russian University of Chemical Technology;
- Moscow Academy of Fine Chemical Technology;
- St. Petersburg State Technological University;
- M. Sechenov First Moscow State Medical University;
- Volgograd State Medical University;
- Kursk State Medical University and several others.

Recently, the following universities have started implementing educational programs in the field of pharmaceutical production:

- Ivanovo State University of Chemical Technology;
- Tver State University and others.

The expansion of the list of universities that train specialists for the Russian pharmaceutical industry can be adjusted by the fact that, according to public opinion polls, no more than half of the representatives of engineering and technical specialties work in the profile of education.

The problem determining the personnel shortage in some pharma manufacturers is the lack of territorial proximity of pharma enterprises and high schools that prepare students for working there. The major national pharma clusters are located in Bashkortostan, Novosibirsk, Altai, Nizhny Novgorod, Tomsk, Kurgan, Omsk, Penza, Tatarstan, and Kursk. Most pharma employees are graduated from universities in St. Petersburg, Moscow, and several cities of the Central Federal District. Currently, pharmaceutical concerns are not actively working to attract young specialists from other regions. Therefore, it is necessary to develop and implement appropriate programs that provide a mechanism for interaction between the educational community and pharma manufacturers who select future employees, starting from the student bench (Narkevich & Trofimova, 2011).

Thanks to the implementation of the FTP “Pharma-2020” for group 4, the increase in the volume of investments in fixed assets in the Russian Federation by type of economic activity “production of medicines and materials used for medical purposes” in 2020 increased by 98% compared to the previous year and amounted to 105 billion rubles, that is, about 3.57% the total volume of investments in manufacturing.

It is impossible not to mention the effective experience of the development of import substitution on the example of the introduction of offset transactions when businesses are guaranteed purchases of their products for state budgetary institutions. A positive example of the implementation of offset contracts in the city of Moscow is the company “Biocad”, which has been supplying the capital’s patients with drugs for the treatment of oncological diseases, including Western analogs, since 2021.

No matter what that the realization of the FTP “Pharma-2020” has been implemented by most indicators. It is currently possible to identify several problems in the domestic pharmaceutical market that continue to persist. These problems are as follows:

- (1) The dependence of the domestic pharmaceutical market on imports for certain categories of drugs. In the second half of 2022, the part of foreign pharma in the Russian market in monetary terms was 55% with a total market volume of 2.3 trillion rubles; in quantitative terms—33% of 6.5 billion packages. In future, the goal has been set to achieve drug sovereignty by the national pharma industry (85% of drugs produced in the country in packages will be produced in the country) by 2030. It also follows from the concept that active pharma substances produced in Russia are used only in 20%. There are goals to make it as high as 75%, which is meant to spend 200 billion rubles.

- (2) The dependence of the national pharma market on imports for certain categories of raw materials. The main reason for the increase in the cost of Russian medicines is the dependence of domestic production on foreign raw materials, which consists of 85% of foreign purchases. Thus, the synthesis of substances in Russia requires foreign intermediate and auxiliary substances; even foil and wrapping paper continue to be imported.
- (3) The protracted transition of Russian pharmaceutical industries to good manufacturing practice (GMP) standards. About 250 Russian and 600 foreign manufacturers of drugs in the Russian Federation work according to this standard. Among the most well-known certified Russian manufacturers are “Nizhpharm”, “Veropharm”, “Pharmstandard”, “Niarmedic Pharma”, and pharmaceutical enterprises in Krasnoyarsk, Novosibirsk, Yekaterinburg, St. Petersburg, and other regions. However, there are still manufacturers who have not been able to pass certification for a number of reasons, including imperfections in production (Oborin, 2021).

It is advisable to present all considered trends in the industry's development in the format of an industry SWOT analysis presented in Table 5.1. This technique will allow systematizing all positive and negative trends with a subsequent description of the prospects for the industry development.

Thus, in the context of import substitution, the pharmaceutical industry in Russia has strengths and weaknesses. Among the strengths, the most significant factors are S.1 and S.2. The re-equipment of enterprises and the creation of a class of domestic pharmaceutical technologies will significantly increase the production of domestic drugs with a high proportion of domestic ingredients. It is impossible not to mention factors S.3 and S.4. The introduction of offset contracts stimulates the creation of new enterprises that have begun to form in the industry. The expansion of local production makes it possible to develop a cluster approach that can bring a synergistic effect to development.

Within the framework of weaknesses, weaknesses W.2 and W.3 remain significant because it is difficult to establish a dynamic growth in the production of drugs if there is dependence on imported raw materials and primary pharmaceutical substances. In our opinion, this problem is the most significant and requires the fastest solution. The commercialization of some technologies that are strategically important for industry development, as well as the protracted transition of domestic enterprises to the GMP standard, hinder the development to a certain extent. In general, at this stage, strategic technologies should remain accessible to all manufacturers, which will significantly accelerate the processes of industry growth. Standardization of pharmaceutical production can significantly optimize business processes and increase labor productivity and competitiveness in domestic and foreign markets.

It seems important to denote the outline of the FTP “Pharma-2030”, which has been actively formed during the previous three years and is currently being approved. If the main strategic vector of the FTP “Pharma-2020” was the launch of the national pharma by transferring it to an innovative improvement model and solving the problem of import substitution, then the new strategy sets slightly different tasks.

Table 5.1 SWOT analysis of the development of the national pharma in import substitution conditions

S-strengths	W-weakness
S.1 Expansion of the national pharma technologies class: – Technologies for the development and production of initial pharma ingredients (substances); – Technological equipment; – Technologies for the production of therapeutically effective medicines (finished dosage forms [FDF]); – Quality control technologies	W.1 The lag in the actual volumes of national pharma production according to the nomenclature of the list of strategically important medicines and the list of VEM due to the commercialization of the created technologies from the planned
S.2 Phased technical re-equipment of pharmaceutical industries	W.2 Acute shortage of domestic active pharmaceutical substances for the production of medicines
S.3 Expansion of local production of medicines in the Russian Federation	W.3 High share of imports in certain categories of raw materials
S.4 Introduction of the mechanism of offset contracts, when the business is guaranteed the purchase of its products for state budgetary institutions	W.4 Prolonged transition of domestic pharmaceutical industries to GMP standards
O-Opportunities	T-threats
O.1 Expansion of volumes and geography of export of medicines	T.1 High demand for highly qualified personnel: – Chemists and biologists; – Specialists in preclinical and clinical trials; – Technologists; – Managers of the innovation and scientific sphere
O.2 Measures of state stimulation of innovation activity	T.2 Inconsistency of localization of pharmaceutical industry enterprises and training centers for them
O.3 Measures of tax incentives for the introduction of technological innovations and the development of high-tech companies	T.3 Maintaining the dependence of the domestic pharmaceutical market on imports for certain categories of drugs

Source Compiled by the authors

According to this document, it is planned to create a high-performance export-oriented sector and increase the volume of exports of Russian pharmaceuticals by 5–6 times and medical devices by 8–10 times.

At this stage of the formation of the FTP “Pharma-2030” project, the most sensitive negative factors of the external and internal environment are taken into account concerning the appropriate material and technical level and cooperative ties between production institutions, educational institutions, and science, as well as providing the industry with raw materials, pharmaceutical substances, solvents, and catalysts of a high degree of purification necessary in high-tech industries.

Leading industry experts responsible for the development of the FTP “Pharma-2030” formulate a strategic guideline for the development of the industry as a policy of innovative import substitution and propose the following measures to achieve the following goal:

- (1) To form large venture funds with state participation to identify developments at the stage of preclinical trials in order to bring them to the successful completion of phases I or II of clinical trials. This considers the positive experience of the FTP “Pharma-2020”, as a result of which 600 clinical projects were supported, among which several dozen turned out to be promising. In addition, this measure will create demand for new early innovations emerging at the sites of Russian universities, as well as attracted by technology transfer schemes (Izmaylov et al., 2022).
- (2) To adopt legislative acts providing for accelerated registration of innovative domestic drugs based on the results of phase II clinical trials. In this case, it is important to consider the positive experience of accelerated registration of drugs and vaccines from COVID-19 within the framework of the Decree of the Government of the Russian Federation No. 441 dated April 3, 2020 (Government of the Russian Federation, 2020).
- (3) To expand the practice of offset contracts and introduce a standard for purchasing innovative domestic medicines by state medical institutions.
- (4) To consolidate in the legislation of preferential taxation and a number of other preferences for pharmaceutical companies reinvesting profits in the production of innovative medicines (“Portal of state programs...”, n.d).

5.4 Conclusion

The analysis of the pharmaceutical industry in Russia allows us to conclude that Russian manufacturers have managed to significantly increase the production of medicines since the beginning of the 2010s, which was largely due to the implementation of the FTP “Pharma-2020”. This success is especially significant given the recent total import dependence of the domestic pharma market. Legislatively, it was possible to consolidate the priority of the national pharma in the state programs realization in the field of providing medicines with a full production cycle on the Russian territory, which reflects the import substitution policy.

As a result of studying the current state, it was possible to develop a matrix of SWOT analysis of the Russian pharmaceutical industry in today’s conditions of import substitution, which indicates the presence of strengths, opportunities, weaknesses, and threats. If the former were largely due to the measures realized under the

FTP “Pharma-2020”, the latter deserves close attention in the project being developed by the FTP “Pharma-2030”. The FTP “Pharma-2030” considers.

- The need for an innovative model of industry’s development associated with the possibility of preclinical testing using specialized venture funds and creating demand for new early innovations;
- The need to consolidate at the legislative level the accelerated registration of innovative domestic medicines, preferential taxation, and other preferences for domestic pharmaceutical companies;
- The expansion of the practice of offset contracts;
- The introduction of a standard for purchasing innovative domestic medicines by state medical institutions.





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Chapter 6

The Lateral Strategy of University Development in the BANI World



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Abstract The research discusses the features of the BANI world compared with the SPOD and VUCA world, which consist in increasing the chaotization of processes and increasing the likelihood of unexpected adverse events with devastating consequences (“black swans”). Under these conditions, the method of extrapolating past events to the future, which is characteristic of strategic planning in the SPOD world, does not work. An important direction of the strategic management of the organization in Industry 4.0 is to increase the organization’s antifragility. The research formulates the main requirements for universities in Industry 4.0, such as anticipating the needs of tomorrow’s labor market, the integration of science and education, and an interdisciplinary approach to research. These can be met with a barbell strategy or a lateral strategy. Lateral strategy is about overcoming patterns of strategic thinking. The research provides examples of how Volgograd universities respond to global and local agendas when developing lateral development strategies. However, to increase their antifragility and ability to respond to the challenges of the BANI world, universities need to continue to increase their efforts to implement lateral strategies in such areas as strengthening horizontal connections in social space, personalized education, and an edutainment approach.

Keywords Industry 4.0 · BANI world · Strategy · Antifragility · University

JEL Codes I25 · L20

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6.1 Introduction

In today's world, the development of economic systems is, as a rule, nonlinear. This is due to the increasing complexity of the economic structure of society, the complexity of economic management processes, the emergence of new technologies (e.g., NBICS synergy), and other factors. The increasing chaotization of processes and structures in this area made it necessary to designate it as a BANI world: brittle, anxious, nonlinear, and incomprehensible world. According to the concept of A. Stinchcomb, largely confirmed by further research by J. Woodward, P. Lawrence, and J. Lorsch, the company's structure (and strategy) reflects the social structures and processes of the era when the industry within which the company operates appeared. Such a kind of managerial "time machine" allows one to see the traces of different eras in different companies. Therefore, it is not surprising when an IT startup demonstrates the social relations of the twenty-first century in 2023, while the railway monopolist reproduces social processes that were more typical of the nineteenth century. Companies that have recently been created within contemporary industries (e.g., startups related to genetic engineering) are easier to adapt to the challenges of the BANI world, while even new organizations created in traditional industries (e.g., education) have difficulty adapting to the external environment. This raises a non-trivial question for managers and researchers: "What are the mechanisms by which a company from a traditional industry can successfully adapt to the external environment?" This research describes one such mechanism—the creation and implementation of a lateral strategy for university development.

6.2 Methodology

Based on the concept of lateral thinking by Edward de Bono, the main characteristics of the lateral strategy for the development of the university are formulated, which can become a means of increasing the antifragility of the university in the BANI world.

6.3 Results

The behavioral strategies of companies in the BANI world are different from their behavioral strategies in the SPOD world. The parameters of the SPOD world (steady, predictable, ordinary, and definite) allowed organizations to rely on the traditional strategic planning paradigm. Indeed, if the organization's external environment is relatively simple and immobile, then the basis of the strategy is a well-calculated extrapolation of yesterday's data to the future with a correction factor. In such conditions, strategic management was reduced to the coordination of programs within the organization (as a rule, it was not required to adjust them in accordance with

changes in the external environment) and the development and approval of budgets for implementing these programs.

However, the development of the economy, which includes the complication of the structure of markets, the emergence of new players, and, as a result, the intensification of competition, the increase in the level of consumer welfare, the complication and changeability of customer tastes, globalization, and other factors, has led to the fact that the abbreviation SPOD has ceased to describe the characteristics of the environment reality. The level of risk in making managerial decisions has increased many times over. To describe the characteristics of the new economic reality, generally established by the 1980s, the abbreviation VUCA was increasingly used (volatility, uncertainty, complexity, and ambiguity). Under these conditions, a linear approach to strategic planning was no longer relevant. In fact, managers each time had to adjust their plans in accordance with changes in the external environment, paying increased attention to innovation and non-standard moves. A simple extrapolation of data for the past period into the future no longer met the requirements of a changing external environment. Creating a vision for the future was an increasingly demanded managerial skill. The scarcity of meaningful information and the ambiguity of available information needed for decision-making has challenged managers to develop the skills to understand and interpret data. The presence of a huge number of parameters and characteristics in meaningful information has given top managers the task of setting priorities in accordance with the created vision of the organization's future, which helps ensure clarity in the development and adoption of managerial decisions. Finally, the ambiguity of information coming from the external environment forced managers to start using elements of organic structures, even in large bureaucratic organizations. The search and production of meanings (Weick, 1995) are possible only with open communication interaction between people and the unit, which requires the introduction of flexible structures and management methods. Thus, a VUCA response arose to the VUCA challenge: vision, understanding, clarity, and agility.

Important for understanding the realities of the VUCA world is the concept of Nassim Taleb's "black swan," denoting an event that is difficult to predict with significant consequences (Taleb, 2015b). To include such events in the development strategies of companies, scenario planning is used, which makes it possible to draw up action programs in case of a sharp change in the values of environmental factors critical for the company. However, in the VUCA world, the arrival of the "black swan" may not take place during the life cycle of the organization, as it is a relatively rare event.

Over the past 2–5 years, researchers have begun to notice an increase in the number of arrivals of "black swans." From relatively rare, events of this kind have moved into the category of quite frequent. This allowed researchers to talk about a new change in the nature of the parameters of the external environment. This time they were given the abbreviation BANI: brittle, anxious, nonlinear, and incomprehensible. Nassim Taleb warned about this, believing that the Internet and globalization have greatly complicated the world, making the arrival of "black swans" an everyday commonplace.

However, the development of the Internet and computer technologies and the strengthening of globalization processes have become the basis for the transition of the economic system to the phase of Industry 4.0 (Schwab, 2016). On the one hand, this system of smart production based on the Internet of things and services generates new social relations. On the other hand, it necessitates the development of new approaches in strategic management by organizations to be able to respond to the challenges of the new economic order (Schwab, 2018).

Let us look at some of the features of Industry 4.0 using the example of an organization from such a traditional industry as education. The development of Internet technologies in the new social conditions has led to the fact that the market for massive open online courses has grown almost five times over the five years (2015–2020). With the introduction of social restrictions due to the COVID-19 pandemic in 2020, these types of courses have become even more popular. This has become a considerable strategic challenge for those traditional universities that strive to create their own vision and bring plans to life.

The growing competition on the Internet, which is rather new for traditional universities, is not the only challenge for them. The realities of the new normality include the restructuring of universities, the digitalization of education, the increasing mobility of students, the concept of life-long learning, the commercialization of university developments, and much more. Simultaneously, the social order from the side of society to universities as to the core of the knowledge economy, in which the production, accumulation, and transfer of knowledge take place, is preserved. That is, along with state corporations and private firms, universities play a significant role in creating innovation in the contemporary economy.

We can formulate the main requirements for universities that want to maintain and improve their positions in the contemporary economy:

1. Universities are platforms for the development and implementation of innovations in the field of NBICS technologies.
2. This requires the integration of research schools in interdisciplinary projects.
3. Universities should provide students with programs that meet the needs of today and tomorrow.

This is possible if universities can become global, open, and dynamically developing platforms.

In the Russian Federation, the education system has already overcome some stages of this path. Thus, the status of a national research university and a federal university was established in 2008. In 2009, universities were given the opportunity to create small innovative enterprises to commercialize R&D results. Additionally, state support is provided for the development of innovative infrastructure of universities and the development of cooperation between Russian universities and organizations implementing complex projects to create high-tech production.

Apparently, just as the VUCA challenge has its own VUCA response, the response to the contemporary challenges in the BANI world is the strategy of achieving the antifragility of the organization. The author of the term is Nassim Taleb, who understands it as the property of systems not to break and to develop under the influence

of unexpected strong adverse effects (“black swans”) (Taleb, 2015a). Simultaneously, Nassim Taleb divides three categories in this theory: “fragile,” “resistant,” and “antifragile.” The fragile system breaks down under the influence of the “black swan.” A resistant system deliberately makes efforts to increase its protection in the riskiest aspects of its activity. As a result of the influence of black swans, the antifragile system acquires new properties (accumulates useful mutations and evolves), which allows it to develop in a crisis. Consider one such crisis—the COVID-19 pandemic. For example, if a university is fragile, then the introduction of a lockdown can deprive this university of a significant part of its students. If a university is considered resistant, then, following the trends of technological development, it will focus on the introduction of distance learning technologies, and the introduction of a lockdown will not affect the number of students. If a university is antifragile, then it will, first of all, develop an ecosystem, that is, a set of organizational and sub-organizational forms that will effortlessly accept the conditions of distance education and make it an integral part of everyday work. For example, at the university, there is (a) a developed IT service, (b) a developed media service, (c) a developed teaching staff, (d) established scientific and creative teams of students, (e) developed horizontal connections between participants in the educational process, and (f) an administration that is ready to institutionalize ongoing experiments, as well as a number of other favorable factors of a developed ecosystem. Then, under lockdown conditions, students and teachers can initiate remote conduct of traditional lectures and practical classes, as well as unusual forms of university life: for example, streaming the most popular teachers or various competitions between students and student groups, creating popular science videos, gamification of the educational process on the university Website, etc. We can say that “antifragile” organizations have a developed ecosystem. Their organizational structure is closer to the organic type than to the mechanistic one. In such organizations, there is a significant degree of decentralization of management decisions. Antifragile organizations welcome and encourage innovative initiatives from the bottom up.

The strategy for achieving antifragility is a subspecies of anti-crisis development strategies created in advance. In our opinion, these strategies can be divided into conscious (rational) and unconscious (spontaneous). The so-called barbell strategy belongs to the first type. It lies in the redistribution of risk: the organization protects the weakest areas of work and allows strong professionals to act independently in the most protected areas of work. For example, a university may come up with various marketing activities to increase the popularity of areas of study in which applicants have little interest. The most popular areas of training cope with the recruitment of students on their own. Another example is the funding of scientific research. For example, if a university only plans to start development in a certain area, then it can support the research team by purchasing the necessary equipment, materials, etc. If another research team has been conducting promising developments in another scientific field for a long time and has achieved success in this, then, in accordance with the barbell strategy, the university should not provide targeted support because the research team can independently allocate grant funds for the purchase of the necessary equipment and materials.

In our opinion, the barbell strategy is not the only strategy for achieving antifragility. The unconscious (spontaneous) strategies for creating antifragility include lateral strategies for the organization's development. Lateral thinking became known back in the 1960–1970s, thanks to the developments of the famous scientist Edward de Bono in the field of the nature of creativity (De Bono, 1969). One of the important mechanisms of creative thinking is lateral movement or movement around the existing stereotypes (De Bono, 1970).

Developments in the field of lateral thinking gave impetus to applied research, for example, in the field of marketing (Clapham, 2003). In lateral marketing, the so-called shift technique was used to develop new products. This technique consists in identifying an important characteristic feature of the product and its radical rethinking (Kotler & De Bes, 2017). For example, if one takes a product such as a flower, then one of its characteristics will be “withering.” What if we create a flower that will never wither? Thanks to this radical rethinking of the flower phenomenon, a market for artificial (never withering) flowers has emerged.

With regard to the educational system, such a rethinking is possible. In Russia, university administrations usually form student groups and distribute them among teachers. What if students were given the right to choose their own teachers? This concept has been implemented in some countries.

According to M. Porter, the usual competitive strategy for the development of an organization is based on advantages either in economies of scale, product differentiation, or a pronounced focus on a segment (Porter, 2007). The traditional competitive strategy involves going head-on with competitors who want exactly the same advantage. The competitive strategy of the university involves competition with other universities in the quantity and quality of educational programs and areas of training.

Of all the 5Ps, the lateral strategy in G. Mintzberg's model is most similar to the Ploy (Mintzberg et al., 2013). With the help of the lateral strategy, one can bypass the patterns of behavior of organizations on the market, avoid a head-on collision with a competitor, swim out of the red ocean into the blue one (Kim & Mauborgne, 2017), and increase your antifragility. The object of the tactical move is not only and not so much competitors but the BANI world itself, forcing it to respond to the challenges of the environment.

Volgograd universities respond to global and local agendas when developing lateral development strategies. The Volga State University (VoISU) implements ESG principles in scientific, educational, and economic activities in accordance with 17 sustainable development goals developed by the UN General Assembly in 2015. This provision is reflected in the Strategic Development Program of Volgograd State University (2022–2026). The Research and Educational Center “Vector” (REC “Vector”) was founded to implement the ESG principles in the activities of the university. The main goals of the REC “Vector” are the conceptual development and practical implementation of the ESG model for managing the sustainable development of the university, as well as the systematization of scientific and educational practices and proposals in this area.

A practical continuation of this activity is the various environmental initiatives of the VoISU. The university has a department of ecology and nature management,

which conducts educational activities in the field of ecology. The university also conducts scientific conferences and scientific research to improve the environmental situation in the region, country, and world. Additionally, based on this department, the student ecological society “Ecoinitiative” was organized, whose student activists carry out various kinds of environmental actions to improve the territory.

However, not only students can show environmental awareness and activity. Citizens of Volgograd can also join Volgograd environmental initiatives as part of the activities of the volunteer center “Breakthrough.” This center is engaged not only in environmental actions but has a wider range of activities. For example, the Volgograd World Cup in 2018 was supported by volunteers from the volunteer center “Breakthrough.” At that time, the VolSU managed to attract very broad public attention and, accordingly, attract a considerable number of applicants due to the activities of the volunteer center “Breakthrough” at the championship.

Since its founding in 1980, many scientific schools have developed at the VolSU. Many scientists have significantly contributed to such scientific fields as philosophy, economics, management, law, philology, linguistics, history, mathematics, and chemistry. These scientific schools conduct scientific research and develop various innovative products. The VolSU also uses the accumulated scientific potential to attract applicants. For this purpose, the departments have a number of free circles for high school students in such areas as philosophy, linguistics, history, political science, biology, mathematics, and computer science. Additionally, the VolSU operates the Regional Center for Additional Education for Children “House of Scientific Collaboration named after Z. V. Ermolieva,” within which children can get acquainted in practice with such areas as, for example, bioengineering and bioinformatics or robotics, and teachers can improve their skills in teaching the school subject “Technology.”

The mentioned organizational form of the scientific and educational center allows the VolSU to decentralize decisions on training students in advanced training programs. This allows the institutes and departments under which the RECs have been established to show more independence in educational creativity and attract extra-budgetary funding. Currently, there are 23 such scientific and educational centers in the VolSU.

It is worth noting such a space for holding a variety of educational, scientific, creative, and social events as the “boiling point,” which can be visited by every citizen registered on the portal.

The “boiling point” exists not only at the VolSU but also at the Volgograd State Technical University (VolgSTU). It serves as a venue for various events—lectures, seminars, master classes, workshops, trainings, competitions, etc.

Another space for scientific and technical creativity in the VolgSTU is the Polygon Design Center. The main goal of this structure is to create an environment for the creative self-realization of students in the field of science and technology. For example, on the basis of “polygon,” students can form teams to develop scientific and technical projects, which can then be sent to various competitions. As part of these projects, students create prototypes and models using specialized equipment. These prototypes may be of interest to potential employers and investors. In general,

exhibitions of the most promising developments of students and scientists of the VolgSTU are often held on the basis of “polygon.”

One of the most daring and interesting initiatives of the Center for Project Activities was the format for defending graduation theses called “startup as a diploma.” This format makes it possible to create a promising prototype, make all necessary calculations, design work, and experiments, and present the project to potential venture investors and business angels. This format trains students’ engineering and entrepreneurial thinking.

The VolgSTU has its own university Technopark, which is a research center with pilot production, where one can test new materials for chemical, aviation, metallurgical, and other industries.

The Volgograd State Medical University (VolgSMU) also has a very large scientific, technical, and educational potential, which is used in a variety of forms (Shkarin et al., 2022).

For example, the Scientific Center for Innovative Medicines (SCIM) was established to develop and introduce new, highly effective medicines into clinical practice. On this basis, students and scientists carry out their research.

The Center for Electronic Medical Education (CEMO) provides practical training at all levels of training at the VolgSMU using simulation equipment and distance learning technologies, as well as organizational and technical support for the accreditation of clinical specialists.

The “process factory” is a training center for project team leaders and their specialists in the basics of the process approach to management, lean technologies, workflow optimization, etc. On the basis of the project office, working groups initiate certain projects to improve the activities of the university, and the administration of the project office provides them with methodological support, coordinates, monitors, and controls the project portfolio, etc. (Adzhienko et al., 2021).

Students can develop their projects at the Youth Educational Forum “Projectorium,” where students can receive methodological, organizational, and financial support for implementing their ideas.

One of the forms of socialization of students and the disclosure of their professional potential is the initiative of the VolgSMU called “start a career at VolgSMU!” in which students can find a job at a university and continue their education at the expense of a university in residency and postgraduate studies, as well as get an experienced mentor.

However, to increase their antifragility and ability to meet the challenges of the BANI world, universities need to continue increasing their efforts to implement barbell and lateral strategies. Possible directions along the way could be the following:

1. Strengthening horizontal ties in the social space. For example, the VolgSMU holds a “job fair,” where potential employers try to interest students and graduates with their conditions. However, this initiative could be improved by introducing interactive methods. For example, each fair could be hosted by a professional

- presenter who is familiar with networking techniques. Thus, acquaintance with potential employers would be more informal, interesting, and informative.
2. An undoubted trend in the education of the future is personalized education. For this purpose, it is necessary to develop the institution of tutoring. Such attempts were made earlier at the VolSU. However, tutoring is currently rarely used.
 3. Development of the edutainment approach. Volgograd universities have separate initiatives to hold scientific stand-ups, scientific battles, and various intellectual games. Nevertheless, these events are not systemic. Simultaneously, the edutainment approach would increase the attractiveness of Volgograd universities.

6.4 Conclusion

Thus, the development of the economy contributed to the transformation of the SPOD space through VUCA calls into the BANI world, in which the probability of unexpected adverse events (“black swans”) increases manifold. For Industry 4.0, this is becoming commonplace. Traditional universities should evolve into a University 4.0 format characterized by anticipation of the needs of tomorrow’s labor market, the integration of science and education, and an interdisciplinary research approach. In Russia, transformational processes have already been launched at the state level. Much depends on the strategic behavior of each university individually. To acquire antifragility in the BANI world, universities should apply a lateral development strategy. Volgograd universities partially use elements of the lateral approach. It is necessary to strengthen activities in this direction because the lateral strategy is one of those mechanisms by which a company from a traditional industry can successfully adapt to a turbulent external environment (Geschwill & Nieswandt, 2020).

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Chapter 7

Telemedicine from the Perspective of Social Efficiency



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Abstract The paper aims to determine the development of telemedicine consultations in the Russian Federation and the impact from the perspective of social efficiency. The development of telemedicine by all participants is described as a new social practice, a new construction in the system of doctor–patient relationships. The paper identifies that the use of telemedicine expands the possibilities of realizing human rights to medical care and reduces the cost of medical services where distance becomes a critical factor. The authors apply statistical analysis to research the telemedicine market before and during the coronavirus pandemic. The research shows the main trends in the development of telemedicine technologies and major disadvantages in the way of their implementation.

Keywords Telemedicine consultations · Medical care · Technology · Doctor–patient relationship · Healthcare

JEL Codes I1 · I11 · H51 · H540

7.1 Introduction

The implementation of telemedicine is the most important task currently facing healthcare in Russia.

In 2010, the World Health Organization (WHO) counted 104 definitions of telemedicine by its member states and proposed a universal definition, which does not change the essence of the views presented by WHO member states.

According to one of the definitions given by the WHO, telemedicine is a method of providing medical services where distance is a critical factor.

Telemedicine uses digital technologies to provide the necessary medical care to patients and connect doctors with each other (Zheleznyakova et al., 2020).

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The main areas of telemedicine include telemedicine consultations and consilium, distance education, emergency telemedicine, and home telemedicine. The development of telemedicine in the regions allows patients to receive medical consultations and doctors to receive consultations from specialists of the National Medical Research Centers of the Ministry of Health of the Russian Federation.

Nowadays, there is a massive transition from single telemedicine centers to the creation and development of regional telemedicine networks (RTNs).

RTN is an infrastructure that allows providing medical services through existing communication channels in the region. These networks will unite rural and urban doctors with regional centers, which will make it possible to conduct a telemedicine consultations at the regional level (due to the lack of necessary specialists or their insufficient qualifications) and telemedicine consultations at the federal level with the involvement of consulting doctors from leading medical institutions at the federal level. The intensive development of RTN began in 2003 and continues to the present (Vladimirsky, 2016).

The relevance and importance of the development of innovative technologies in the healthcare system are due to several factors that determine the Russian specifics:

- Large territory and low population density in many regions;
- The uneven development of healthcare in the regions;
- The need to increase the level of medical care to the population.

The combination of these factors made it possible to talk about telemedicine as a separate industry designed to optimize doctor–patient communication and improve the quality of healthcare in general.

The paper aims to study and analyze the introduction of telemedicine consultations from the perspective of social efficiency and their development.

The research tasks are as follows:

1. To analyze the application of telemedicine technologies in the Russian Federation;
2. To identify problems and ways of the development of telemedicine;
3. To determine the advantages and disadvantages of remote consultations for patients.

7.2 Materials and Method

The regulations on telemedicine were legislated in 2017 in the amendment to the Federal law “on the fundamentals of protection of the public health in the Russian Federation” (November 21, 2011 No. 323-FZ), which entered into force on January 1, 2018 (Russian Federation, 2011).

Investment activity in the industry has increased after the adoption of the law on telemedicine. According to VEB Ventures, the volume of investments in Russian telemedicine companies from 2020 to 2025 will grow to 96 billion rubles from 1.5 billion rubles in 2019. In 2017–2020, the total volume of venture investments in

telemedicine companies in the Russian Federation amounted to more than 2 billion rubles, while the market volume reached 1.5 billion rubles by the end of 2019.

An interesting fact is that even before the beginning of the deterioration of the epidemiological situation and the increase in morbidity in the country, the global volume of investments in telemedicine projects for the first quarter of 2020 increased 3.6 times compared to the same period last year—to \$788 million against last year’s \$220 million (EverCare, 2020).

Currently, 2675 medical institutions in 85 subjects of the Russian Federation are connected to the telemedicine technology system in Russia.

According to the “Telemedicine Market Analysis in Russia” prepared by BusinesStat in 2022, the volume of the medical teleconsultation market in the country grew almost six times and reached 1.07 million appointments from 2017 to 2019 (BusinesStat, 2022). The market grew due to the legalization of telemedicine and the explosive development of related services. Figure 7.1 presents the number of medical teleconsultations from 2017 to 2021.

An additional surge in calls to telemedicine doctors was observed in 2020 due to the appearance of coronavirus infection. Thus, there were four times as many consultations as in 2019 (4.51 million). This was relevant to quarantine restrictions during the COVID-19 pandemic. The patients had a choice: postpone the doctor’s appointment until the epidemiological situation stabilizes or communicate with the doctor online. Using telemedicine, a person can receive medical care without the personal presence at the doctor, and the clinic remains in regular contact with the patient.

In 2021, the growth in the market amounted to 9.7%, up to 4.95 million teleconsultations. COVID-restrictions on clinic visits have been eased, and the growth rate has slowed.

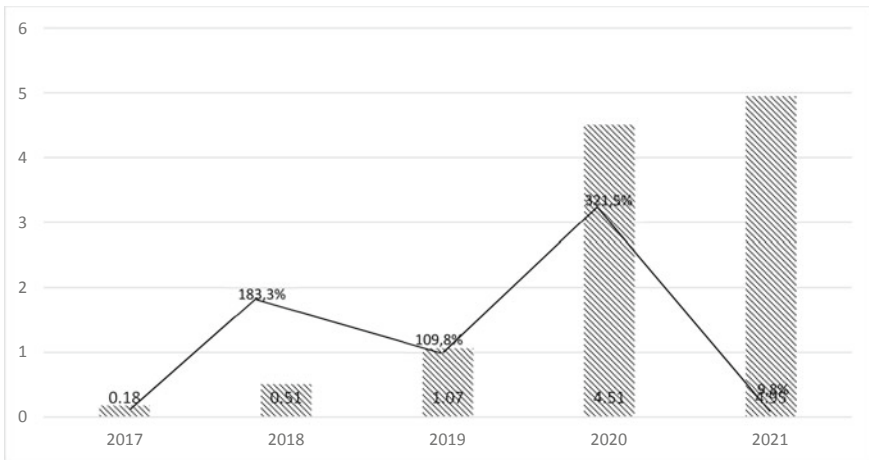


Fig. 7.1 Number of medical teleconsultations from 2017 to 2021. *Source* Compiled by the authors based on (BusinesStat, 2022)

The number of teleconsultations will continue to grow in the coming years. Military-political and economic crises will not stop the market's growth (BusinesStat, 2022).

In Russia, there is a growing demand for telemedicine care: about 10% of the country's residents use doctors' services online, and 60% are ready to use telemedicine and continue treatment at home under the supervision of specialists. This data was presented during the International Round Table on the topic "telemedicine: application practice in Russia and international experience," organized by BCG consulting company in St. Petersburg. According to statistics, 88% of heads of medical organizations expect to increase the growth rate or maintain the current level of the use of digital tools by patients (Association of Private Clinics of Moscow, 2021).

Coronavirus has increased the number of supporters of remote medicine. One in six consulted with doctors online while at work. In surveys of the SuperJob high-paying job search service, economically active citizens of all districts of Russia told whether they had to use telemedicine services.

The survey results showed that one out of twelve Russians interviewed consulted doctors online, while 5% used them for the first time before the pandemic and 3% after the outbreak of the pandemic. They noted that every sixth customer of telemedicine services (17%) sought doctors' advice right at the workplace.

Simultaneously, twice as many women started consulting doctors online after the COVID-19 pandemic than men: 5% versus 2%, respectively.

Most of those who used the opportunity of online consultations with doctors before COVID-19 were among Russians with an income of 80 thousand rubles per month (8%), after the pandemic—with an income of up to 50 thousand rubles (4%) (SuperJob, 2021). Figure 7.2 indicates the results of a study on patient satisfaction with telemedicine consultations.

The leaders in the number of appeals are general practitioners on duty. Their help was needed in 68% of cases. Obstetricians-gynecologists and neurologists were the most popular among doctors of narrow specialties. Behind them are pediatricians, gastroenterologists, cardiologists, dermatovenerologists, endocrinologists, otolaryngologists, urologists, and dermatologists.

Most often, the applicants ask questions related to acute respiratory viral infections. In terms of the frequency of consultations, second place is occupied by choice of the right specialist with narrow specialization. The third place belongs to the request to decipher the tests and the need for a second medical opinion.

In 74% of cases, after remote consultations, doctors gave conclusions with recommendations to undergo a certain diagnosis, visit a specialist in a medical institution, take preventive measures to prevent the development of complications, and make changes to the daily routine and nutrition.

In 15% of cases, the given recommendations are related to a healthy lifestyle, preventive measures, and vaccinations. In 6% of cases, "doctor nearby" specialists advised calling an ambulance. In 5% of cases, they gave specific recommendations for first aid (Medical Portal "Yellmed," 2019).

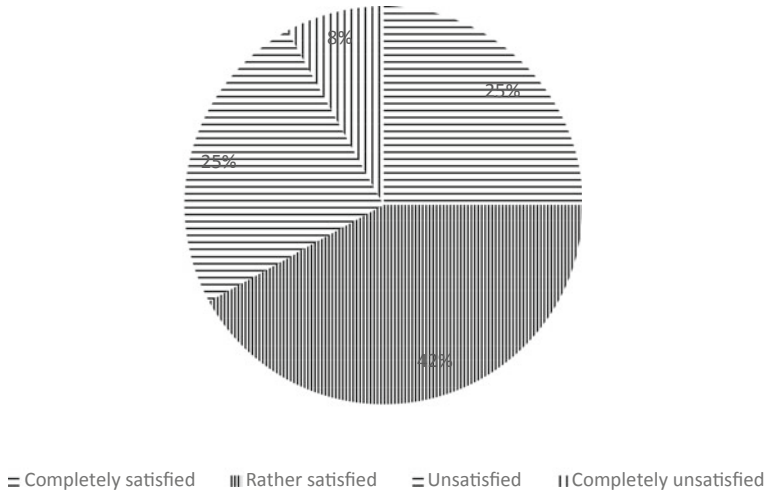


Fig. 7.2 Results of a survey of patient satisfaction with telemedicine consultations. *Source* Compiled by the authors based on the materials of RBC News (2021)

7.3 Results

According to the data from the patient survey, the following advantages and disadvantages of telemedicine technologies can be distinguished (Table 7.1).

The results of the conducted studies indicate important socio-economic benefits for patients, their families, and the healthcare system.

Despite the various difficulties in implementing telemedicine technologies in medical institutions, telemedicine has proven effective during the COVID-19 pandemic. The experience gained will eliminate the existing shortcomings and contribute to its further development on an ongoing basis in future.

Table 7.1 Advantages and disadvantages of telemedicine technologies

Advantages	Disadvantages
1. The possibility of constant communication between the patient and the attending medical doctor	1. Expensive equipment and additional costs for training medical workers
2. Saving patients' money and time	2. Lack of educational standards and training for doctors in telemedicine
3. Simultaneous diagnosis of a patient by several doctors or medical institutions at once	3. Lack of video communication skills by patients
4. Reducing the rate of infection among patients	4. Some patients prefer only face-to-face appointments

Source Compiled by the authors

Currently, the issues of financing, quality control, and accessibility of medical care for all population segments have been updated. In Russia, medical workers do not yet have sufficient motivation to switch to remote patient care due to the increased workload. Additionally, telemedicine combines the problems of the healthcare system and related industries, such as information security, possible risks of network failure and their consequences, and the availability of remote assistance and control.

7.4 Conclusion

Digital technologies are actively introduced into the healthcare sector, gradually changing the format and concept of medical care. However, these technologies are still a new direction, which, on the way to implementation, faces many difficulties related to medical secrecy, the confidentiality of received and transmitted data, increased motivation of patients, and their physiological and material capabilities.

Simultaneously, changes in the organizational, legal, and economic areas often do not keep pace with technological changes. Telemedicine is a fairly new direction, especially for Russia. It has been developed in many countries worldwide, has proven its high effectiveness in practice, has a comprehensive positive impact on the healthcare system, improves the quality of medical care, and expands the capabilities of doctors.

The forecast of the development of telemedicine technologies will directly depend on the further development of IT technologies and the gradual adaptation of telemedicine principles.

It is quite clear that the reliable functioning of the entire system in the country's regions requires high-speed stable Internet and equipment in the form of advanced computers, audio and video transmission systems, including specialized medical systems, and software.

According to some experts, the issues of adapting to the new paradigm should include further informing doctors and patients, the work of marketers associated with the medical services market, and the development of regulations for medical services and standards, considering the peculiarities of telemedicine.

Thus, in the context of a pandemic, telemedicine has become a more popular tool for doctors to interact with patients and other doctors. However, telemedicine is still at the stage of development. Perhaps, it will already be a familiar way of medical communication for us in the near future.

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Chapter 8

Digital Transformation of Russian Retail



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Abstract During the development of the digital economy of Russia, it is necessary to permanently investigate the entrepreneurial activity of trading companies because they are the leaders in the field of digital transformation. This work aims to study the digital transformation of trading companies in the food retail sector. Strategic analysis of the state of the internal and external business environment included the use of tools of economic-statistical and comparative analysis, synthesis of economic justifications, observations, and forecast estimates. The scientific and practical significance of the research lies in the identification of advanced players in the Russian food retail sector. Moreover, the research systematizes the decisive indicators of the Russian grocery retail market and factors that affect the development of digital technologies in this area (fierce competition, rapidly changing market conditions, scale, significant growth and consolidation opportunities for major players, the COVID-19 pandemic, balanced growth strategy, change in consumer behavior, etc.). The authors determined trends in consumer behavior are determined. The main elements of digital transformation in the food retail sector are systematized. Additionally, a risk map “business environment factors determining risks (threats) for X5 Group” is developed.

Keywords Innovation funnel · Food retail sector · Digital technologies · Digital transformation · Trading companies

JEL Classification D5 · F14 · F18 · O32

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8.1 Introduction

In all countries of the world, the trade industry is traditionally of great importance, performing important socio-economic functions to maintain an optimal balance between supply and demand, bring goods to consumers, reduce the costs of circulation in the sphere of consumption, generate tax revenues to the budget, and develop the labor market. Trade is a budget-forming industry, a leader in providing employment for the population, the main marketer of domestic manufacturers' products. The development and efficiency of domestic trade are a prerequisite for the normal functioning of the state economy. In this regard, research on the digital model of trade development should be considered relevant and practically significant.

The methods of logical and semantic modeling, system, structural, and functional, comparative and situational analysis, economic analysis, grouping of statistical, and empirical data are used in our research of the digital transformation of Russian retail.

8.2 Methodology

Strategic analysis of the state of the internal and external business environment included the use of tools of economic-statistical and comparative analysis, synthesis of economic justifications, observations, and forecast estimates.

General issues of the formation and assessment of the state of the retail food market are shown in the works of Orlov (2017), Valigursky (2019a, 2019b), Santalova (2015), and others.

In this research, the authors relied on scientific works in the field of digital technologies in trade by such scientists as Orlov (2017), Valigursky (2019a, 2019b), Santalova, Soklakova, and Balabanova (Santalova et al., 2020a), and others.

8.3 Results

The past period is noted by all experts and top managers of trading companies as a period of fierce competition and rapidly changing market conditions in the food retail sector. The attractiveness of the industry market is provided by its scale, significant growth, and consolidation opportunities for large players (Fig. 8.1) (Orlov, 2017; Valigursky, 2019a, 2019b).

In Russia, the dominance of the two largest players in the "shop at home" segment has historically developed. As of January 1, 2022, X5 Group has 12.8%, and Magnit has 8.8%. Only a sharp decline in household incomes from 2017 to the present has given impetus to the development of hard discounters, with a total share of 3% in the Russian market by the end of 2022 and with a forecast of 5% by 2030, mainly due to a decrease in the share of hypermarkets.

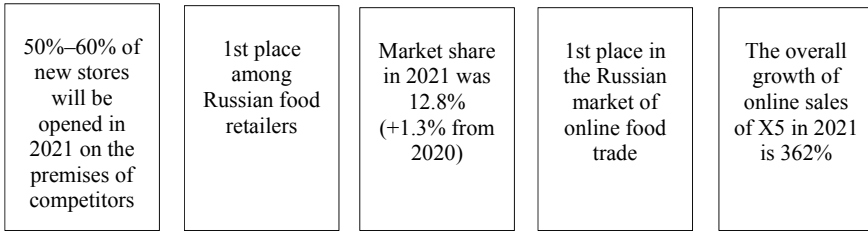


Fig. 8.1 Indicators of X5 Group's market position in 2021. *Source* Compiled by the authors

Due to the COVID-19 pandemic and declining revenues, the share of the HoReCa segment (the ready meals segment) fell from 9.3% in 2019 to 6.2% in 2021. According to forecasts, a return to the pre-pandemic level will occur no earlier than 2024 (Santalova et al., 2022; Valigursky, 2019a, 2019b).

X5 Group has ample opportunities for growth due to the growth of market volumes, its consolidation, the rapid development of digital services, and the combination of popular formats with the development of its own online sales channels (Fig. 8.1).

Since 2015, X5 Group has been consistently ahead of the rest of the Russian offline retail and the top ten largest players in terms of growth rates. The company pursues a balanced growth strategy when performance indicators and long-term profitability take priority over the task of increasing market share. In these conditions, it is necessary to use the company's existing economies of scale, which is the strongest competitive advantage.

The built-in customer orientation system makes it possible to attract a wide target audience consisting of different categories of customers.

Decentralization of operational and management activities is carried out by separating retail formats and online and offline segments. All divisions have a high degree of operational independence and their own marketing and loyalty programs. Simultaneously, they use a single customer identification infrastructure (X5.ID), big data processing, and IT. Most logistics operations are performed in-house (95%) from the company's distribution centers.

One of the main factors influencing the market and, accordingly, the strategy of retail chains are changes in consumer behavior. Sociological studies of recent years show that the boundaries between traditional retail and the expanded food market are gradually blurring (Table 8.1).

Of the macroeconomic indicators of the business environment, the following economic factors affecting consumer behavior have the most significant impact on the activities of retail chains:

- There was a food inflation rate of 4.9% for 2020 and 8.6% for 2021;
- Restriction of the activities of enterprises due to the COVID-19 pandemic;
- Decrease in real disposable incomes of the population by 3.5% in 2020 and by 5.4% in 2021;

Table 8.1 Adaptation of X5 to changes in consumer behavior

Trends in consumer behavior	Actions of X5 retail chains
Conscious consumption and environmental friendliness	<ul style="list-style-type: none"> – Adoption of a sustainable development strategy; – Installation of recycling kiosks for collecting packaging for recycling
Search for impressions	<ul style="list-style-type: none"> – Launch of innovative stores with cafes and coworking areas; – Open kitchens in supermarkets “Perekrestok.”
Activating media channels	<ul style="list-style-type: none"> – Development of own media and content platforms for interaction with customers
Manufacturability	<ul style="list-style-type: none"> – Development of digital businesses (PerekrestokVprok, Express delivery, and 5Post); – Launch of X5.ID, combining a loyalty system and accounts in X5 digital services; – Modernization of the mobile application
Omnichannel	<ul style="list-style-type: none"> – Launch of the express delivery platform; – Expansion of the number of channels for the purchase of goods;
Increase in the share of older buyers	<ul style="list-style-type: none"> – Special discounts during low-load hours of stores; – Free delivery of goods during the COVID-19 pandemic; – Preservation of the traditional assortment of available goods
Striving for convenience	<ul style="list-style-type: none"> – Expansion of the range of ready meals and semi-finished products; – Opening bakeries and coffee shops and selling fresh juice in stores; – Change of the layout and zoning of the trading floor reduction of time due to self-service cash desks; – Creation of routes for a quick snack; – Expanding the range of ready-to-cook meals
Striving for security	<ul style="list-style-type: none"> – Implementation of a set of measures in the pandemic period; – Launch of contactless delivery; – Opening of stores with full automation of the shopping system
Focus on a healthy lifestyle	<ul style="list-style-type: none"> – Expansion of the range of products for healthy nutrition and own-brand products; – Creation of zones with healthy lifestyle products; – Special emphasis on the freshness of products

Source Compiled by the authors

- Negative dynamics of grocery retail turnover: + 7.1% in 2019, + 1.8% in 2020, and -0.2% in 2021 in nominal terms;
- Unemployment growth from 4.6% in 2020 to 5.8% in 2021 (Santalova et al., 2015).

Over the past years, the legislative framework in the circulation field has changed significantly, which, in turn, has affected the activities of retail chains and organizations (Table 8.2) (viaFuture, n.d.).

The global key trend is the transformation of the technological order, moving away from the consumption model toward a certain digital model in which the role of an intermediary providing services or selling goods is losing its relevance.

Another trend is the impact of the COVID-19 pandemic, which accelerated all market processes tenfold and led to a total transition to online (Santalova et al., 2019).

These trends lead to scaling and mass application of technologies, even those that have long been known to the market, such as artificial intelligence, biometrics, and augmented reality. Solutions based on them have become part of everyday life for businesses and ordinary people. This, in turn, forces us to develop these technologies and centralize and automate their application (Santalova et al., 2020a). These processes completely change the interaction of businesses with consumers and the internal processes of the company.

The trade industry is changing dynamically under the influence of advanced technologies (Santalova, 2017); the pace of these changes has increased dramatically against the background of the COVID-19 pandemic. Leading retail chains are actively launching digital business transformation programs, creating big data processing centers, and implementing big data analytics on pricing processes, assortment management, and demand forecasting. Leading retail chains are also commissioning self-service cash registers, self-scanning systems for goods and the scan@go system, VR training systems, WMS systems in wholesale and warehouse processes, mobile express delivery application, logistics platform for the e-commerce market 5Post, etc. (2020b; Santalova, 2015).

The company's digital services offer services at all stages of interaction with the customer: from planning meals to the actual purchase in the store or over the Internet. X5 Group is an industry leader in digital transformation: End-to-end digitization of processes has been carried out, mobile application interfaces are recognized as the best among competitors, and advanced data processing methods based on artificial intelligence are used in the main commercial decision-making processes. The main elements of digital transformation are as follows:

- Assortment, prices, and promotions;
- Digital platform;
- Supply chain;
- Providing functions;
- Digital academy for employees;
- Processes at the enterprise level (finance, transport, IT, and personnel) (Santalova et al., 2016; Retailer, 2021) (Fig. 8.2).

Table 8.2 Legal factors of the business environment and their impact on retail

Requirements of legal acts	Changes made to the legal environment	The effective date in the Russian Federation
1	2	3
Mandatory requirement: product code when selling labeled products	Order of the Federal Tax Service of the Russian Federation No. MMV-7–20-434@ of August 29, 2019 (Federal Tax Service of the Russian Federation, 2019): When selling labeled products, it is mandatory to have a product code	March 1, 2020
Tightening of criminal penalties for violation of sanitary and epidemiological norms	Federal Law No. 100-FZ of April 1, 2020 (Russian Federation, 2020d): Criminal punishment for violation of sanitary and epidemiological norms that have inadvertently caused mass illness or poisoning of people	April 1, 2020
Increase in the volume of administrative fines for violation of sanitary and epidemiological norms	Federal Law No. 99-FZ of April 1, 2020 (Russian Federation, 2020c): The volume of administrative fines during the emergency (quarantine) regime for violation of sanitary and epidemiological rules has been increased—Article 6.3 of the Administrative Code of the Russian Federation	April 1, 2020
Granting regional authorities the right to enter rules of conduct in case of emergency	Federal Law No. 98-FZ of April 1, 2020 (Russian Federation, 2020a): Regional public authorities have received the right to introduce rules of conduct mandatory during high alert and in case of emergency	April 1, 2020
A temporary ban on scheduled inspections	Decree of the Government of the Russian Federation No. 438 of April 3, 2020 (Government of the Russian Federation, 2020b): Suspension of scheduled inspections until the end of 2020, with the exception of inspections related to the risk of harm to human health or life, compliance with administrative requirements, and licensing inspections. Remote checks have been introduced instead	April 14, 2020
Rules for the remote sale of medical products	Decree of the Government of the Russian Federation No. 697 of May 16, 2020 (Government of the Russian Federation, 2020a): <ul style="list-style-type: none"> – Pharmacies included in the Register of the Ministry of Health can conduct the remote sale of over-the-counter drugs with their delivery by their own employees or a third-party organization based on a contract; – Courier services must have the equipment to maintain the necessary temperature regime to deliver thermolabile drugs 	May 18, 2020

(continued)

Table 8.2 (continued)

Requirements of legal acts	Changes made to the legal environment	The effective date in the Russian Federation
Rules for preventing the spread of coronavirus infection	Resolution of the Chief Sanitary Doctor of the Russian Federation No. 15 of May 22, 2020 (Rospotrebnadzor, 2020): Rules have been introduced for legal entities on disinfection, the use of PPE, bactericidal lamps, etc	June 7, 2020
New rules for the layout and labeling of wine products	Federal Law No. 468-FZ of December 27, 2019 (Russian Federation, 2020e): – Use of the inscription “products are not wine;” – Additional labeling; – The inscription “Wines of Russia” is on display when selling Russian wines	June 26, 2020
New rules for advertising and selling nicotine-containing products and devices for heating tobacco	Federal Law No. 303-FZ of July 31, 2020 (Russian Federation, 2020b): – Prohibition of advertising and sales promotion; – Changing terminology; – A ban on the retail sale of tobacco and cigarettes by delivery and peddling, remote means, automatic machines, etc	July 31, 2020

Source Compiled by the authors

Innovative solutions and projects provide value for consumers and shareholders of the company. The main goal is to create additional sources of profit by introducing new products, technologies, and processes to the B2B and B2C markets through their own developments and in cooperation with the startup ecosystem. In addition, X5 was the organizer of the technology alliance of retail as part of M.Video, Hoff, and Beeline.

In 2020 alone, the company included 1516 startups in its innovation funnel. In 2021, the company entered the startup ecosystems of India and Singapore.

It should be noted that the competitive environment has a significant impact on the company’s activities. Fierce competition is a negative factor. However, due to the large scale of business, high innovation, and technological activity, this trend is seriously leveled. The COVID-19 pandemic has intensified competition due to a whole range of restrictions imposed. However, it also created opportunities for those retailers who were able to quickly adapt to the new strict restrictions and the subsequent rapid development of digital technologies and online commerce. Since X5 was developing in these areas several years before the COVID-19 pandemic, it already had serious experience and technical groundwork, which made it possible to quickly scale the online service, express delivery, and new formats. Therefore, in 2020–2021, the company has dramatically moved ahead and strengthened its position as the leader of Russian grocery retail.



Fig. 8.2 Risk map “business environment factors determining risks (threats) for X5 Group.” *Source* Developed by the authors

8.4 Conclusions

Thus, the analysis of the business environment of the X5 Group allowed us to draw the following conclusions:

1. The trade industry is changing dynamically under the influence of advanced technologies. The pace of these changes has increased dramatically against the background of the COVID-19 pandemic. The demands of buyers and consumers for convenience are growing. The ways of satisfying consumer demand for food are changing.
2. Competition from online market players is getting tougher. Rapid adaptation to the increased competition in the conditions of severe pandemic restrictions, as well as the use of existing serious experience and technical groundwork, allowed X5 Group to quickly scale online service, express delivery, and new formats and dramatically break ahead in 2020–2021, strengthening its position as the leader of the Russian grocery retail.
3. Maintaining X5's leadership positions in grocery retail is based on a high level of innovation activity due to internal sources and external startups, the development of multi-format, omnichannel, and the introduction of adapted digital technologies, and the creation of its own digital platform. The company's retail chains are aimed at providing the best service to its target segment of customers, which makes it possible to cover the entire Russian grocery retail market effectively.
4. In 2019, a sustainable development strategy was created and successfully implemented and developed in all X5 Group retail chains in accordance with the principles and the UN SDGs. X5 identifies several key priorities in its sustainable development strategy—responsible consumption and use of resources, caring for employees and the community, and promoting a healthy lifestyle. The sustainable development strategy is a competitive advantage of X5, which is aware of its impact on the environment and the local population, considers the requirements of customers and the needs of society, and provides open information about its activities.

The research generally identified advanced players in the Russian food retail sector. It systematized the decisive indicators of the Russian grocery retail market, factors affecting the development of digital technologies in this area (fierce competition, rapidly changing market conditions, scale, significant opportunities for growth and consolidation for major players, pandemic, balanced growth strategy, change consumer behavior, etc.), and trends in consumer behavior. The authors systematized the main elements of digital transformation in the food retail sector. A risk map “business environment factors determining risks (threats) for X5 Group” is developed.

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Chapter 9

Development of the Tourism Industry in the Context of Digital Transformation



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Abstract The COVID-19 crisis, becoming the largest crisis for the tourism industry, determined the overall transformation of the industry inside and outside the country, ensuring the creation of new directions, ideas, and concepts. The presence of deferred demand and the need to satisfy it indicates the desire of tourists to travel, experience the unknown, and get new impressions. In the current conditions, a special role is assigned to digitalization and offering new experiences to customers. It is advisable to consider the reorientation of tourists in the direction of tourist flows as an incentive for sectoral development. Digital technologies play a special role in the system of formation of consumer loyalty. The tourism ecosystem should combine a set of digital solutions to promote domestic tourism products by means of tourist marketplaces, multilingual services, augmented reality, big data, artificial intelligence, chatbots, super-applications, and other advanced services.

Keywords Tourism · Tourist flows · Pandemic · Digital technologies · Tourism ecosystem · Tourist marketplaces

JEL Classification L10 · L83

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9.1 Introduction

As an economic system, the tourism industry accumulates information about the number of visitors per season, average spending per day, and average duration of stay. This is a basis for the formation of development forecasts, which have become of utmost importance in recent years due to the unstable situation of the industry and the maximum damage caused by the spread of COVID-19. Suspension of current tours and cancelation or deferral of bookings led to considerable losses for tour operators, travel agents, carriers, and other players in the tourist services market. Loss of income from international tourism totaled \$1.3 trillion. The year of 2020 became the worst year in the history of tourism. In 2021, international arrivals remained below the pre-pandemic 2019 (according to preliminary estimates by 72%). The data collected by the UN World Tourism Organization confirm the state of international tourism at the level of more than 30 years ago (UNWTO, 2021).

The problems of tourism development in the context of digital transformation are being actively studied by foreign and Russian researchers (Bogomazova & Stenyushkina, 2018; Klimova et al., 2020; Pesce et al., 2019; Voronkova, 2019; Yang et al., 2020). This research focuses on the need to implement measures for the development of domestic and inbound tourism in the Russian Federation by creating conditions for the formation of a tourism ecosystem that will combine the services, ensuring the promotion of a tourist product, increasing the attractiveness and efficiency of the use of destination resources.

9.2 Materials and Method

The research aims to assess the prospects for the development of the tourism industry and the impact of digital transformation processes on the industry.

To achieve the research goal, the authors studied the materials of Russian and foreign authors on digitalization in tourism and the experience of using digital services in tourism. The primary source was the statistical data of the Federal Agency for Tourism, results of studies by Yandex, Center for Information Communications “Rating,” and expert opinions, as well as industry analytical reviews presented in open sources. The research uses the conceptual provisions of the system approach and methods of logical analysis, which make it possible to formulate the main mechanisms of functioning of the digital tourist ecosystem.

9.3 Results

Tourism statistics generally reflect a reduction in the number of companies included in the Unified Federal Register of Tour Operators in 2014–2020 operating in the territory of Russia (Table 9.1) (Federal Agency for Tourism, 2021). Thus, during the period presented, the total number of companies reduced from 4593 to 4298 to the level of 2014–2015.

Expansion of the tourism geography and the popularity of international trips have determined the growth of tour operators in 2016–2019 operating in the international inbound and outbound tourism market. However, the closure of the borders led to a collapse in their operation and a reduction from 3130 in 2019 to 2436 in 2020. The work of tour operators, operating in the domestic tourism market, is usually represented by small and medium-sized businesses that have suffered less losses due to government support programs (from 1259 to 1243). As for organizations dealing exclusively with international inbound tourism, it is necessary to note the disappointing fact of a decrease in their number from 224 companies in 2019 to 192 firms in 2020.

The directions of tourist flows characterize the predominance in the pre-pandemic period of demand for tours in the field of outbound tourism. Since 2020, a transformation toward the growth of domestic tourism has been observed (Fig. 9.1) (JSC “Delovoy Profile,” 2021).

A review of the structure of tourists by destinations confirms a substantial drop in foreign trips by 77.5%, while in Russia’s territory—by 39%.

As far as directions of domestic tourism development are concerned, the absolute leadership in tourist visits belongs to the Krasnodar Territory, the Moscow Region, Moscow, the Republic of Crimea, and Saint-Petersburg, which is confirmed by the National Tourism Rating (Center for Information Communications “Rating,” 2021). Other popular tourist regions among travelers are the Golden Ring, the North

Table 9.1 Number of tour operators included in the unified federal register of tour operators in 2014–2020, units

Indicator	2014	2015	2016	2017	2018	2019	2020
The number of tour operators included in the unified federal register	4275	4202	4467	4553	4426	4613	4298
The number of tour operators working in the field of domestic tourism	2626	1616	1475	1456	1323	1259	1243
The number of tour operators working in the field of international inbound and outbound tourism	1649	899	2992	3097	2814	3130	2436
The number of tour operators working in the field of international inbound tourism	161	175	190	207	234	224	192

Source Compiled by the authors based on (Federal Agency for Tourism, 2021)

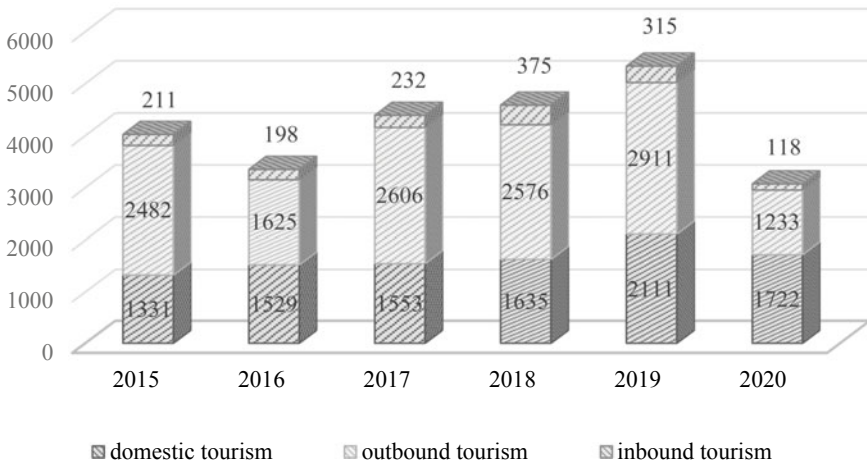


Fig. 9.1 Number of tourist packages sold to the population in 2015–2020, thousand units *Source* Compiled by the authors based on (JSC “Delovoy Profile,” 2021)

Caucasus, Altai, Baikal, the Curonian Spit, Karelia, the Khibiny Mountains, Tyumen, Tobolsk, Arkhangelsk, and Murmansk (Yandex Research, 2020).

The all-Russian *Open Your Russia* project, implemented to develop conceptual touristic routes, identified projects that had been awarded the status of a National Branded Route by the end of 2021. These projects include *From Baikal to the Ocean*; *Dagestan through the Eyes of Eagles*; *Zapovednaya Chud* (Arkhangelsk Region); *Mountain Shoria. To the Children of Taiga* (Kemerovo Region); *The Energy of Ladoga* (North-Western Federal District); *Sacred Khakassia*; *Buryatia in the Faces*; *The Energy of Baikal*; *Open the Unknown Yakutia*; *Active Tour, Genius. Formula. Legend* (Novgorod region, Saint-Petersburg); *Extraordinary Buryatia*; *Nature Calls. Fusing the Elements of Earth, Fire, Water, and Air* (the Oryol Region) (Petrov, 2022).

Simultaneously, holidays in Russia form contradictory impressions for the target audience, especially, among those who are used to spending holidays abroad: concurrently highlighting the positive aspects of a trip (a higher degree of certainty, essential ease of receiving medical care for COVID-19 infection, knowledge of the country and language, the possibility of independent travel organization) and the negative aspects (a well-known ratio of the discrepancy between price and quality, lack of novelty effect, increase in the number of tourists at popular resorts, etc.) (Yandex Research, 2020).

In general, most Russians (55%) determine the ideal duration of a tour from 8 to 14 days; for 18%, full rest is 4–7 days; 17% of travelers prefer 15–20 days; for 8% of respondents, a long rest is optimal (more than three weeks); 3% prefer short trips for 1–3 days (Ipsos, 2021).

According to the Skift Recovery Index (Welcome Times, 2021), the tourism industry in Russia is characterized by a faster recovery than in most foreign countries, which is mainly due to the promotion of domestic tourism. The IATA data (Welcome

Times, 2021) confirm Russia's leading position in the number of domestic flights after China and the USA.

The following areas should be considered fundamental trends in the near future (RBC Trends, 2020; Welcome Times, 2021):

1. The development of authentic tours due to the popularization of domestic tourism. While 2020 was characterized by a cautious and selective attitude toward domestic tourist destinations, in 2021, the popularity of authentic tours is confirmed by their mandatory presence in the list of many Russian travelers.
2. Wellness trips due to a long period of isolation and the need for restorative rehabilitation. As a rule, rest in combination with treatment has become especially relevant, which is confirmed by a 57% increase in the demand for health resorts and a decrease in the average age of the target audience.
3. Traveling by car due to the safety of travel and maintaining social distance.
4. Expansion of the glamping network provides comfortable living conditions in various accommodation options—a bell tent, safari tent, a-frame, yurts, wigwams, igloos, and teepees. Demand breeds supply: In 2020, there were no more than 60 providers of these services on the market, while in 2021, they exceeded 100.
5. The concern for the environment and reducing the effect of over-tourism. The impact of tourism can be considered from the perspective of a positive and negative impacts. The system of conscious consumption became a basic trend in 2021. Many travelers are increasingly abandoning mass destinations, preferring small towns and villages, thus ensuring the alignment of tourist flows and the local economy. The Ecological Union of Russia has approved “The Vitality Leaf” voluntary environmental standard for hotels that confirms the implementation of the quality policy and environmental protection.
6. In the system of promotion of tourist products, special attention is focused on the specifics of the youth audience in the format of the development of active recreation and children's tourism, which is related to a reorientation in the target audience segments. Active digitalization and digital technologies determine the competitiveness of the industry through the comprehensive involvement of social media (e.g., TikTok and Facebook). For example, #RUSSIATRavel flash mob on TikTok with 200 million participants brought together Russian celebrities, professional guides, and users who have posted videos of their favorite vacation spots in Russia (Marketing Tech, 2021). The challenge received such wide coverage not only during its official holding and upon the results of its completion; the most popular hashtags exceeded 150 million: #otdykhuvody—166.6 million, #zagorodom—243.9 million, #RussiaTravel—254.4 million. The “Russia from Home” chatbot (on Facebook) studies users' preferences and introduces the tourist attractions of the country in a virtual format.
7. Expanding the degree of influence of information technology and artificial intelligence—the development of an ecosystem of digital services for tourism providing comprehensive tourist services and impressions.

9.4 Discussion

The preservation and expansion of domestic and inbound tourism will be possible, provided that outbound destinations are reduced and replaced with trips inside the country, as well as through the promotion of the national tourist market and destinations. Simultaneously, as factors of state support that add to sustainable tourism development and a high degree of consumer preferences and loyalty, it is advisable to highlight the following:

- Support for SMEs (subsidizing, access to PRF, mitigation of administrative restrictions, and financial support);
- The tourist cashback program with a refund of 20% of the cost of a tourist product in Russia, when paying with a “Mir” card;
- Reimbursement of 50% of costs for organizing charter flights for tour operators to ensure the growth of domestic tourist flows;
- Implementation of projects (*development of tourist infrastructure and creation of high-quality tourist products, increasing accessibility and awareness of tourism products, and improving tourism management*), formation and development of tourist clusters, and macro territories to expand the influence of attraction “magnets” (The Big Golden Ring, Greater Urals, Big Volga, and Baikal);
- Intensification of work in the application of digital technologies (“Digital Tourism,” “Top-1000 Russia’s Local Cultural Tourist Brands”) (Marketing Tech, 2021).

According to the strategy for tourism development in Russia until 2035, in the near future, the primary role should be assigned to digital technologies. The expansion of their influence identifies the transformation processes of the entire range of services that ensure the functioning of the tourism industry in an electronic format. In the current conditions, the main task aimed at the implementation of measures for the development of domestic and inbound tourism is the creation of conditions for generating a tourism ecosystem, which will combine a set of services that promote a tourist product in the Russian Federation by increasing the attractiveness and efficiency of the use of resources of tourist destinations. It is advisable to highlight the following main mechanisms of functioning of a tourism ecosystem:

- Expansion of the tourist marketplaces network;
- Information saturation of multilingual services for tourists;
- Development and implementation of an electronic tourist card for the guest and its conversion into a mobile application;
- Organization of an electronic system for assessing the quality of tourist services;
- Formation of a rating of tourist services and facilities;
- Implementation of augmented reality projects;
- Development of open data systems, big data, and artificial intelligence in the area of tourism;
- Expansion of the range of influence of the work of real-time tourist aggregators that build routes;

- Development of multimedia applications for display objects, audio, and video guide services, with the possibility of integration with GPS navigation, using QR codes to form queries (Government of the Russian Federation, 2019).

The inevitable transition of the tourism industry to the digital space is apparent. Travelers have long been choosing tours online and paying for airline tickets in applications. The trend of recent years is associated with the introduction of VR presentations, artificial intelligence, chatbots, and other digital solutions (Baynazarov, 2020). Virtual reality technologies with the possible promotion of tourist products using the presence effect help tourist companies during the pandemic. VR and AR solutions and their involvement in the tourism sector visualize objects to choose from by a tourist, concurrently generating an attractive product by tourist organizations.

Transformational processes and the COVID-19 pandemic have strengthened the role of tourist marketplaces, which, in turn, resulted from the influence of restrictive measures, growth of online shopping, and the transfer of a part of employees to work remotely. According to Sberindex, online purchases of tickets in the business tourism sector for air flights in this segment amounted to almost 94% (Pirozhnikov, 2020). Among the tourist marketplaces presented in the domestic market, the following can be considered:

- ITOURIST—combines the functions of a tourist marketplace and a travel guide. Its structure should be noted as positive characteristics (regions, tours, excursions, guide, and blog), unfortunately, with a low degree of occupancy of sections. Only ten regions of the Russian Federation are presented in the marketplace, where only the Republic of Karelia is presented as informative as possible;
- WOWTRIP—a platform for searching and booking author's tours. The tourist's interaction is carried out directly with a travel organizer. The site presents a wide offer of tours; however, the functionality is limited only to providing secure payments;
- Russia.travel national tourist portal—an informational and educational project of the Federal Agency for Tourism dedicated to traveling in Russia;
- YouTravel.me—an aggregator of author's tours.

In the current conditions, the main competitive advantage of tourist organizations has become the availability of advanced online tools, including remote payment, availability of search engines, own mobile applications, functional Website, prompt changes to the tour and clear money cancelation and refund system, digital guides, and such services as a callback, online consultations with a virtual travel agent, and availability of widgets and accounts in messengers for a chat with employees.

The demand for digital services is provoked by the development of domestic tourism and, consequently, by the growth of independent travelers who acquire elements of a tourist product with the help of online agencies: purchase of tickets (KupiBilet), hotel reservations, development of a trip plan (Google Trips), search for transport (GetTransfer), travel insurance ("Cherepakha" online aggregator platform), and audio guides to local attractions and places for short-distance trips.

Services that allow planning trips and booking tickets determine an optimal period, subject to the cost and wishes of a tourist based on the analysis of the user's digital footprint and his or her online behavior. Artificial intelligence algorithms recommend a wide range of elements of future travel, including a comfortable time for a trip and the choice of a hotel or a room for booking.

Functioning as a digital concierge, the RUSSPASS digital service provides a quick trip collection (train or plane tickets, hotel reservations, ordering guided tours, etc.). It also narrates about the main attractions and gastronomic features of each region.

For example, one can also consider travel inspirator—an aggregator of planned trips. Its operation is based on the refusal to work independently with such services as Booking, Airbnb, and Tripadvisor. Buying city or country guides with a trip itinerary for a certain number of days, a selection of hotels, and interactive maps with places of interest, cafes, and stores provide tourists with practical information.

The involvement of voice assistants (Apple, Amazon, Google, and Yandex) is carried out in all spheres of human life: from buying groceries and medicines to financial advice. Surveys of respondents confirm the willingness of consumers to delegate everyday tasks to electronic assistants. According to OAG (Baynazarov, 2020), 25% of travelers in the USA plan to entrust ordering and purchasing air tickets to voice assistants. The mass introduction of such services confirms the fact that a number of foreign airlines offer the operation of services through voice assistants in the service process, including registration, providing flight information, booking of accommodation facilities, and rental of transport at the destination.

The involvement of large companies with their developments in providing comfort for travelers is expressed in offering special functionality and software products to the market. For example, the voice assistant from Amazon is presented by function Alexa for Hospitality, and its operation should be ensured by Amazon Echo that allows ordering food to a hotel room, cleaning, taxi booking, TV control, and lighting and curtains control. The result of the Google and KLM joint development is designed to help with getting ready for a trip: by activating voice assistance with the phrase “OK Google, Let me talk to KLM,” and by naming the country, a user receives information about the destination (Baynazarov, 2020).

Distribution of virtual interlocutors in a 24/7 format led to cost optimization when working with clients and improved user experience, as well as promotion of tourist products. For example, the Mindsay chatbot provides automation of 80% of user requests in 110 languages, as well as integration with business platforms, which is convenient when automating orders and bookings.

In the promotion of tourist products, a special role is assigned to virtual reality technologies. The following projects can be provided as domestic examples and developments of the use of digital tools:

- StavTravel—an online map and mobile application for iOS and Android-based devices with the attractions of the Stavropol Territory;
- “Altai Today” mobile guide—an application with information about the region and its places of interest and attractions, with the possibility of booking rooms, ordering, and renting vehicles;

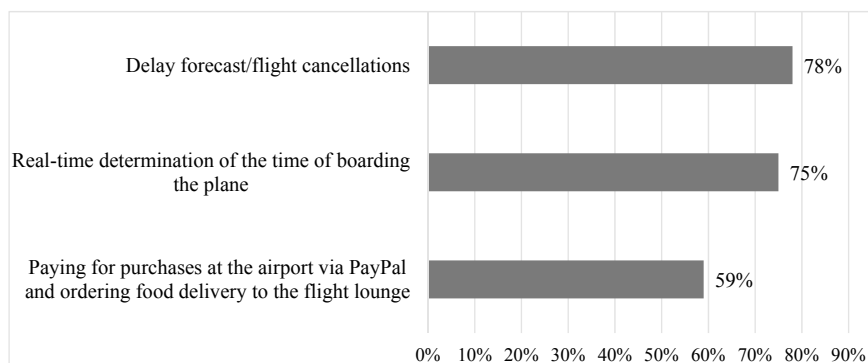


Fig. 9.2 Consumers' expectations from filling super-applications. *Source* Compiled by the authors based on (Baynazarov, 2020)

- A mobile application about Dagestan operating in online and offline modes that contains information about the infrastructure, where the work of an audio guide is combined with geolocation.

A significant disadvantage of the applications presented on the market is performing a limited number of functions and lack of their collaboration. The development of travel super-applications reflects the requirements of current times, combining online services that are in demand by tourists.

The data of a survey by OAG reflect the following consumers' expectations from super-applications:

- The availability of a service that makes delay forecast or flight cancellations—78%;
- Real-time determination of the time of boarding the plane—75%;
- Paying for purchases at the airport via PayPal and ordering food delivery to the flight lounge—59% (Fig. 9.2).

In future, we can say with a high degree of confidence about the expansion of the capabilities of super-applications and global metasearch engines with a complex of personifying services. A striking example of a super-application presented at the domestic tourism market is MegaFon Travel, which accumulates the selection and booking of bus, train, and air tickets, accommodation facilities, tour purchases, insurance, transfer, and excursion services based on aggregators—Aviasales, Ostrovok.ru, Booking.com, Agoda, and Onlinetours.

9.5 Conclusion

Creating conditions for the formation of a digital tourism ecosystem that will combine a set of services ensuring the promotion of tourist products, their attractiveness, and effective use of destination resources becomes the main task in developing domestic

and inbound tourism. Transition to the digital space is apparent. The development of digital solutions will be characteristic of the entire tourism industry in the near future. Strengthening the processes of digitalization of companies becomes a prerequisite for business success, including based on the personalization of offers, development of online payments, integration of diverse travel content on single platforms by introducing innovations in communication with customers, development of IoT, the introduction of big data technologies, artificial intelligence, etc.

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Chapter 10

Theoretical Foundations of Organizing and Preparing Schoolchildren for Mathematical Olympiads



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Abstract The paper aims to study the problem of improving the organization and training of schoolchildren for olympiads in the conditions of the competence approach. The authors perform a theoretical analysis of scientific psychological, pedagogical, and methodological literature on the problem of preparing schoolchildren for contests and the formation of their competencies in teaching school subjects. The authors analyze the subject content of mathematical olympiads and use empirical methods to summarize the methodological and international experience in organizing subject olympiads for schoolchildren at educational institutions. The study of the state of preparation of schoolchildren for the olympiads revealed the need to update the studied process. On the basis of 9 criteria, the authors designed a system of training schoolchildren for competitions, including diagnosis, training, activation, selection, and adaptation of gifted students. There are five types of competency tests in school education: creative works, conferences of the scientific society of learners, olympiads, tasks of the National Admission Test (NAT), and Final State Attestation (FSA) of level C. Consequently, the goals of olympiads are related to the formation of competencies in schoolchildren. The research novelty lies in the fact that it studies the history of formation, development, and functioning of the Olympic movement in Kyrgyzstan in 1963–2021 and summarizes the domestic and foreign experience of training schoolchildren for the olympiads. Moreover, the research identifies the factors contributing to the renewal of the school education system, contributing to

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the application of the competence approach in training for the subject olympiads. The author's system of training schoolchildren for the olympiads was developed.

Keywords Olympiad · Schoolchildren · Mathematics · Kyrgyzstan · Training system · Competence

JEL Classification I2 · I21 · I28

10.1 Introduction

The renewal of school mathematics education is associated with the introduction of the competency-based approach to learning. The educational standards for vocational and school education (Government of the Kyrgyz Republic, 2014; Ministry of Education & Science of the Kyrgyz Republic, 2013) and the Subject Standards (Ministry of Education & Science of the Kyrgyz Republic, 2015, 2018) emphasize the need to form and develop the competencies of Kyrgyz schoolchildren as the main criterion for the effectiveness of the education system. A positive side effect arising from preparation for olympiads is that it can replace the additional preparation of graduates for competitive tests, such as the National Admission Test (NAT) and the Final State Attestation (FSA). The relevance of the research topic is due to the goals of sustainable development of the Kyrgyz Republic and the tasks set before the general and vocational schools in terms of creating conditions for the development of specially gifted learners (Kyrgyz Republic, 2003), as well as the need to fulfill social order: diagnosis and education of gifted children, ensuring equal access to all levels of education depending on the abilities and needs of the learner, and support for talented youth at all levels of the education system (National Statistical Committee of the Kyrgyz Republic, 2018). The paper aims to investigate the problem of improving the organization and preparation of schoolchildren for olympiads in the conditions of the competence approach. The following tasks are set to achieve the research goal:

- To summarize the domestic and foreign experience in the preparation and organization of subject olympiads for schoolchildren;
- To justify the need to improve the preparation of schoolchildren for olympiads in the context of the competence approach;
- To design an effective system for preparing schoolchildren for olympiads.

10.2 Materials and Methods

During the research, the authors conducted a theoretical analysis of scientific psychological and pedagogical and methodological literature devoted to the problem of preparing schoolchildren for olympiads and the formation of their competencies in the process of teaching school subjects. The authors also analyzed the subject content

of the mathematical Olympiads. During the research, the authors used empirical methods of generalization of domestic and international methodological experience of organization and conduct of subject olympiads. Mathematical olympiads play a significant role in the intellectual development of schoolchildren, laying the basic knowledge necessary for the study of school subjects of the natural and mathematical cycle. The basics of the methodology of teaching problem-solving in the system of mathematical education were investigated by Aksenov (2007), Bekboev (1994), Papishev (2007), and others. Evnin (2018) studied the tasks of olympiads as a means of developing learners' abilities.

Golovachyova et al. (2019), Lazarev (2017), and Szetela and Nicol (1992) noted the need to improve the procedure for evaluating knowledge during olympiads. Various research is devoted to the problem of organizing and preparing schoolchildren for the subject olympiads:

- Mathematical olympiads (Alekseeva, 2002; Baisheva et al., 2017);
- Chemistry olympiads (Belan, 2009);
- Drawing olympiads (Daramaeva et al., 2008);
- Physics olympiads (Kiryakov, 2002; Podlesnyi, 2001);
- Computer science olympiads (Maltsev, 2006), etc.

The formation of competencies of schoolchildren during preparation for olympiads is discussed by Bakhir and Ilyinsky (2014), Lubinskaya (2010), et al. Psychological and pedagogical conditions of the organization of education of gifted children through olympiads were studied by Korsunova (2003) and Sharapkov (2003), and others. Particular attention is paid to the problem of developing the thinking of schoolchildren (Kasumova, 2008; Tetina, 2019). The specifics of the participation of schoolchildren in distant and heuristic forms of olympiads are discussed in the works of Andrianova (2014) and Skripkina (2012). Dissertations by Vyshnepolsky (2005), Shamaylo (2009), and others are devoted to preparing university students for mathematical olympiads.

10.3 Results and Discussion

The olympiad movement in the Kyrgyz Republic began with the mathematical specialization of schools in 1966, contributing to the opening of specialized classes with a mathematical bias. The first national olympiad in the Kyrgyz Republic was held in 1967 in mathematics, physics, and Russian. Subsequently, the XXI All-Union Olympiad in Mathematics for students of schools of the USSR was held in the capital of the Kyrgyz Republic (Keldibekova & Baisalov, 2019a). Innovations are currently introduced in the organization of olympiads: The qualifying round of the city olympiad in an offline format, broadcast of the final stage of the olympiad online, and video registration of participants; since 2018, the organization "Center for evaluation in education and teaching methods" is involved in conducting the Olympiad and developing the content of the olympiad assignments (Keldibekova & Baisalov,

2019a). A significant contribution to the development of the olympiad movement has been made by universities, public organizations, and foundations. As a result, there are now seventeen varieties of national olympiads: National Correspondence Mathematical Olympiad “Young Pythagoreans in the world of technology,” the Olympiad for sixth-graders “AKMO,” Bilimkana, the Alternative Olympiad in Mathematics, Physics, Biology, Chemistry, and Informatics, and other Olympiads. Keldibekova (2021a) noted the positive impact of preparation for olympiads on the results of schoolchildren in the National Admission Test, the content of which is built given the possibility of assessing the level of subject competence.

The study of the experience of organizing the Republican Olympiad of schoolchildren in Kyrgyzstan, a partial description of which was given by Keldibekova and Baisalov (2019b), the activities of supplementary education organizations of the Republican correspondence mathematical school, the Republican Children’s Engineering Academy “Altyn tyyn,” and the results of various international olympiads on subjects of the natural and mathematical cycle, in which Kyrgyz schoolchildren participated, allow us to state that preparation for olympiads is traditionally carried out through forms of additional education. The forms of additional education include learning and development centers, Bilim and Sapat high schools, correspondence schools with a mathematical bias, and physics and mathematics camps (Keldibekova & Baisalov, 2019a). We have seen that the activities deployed in the olympiad movement by the subjects of the olympiad (i.e., subject teachers, managers in education, universities, and public foundations) are aimed at forming and strengthening the positive motivation of learners to participate in an Olympiad. The study of international experience in preparing schoolchildren for olympiads in countries near and far abroad demonstrates the development of the world olympiad movement, promoting the appearance of international mathematical olympiads with a variety of rules for participation in them: IMO, Junior Balkan mathematical olympiad, China Western Mathematical Olympiad, Tuymaada Olympiad, remote Asia–Pacific Mathematical Olympiad, the Silk Road Olympics, and other forms of competitions (Keldibekova & Kasymbaev, 2016). Russian schoolchildren participated in more than 160 kinds of olympiads in mathematics of national and international importance; schoolchildren from Kazakhstan participated in more than 20 kinds of olympiads. The emergence of directed geometric distance olympiads is explained by the desire of the international community to stop the facilitation of mathematics education.

Researchers group the 22 functions of subject olympiads into several groups: “organizational, controlling, humanistic, representative, motivational, creative, stimulating, and adaptive” (Podlesnyi, 2001; Vyshnepolsky, 2005). The authors consider “the formation of psychological readiness to solve non-standard tasks” to be the main goal of the olympiad preparation activities (Agahanov, 2018). In examining the problem, we identified four areas of additional education, which implement school education by deepening classroom knowledge. The elective form of differentiation of education is recognized as more effective than the selective form.

Researchers closely link the formation of mathematical competence in schoolchildren with logical thinking (Ekimova, 2002; Friedman & Turetsky, 2005), creative thinking (Kapitsa, 1981; Maslow, 1999); mathematical thinking (Krutetsky, 1998;

Smagulov, 2009); spatial thinking (Podhodova, 2002), etc. Kolmogorov (2001) emphasizes the need to develop students' geometric ideas in research papers. The research identified the signs and characteristics of mathematical, logical, spatial, and creative thinking, necessary for participation in mathematical olympiads. Thus, the stages of development and formation of spatial representations, three types of operation with spatial images, and five basic substructures (topological, ordinal, metric, algebraic, and projective) are identified in the development of spatial thinking of the olympiad participants (Kaplunovich, 1986). The relevance of the research problem is emphasized by the need to harmonize the conceptual apparatus of the competency-based approach to learning, the main goal of which is to form a motivated personality of a schoolchild, ready to realize the intellectual potential in a stressful environment of olympiads. Abrantes (2001), Aronov and Znamenskaya (2010), and Hutmacher (1997) take the position that competence consists of a set of competencies. In the context of the research problem, we will assume that competence is an integrative characteristic showing the formed readiness of a schoolchild to solve the educational tasks related to a particular subject. In turn, competence is the ability to apply the mastered subject knowledge, skills, experience, and personal qualities necessary to solve problems of the olympiad and participate in it.

In school education, there are types of competency tests: creative works, conferences of the scientific society of learners, olympiads, tasks of the National Admission Test (NAT), and Final State Attestation (FSA). We consider that "the sets of NAT and FSA, in addition to the program tasks testing one particular competence, contain C-level tasks from olympiads, requiring a comprehensive approach in solving, which allows us to draw conclusions about the application of a fundamentally different approach to assessing the level of mathematical competence of school graduates" (Keldibekova, 2021a).

To determine the possibility of preparing schoolchildren for the olympiads in the classroom, we studied the content of 18 mathematics textbooks for grades 5–9 of the schools, recommended by the Ministry of Education and Science of the Kyrgyz Republic, as well as alternative textbooks. The analysis revealed that 91% of the content of mathematics, algebra, and geometry textbooks contains some portion of higher difficulty tasks, including non-standard ones; 7% of all tasks have an entertaining focus. Textbooks for grades 5–7 contain more material to prepare for math olympiads than textbooks for high school students. We have seen that the concepts and terms included in the sections of mathematics and used in the content of the olympiads, as well as information from related academic subjects, broaden students' horizons. We revealed a variety of topics, forms, ways of solving, and educational functions of tasks of increased difficulty in special sections of school algebra textbooks. The tasks, the solution of which contributes to the consolidation of knowledge, skills, and abilities acquired by students when studying the topic, are highlighted. Non-standard tasks, which occupy a significant place in the textbooks, cause the greatest difficulty for schoolchildren.

The analysis of the content of three textbooks for extracurricular work in mathematics showed the presence of non-standard modeling tasks for the development of thinking in schoolchildren. These tasks are used in the school stage of the olympiads.

Most researchers take the approach that competence consists of a set of competencies. Dalinger and Tolpekina (2004) and Ogure et al. (2014) determine the stages and forms of the lesson and extracurricular organization of research activities, as well as the content of universal learning and logical actions for mastering learning, cognitive, and research competencies. The authors offer recommendations on the organization of educational and research work of the participants in olympiads.

In addition to “core competencies common to all subject areas, researchers distinguish subject competencies necessary for action in a subject area. By subject, in this case, mathematical competence, we will understand the ability to structure data, isolate mathematical relations, create, analyze, and transform a mathematical model of the situation, and interpret the results” (Keldibekova, 2021a). Let us note the integral characteristic of mathematical competence of the participants of the olympiads, the components of which are “mathematical knowledge, skills, skills of mathematical modeling, scientific communication, psychological readiness, and experience of participation in olympiads” (Keldibekova, 2021a). The development of mathematical competence occurs through mastering school subjects: arithmetic, algebra, geometry, and the beginnings of analysis. The formulation of computational, analytic-functional, statistical-probabilistic, and visual-imaginative competencies, the formation of which occurs through the sections of mathematics, are based on “the requirements of the international assessment of the quality of the subject of mathematics, reflecting the degree of mastery of the laws of mathematics, knowledge, and skills of mathematical thinking” (Keldibekova, 2021b).

In view of the above, we propose a draft system for preparing schoolchildren for olympiads, including diagnosis of the giftedness of schoolchildren, training in olympiad knowledge, activation of the olympiad activity, and the selection of participants and their adaptation to the olympiad environment (Fig. 10.1).

The authors determined the following criteria for the effectiveness of the projected system of preparation of students for olympiads:

- Interaction of competence-based, meta-disciplinary, activity-based, and person-centered approaches in the learning process;
- The use of STEM, ICT, and critical thinking technologies in training;
- Formation of types of thinking and educational-cognitive, informational, and research competencies necessary for success in the olympiads;
- Teaching known and new methods of solving olympiad problems;
- The method of solving each problem independently;
- Forms of training—special course, circle work, or Olympic reserve school (Keldibekova, 2016);
- Learning tool—collections and electronic databases of olympiad tasks;
- Training of teacher—coaches in the theory and practice of olympiad tasks solving, the basics of organizing olympiads, and educational technology.

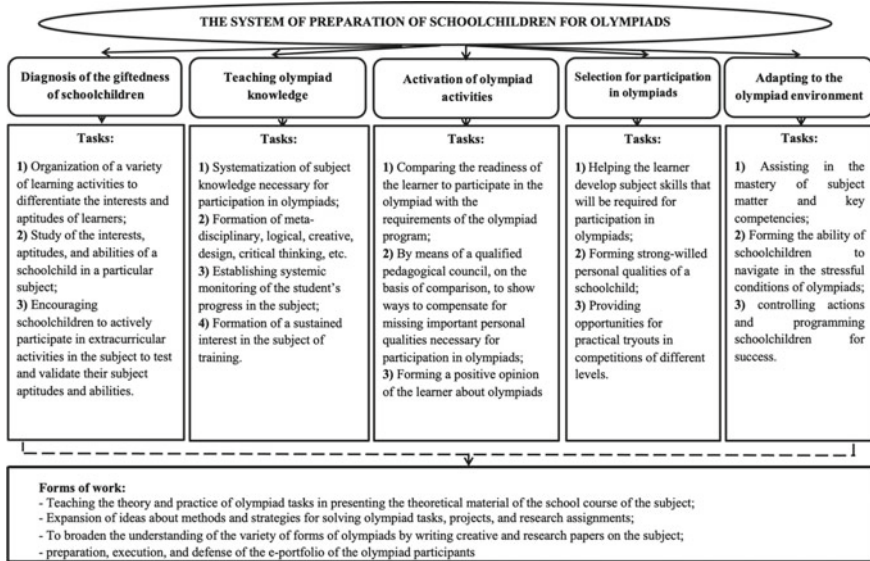


Fig. 10.1 Components of the system to prepare schoolchildren for the subject Olympiads. *Source* Compiled by Aida O. Keldibekova

10.4 Conclusion

- I. A significant part of the dissertation works deals with aspects of the organization, content, and provision of olympiads for schoolchildren. Most of them address the problem of the organization of school subject olympiads (goals and functions) and training in preparation for them. Simultaneously, the issues of developing teaching materials for preparation for olympiads are studied.
- II. The analysis of the state of preparation of schoolchildren for olympiads showed the need to update the studied process:
 - When schoolchildren are not systemically prepared for olympiads, it is necessary to use the potential of additional education;
 - It is necessary to provide teachers of mathematics and physics with a unified training program for olympiads, as well as methods, information materials, and task bases required for proper activities during olympiads;
 - It is necessary to use the potential of the disciplines of the educational program Physics and Mathematics Education, the departments “Technology of Teaching Mathematics, Informatics, and Physics,” and the disciplines of specialization in the targeted preparation of university students for the organization of olympiads (Keldibekova, 2021b).
- III. The result of educational reforms in accordance with the Sustainable Development Goals is to update the content, teaching material, methods, and approaches to teaching mathematics to form a clear system of mathematical

knowledge, functional competencies of the future, the intellectual development of the student at all levels of school mathematics education. Conducting olympiads at the international level makes it possible to perform a comparative substantive analysis of mathematics education in the countries participating in them, as well as formulate national requirements for the results of learning the subject “Mathematics,” adjusting the activity of specialized schools and the organization of mathematical olympiads (Keldibekova, 2021b).

- IV. In pedagogy, the following areas of additional education are identified: socio-pedagogical, natural science, art, technology, tourism, local history, and physical education and sports. Children with an aptitude for science are selected to study in lyceum schools and gymnasium schools or supplement subject knowledge in non-typical institutions as additional education (Baisalov & Keldibekova, 2019). A distinction is made between “selective and elective forms of differentiation of learning, types of differentiation of mathematically gifted children” (Keldibekova, 2021b). To develop the thinking of mathematically gifted children, teachers use fun, non-standard, and modeling tasks.
- V. The key indicator of the quality of training of the olympiad participants is their subject competence, which is consistent with the olympiad’s objectives. The environment of the subject olympiads creates the most favorable conditions for the formation of intellectual independence and the acquisition of experience of achieving the goal. Moreover, olympiads form and develop the subject, learning and cognitive, research, information, and other competencies of schoolchildren, making it possible to implement a competency-based approach to learning.
- VI. The distinctive feature of a computer-based learning environment is the creation of favorable prerequisites for the formation and development of the competencies of the student listed in the previous paragraph, which is a crucial condition for its use in conducting mathematical olympiads. Based on the above, we consider the information and methodological and general technical areas as the main in preparation for distance and correspondence olympiads on subjects of a natural and mathematical cycle (Keldibekova & Omaraliev, 2018).
- VII. The factors that improve the quality of students’ preparation for the mathematical olympiads are the formation of types of thinking necessary for successful participation in the olympiads; mathematical, educational-cognitive, research, and information competence to improve mathematical and general intellectual preparation of students; learning to find an independent solution to the problem of the olympiad through known and new methods.

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Chapter 11

New Needs for the Infrastructure of Entrepreneurship in the Digital Economy Markets and the Prospects for Its Provision



Dmitriy N. Pantelev

Abstract This paper elaborates on the characteristics, problems, and prospects for digital infrastructural provision of entrepreneurship in the countries of Southern Europe. Features and similarities of digital infrastructure formation of the studied region's enterprises are considered. The modern needs for overcoming various problem aspects of digitalisation, which will allow ensuring economic and competitive growth in the long term, are substantiated. A tendency, which is traditional for many regions, is revealed: an insufficient level of digitalisation of enterprises of small and medium businesses and micro-companies. The focus of large entrepreneurship on the implementation of innovative information and communication technologies is shown. The methods used in this research include the index method and method of comparison and trend method. The novel approach of this research consists in the expansion of the economic and geographical characteristics and prospects for the formation of digital support for the entrepreneurial sector of the countries of Southern Europe.

Keywords Digital infrastructure · Coworking · Digitalisation · E-Government · Online communication · Digital economy · Entrepreneurship

JEL Classifications K24 · L21 · L84 · L85 · L86

11.1 Introduction

When working on the improvement of their competitive positions and implementation of economic programmes to support a certain level of profitability, companies face a range of challenges. Dealing with these challenges allows reaching success.

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An important role in the sphere of ensuring the planned prospects for the functioning of entrepreneurial activities lies in the implementation of digital economy tools. Constant transformations and the emergence of new types of ICT allow technology-oriented enterprises and countries to have leading positions in the world market, facilitating the increase in the quality and assortment of exported products. Subjects of the business environment that do not have the corresponding vision, goals, and opportunities for digitalisation cannot successfully compete with other market participants, because they do not have a corresponding level of digital support. Accordingly, companies with a low level of digital technologies implementation form a low-tech image of countries.

The focus on the opportunities provided by the digital economy opens new prospects for the entrepreneurial sector and influences the creation of innovative types of products (services) and the formation of competitiveness indicators. Thus, the problems of implementing ICT in the activities of enterprises of various sectors are very relevant and have to be studied.

The goal of this research is to describe the characteristics of the modern state, needs, and prospects of the infrastructure of the entrepreneurial sector for digital support tools. To achieve this goal, the features for the formation of entrepreneurial infrastructure in the selected countries are studied, and the problematic aspects and prospects for digitalisation in the entrepreneurial activities of the countries are considered.

11.2 Materials and Method

The issue of implementing digital tools in entrepreneurial activity was studied by many scholars. A lot of works either dwell on theoretical issues or analyse empirical aspects in this sphere. It is worth noting such works as (Battisti, 2020; Bianchini & Kwon, 2020; Mitoula et al., 2020; Morgado et al., 2020; Pereira et al., 2022; Perrone, 2020; Rapaccini et al., 2020; Serrasqueiro et al., 2021). Despite a serious number of works on the studied problems, there is a need for further research to determine the needs and perspectives in the sphere of digitalisation of the business environment.

The methodology used in this research is as follows: estimates of the formation of digital support for enterprises in the countries of Southern Europe were studied with the use of the index method, with identification of the factual state of the analysed indicators. The method of comparison was used to compare the estimated data on the formation of the given indicators. The statistical method was used to collect statistical data on the designated indicators. The forecast and trend methods were used as well.

Assessment variables that are used in this work are categorised in the following manner:

- (1) Index of infrastructure of information and communication technologies (Internet access, access to other ICT tools (a1), level of implementation of various digital solutions for doing business (a2), level of provision of e-government services

- (a3), state of online communication (including the focus on e-commerce) (a4)), presented at the level of countries (Wipo, 2022), was assessed with the help of the indicator ICTIn;
- (2) Index of infrastructure of general conditions of coworking and creation of the sphere of office real estate was identified with the help of the indicator IG (Wipo, 2022).

11.3 Results

Infrastructural indicators of the entrepreneurial sphere of the countries of Southern Europe were studied for further determination of the needs and prospects of future digitalisation in the region.

In January–October 2022, Italy was ranked 9th in the world by the level of GDP, which is USD 2272 billion (Globalpeoservices, 2022). Over 2018–2022, Italy's GDP changed (increased and decreased), which was caused by internal and external factors. It should be noted that technological and general infrastructure is a factor that allows opposing risks that emerge in the modern conditions of global international interaction.

The state of the mentioned types of infrastructural support (Table 11.1) changed over the studied period in the following way:

- (1) The index of infrastructure that is connected with office rentals and coworking in (IG) demonstrated an improvement, caused by the government's activities at various levels and the efforts of developers;
- (2) Infrastructure of ICT, which is assessed with the help of the indicator ICTIn and its components, demonstrates technological capabilities and potential of functioning under the conditions of negative factors. Italy's position by ICTIn changed from 24th to 42nd. The indicator of access to digital economy tools (a1) started reducing in 2019. According to Rapaccini et al. (2020), this was due to the change or aggravation of business models, including in Internet coverage in regions. The pandemic led to the destruction or changes in many logistical connections (maintenance of digital infrastructure, work of outsourced personnel, deterioration of work of storage facilities that function within partnership agreements).

There was also a significant decrease in the digitalisation of sectors in some activities of SMEs and micro-companies with a stable level of ICT implementation by large enterprises. This so-called digital divide appeared due to the absence of possibilities for investments in the growth of intellectual capital and due to the problems of Internet coverage in southern regions of the country (Bianchini & Kwon, 2020). The significant growth of the digital divide affects the level of productivity and economic effectiveness of the industry's activities. A gradual decrease in the digitalisation of the entrepreneurial sector (index a2), from 38th position in 2018 to 46th position in 2022 (Wipo, 2022), led to a decrease in the ranking of economic effectiveness

Table 11.1 Analysis of the infrastructural support for the entrepreneurial sector in the selected countries of Southern Europe in 2018–October 2022

No.	Indicator/country of the region	Values, rank					Dynamics of changes, ±						
		2018	2019	2020	2021	January–October 2022	2018–2019	2019–2020	2020–2021	2021–October 2022			
I	Italy												
1	ICTIn, including	24	24	25	38	42	0	1	13	4			
1.1	a1	42	48	49	44	60	6	1	-5	16			
1.2	a2	38	44	40	44	46	6	-4	4	2			
1.3	a3	17	9	9	36	36	-8	0	27	0			
1.4	a4	8	15	15	41	41	7	0	26	0			
2	IG	55	55	48	51	36	0	-7	3	-15			
II	Spain												
1	ICTIn, including	14	17	16	19	23	3	-1	3	4			
1.1	a1	26	25	23	19	34	-1	-2	-4	15			
1.2	a2	26	23	21	17	22	-3	-2	-4	5			
1.3	a3	11	16	16	17	17	5	0	1	0			
1.4	a4	7	5	5	36	36	-2	0	31	0			
2	IG	45	36	32	34	27	-9	-4	2	-7			
III	Portugal												
1	ICTIn, including	38	25	24	27	36	-13	-1	3	9			
1.1	a1	28	28	18	18	40	0	-10	0	22			
1.2	a2	45	40	41	37	47	-5	1	-4	10			
1.3	a3	33	17	17	35	35	-16	0	18	0			
1.4	a4	49	30	30	41	41	-19	0	11	0			

(continued)

Table 11.1 (continued)

No.	Indicator/country of the region	Values, rank				Dynamics of changes, ±					
		2018	2019	2020	2021	January–October 2022	2018–2019	2019–2020	2020–2021	2021–October 2022	
2	IG	72	60	45	44	37	-12	-15	-1	-7	
IV	Greece										
1	ICTIn, including	52	35	32	43	51	-17	-3	11	8	
1.1	a1	34	30	26	21	52	-4	-4	-5	31	
1.2	a2	48	50	36	35	42	2	-14	-1	7	
1.3	a3	71	41	41	65	65	-30	0	24	0	
1.4	a4	63	34	34	50	50	-29	0	16	0	
2	IG	107	100	87	94	63	-7	-13	7	-31	

Source Prepared by the authors based on Wipo (2022)

(profitability). The fact that the previous economic indicators were more stable is explained by the fact that the existing level of ICT implementation was sufficient for Italian enterprises, and then, the needs changed due to market effects.

A negative feature that led to the decrease in digital infrastructure was the reduction of the level of e-government services, including in the sphere of services provided to the entrepreneurial sector (index a3). This fact was caused by the growth of the need for online public services, for which the government was not ready (Battisti, 2020).

Another aspect of the deterioration of Italy's digital infrastructure was the reduction of the level of online communication (index a4). This indicator decreased from 8th position in 2018 to 41st position in 2022. It might seem that such changes are not logical since consumers of products (services) that are produced by the entrepreneurial sphere in 2018 had skills and abilities for online communication, whilst this potential decreased substantially. This is particularly strange because the years 2020–2021 saw strict limitations and a focus on online purchases. The same is true for communications at the entrepreneurial level, which is also assessed with the help of the index a4. There is an explanation to the described dynamics. Online interaction in each year was assessed at the level of offers of products (services) that were sold (provided) remotely. According to Perrone (2020), high-quality online interaction at the level of consumers and the entrepreneurial sector complicated due to the fact that about 50% of the Italian population does not have basic digital knowledge; three persons out of ten do not use the Internet on the constant basis; 1/3 of households (especially in southern regions of Italy, where living standards are lower compared to other regions) do not have ICT means (laptops, tablets, etc.).

Analysis of the materials on infrastructural support of the entrepreneurial sector in Spain (Table 11.1) showed that problems and tendencies are similar to Italian problems and tendencies. The following aspects of the formation of the main infrastructural components of the country could be noted:

- (1) The value of the index of infrastructure in the context of areas provided for business (IG) grew from 45 to 27th position in 2018–2022. This indicator can also be identified as the coworking index, which is more popular amongst entrepreneurs and companies (they pay for office facilities in coworking centres for their employees) compared to office rentals. Private managing companies deal with the creation and management of coworking centres in Spain. Their largest number and their highest level are observed in Barcelona and Madrid, as well as other quickly developing cities Teleworkandalucia (2022). A positive fact in this sphere is the absence of the focus on centralisation and the quick formation of coworking infrastructure (Internet, premises, and related services) in other cities. This is a sign of the sustainable development of territories.
- (2) Index of ICT infrastructure (ICTIn) mainly reduced (from 14th position in 2018 to 23rd position in 2022). The most negative manifestations in this sphere were observed in the level of access to digital tools (index a1); ICT implementation (index a2); level of online interaction (index a4).

In the context of e-government services provision, there is a programme plan for the transfer of more than 50% of service to the digital form by early 2025 (Datos,

2022). At this stage, there is a problem with the difference between the country's capabilities and the needs for the digitalisation of services. Whilst about 67% of digital services are accessible to the population, the indicator for the entrepreneurial sector is insufficient. Companies need to improve this direction, which is connected with the reduction of bureaucracy and reduction of time spent for visiting public authorities of different levels.

The issue of access to ICT tools in the entrepreneurial sector of Spain is linked with the problems of cybersecurity, which emerge due to the fact that there are strict requirements for market participants on accelerated digitalisation, with the absence of protection against hacking. Hacker attacks in Spain become widespread due to the improvement of Internet connection and the country's plans to implement 5G on the entire territory (Telefonica, 2022). Accordingly, the level of cybersecurity reduces, including in the sphere of business with the use of ICT (IMD, 2022). SMEs do not have sufficient funds to ensure hack-prevention means.

Portugal has a medium rating in the sphere of digital infrastructure (36th position by the indicator ICTIn) and the sphere of infrastructure conditions (office space) (IG) (37th position). The value of IG improved over the entire period, due to the improvement of the conditions of coworking in Portugal, which implies the creation of attractive coworking centres on the entire territory of the country (Morgado et al., 2020). The significant problems of Portugal's digital infrastructure are as follows:

- Access of business to ICT through the problems of crediting for the category of small and medium enterprises Serrasqueiro et al. (2021);
- Insufficient focus of the small business on the implementation of innovative digital solutions, which would stimulate the growth of productiveness and reduction of defects and failures in production and logistics. The insufficient level of quality, caused by technological underrun, influences the international integration of small enterprises (especially in the textile and chemical industries) (Pereira et al., 2022).

Unlike Spain, Italy, and Portugal, Greece has a low level of infrastructure that is connected with coworking. All coworking centres in the country are created without attention to the state of the related infrastructure, including digital infrastructure, which reduces their attractiveness for business (Mitoula et al., 2020). Digital infrastructure in Greece does not have sufficient potential (Internet, software, and production technologies).

Let us consider from the practical standpoint the new needs for the infrastructure of entrepreneurship in digital economy markets and the prospects for its provision by the example of the Russian market of furfural. This material is used in pharmaceuticals and high-tech production. Thus, the importance of studying the prospects for the development of the market of furfural grew, first, against the background of the COVID-19 pandemic, since furfural can be used for the production of more effective medicines; second, for the development of high-tech productions. In this case, the production and sale of furfural are an element of the infrastructural support for entrepreneurship in other markets of the digital economy.

In Russia, the size of the market of furfural is 1,923,734 kg. In 2020, the production volume was 1,863,680 kg. It is expected to reach 2058.9 tonnes by 2025. Its annual

growth (compared to 2019) is 25%. A structure of natural monopoly is peculiar to the Russian market of furfural. The sole monopolist of this market is LLC Kirov Biochemical Plant, the market share of which equals 97.7%. Russia has a negative balance of foreign trade of furfurals. The volume of imports in 2020 was \$88,309, and the volume of export was \$342.9. The imported furfural is used (66.6%) by LLC Rusplast in the production of construction materials (DG Group, 2021). Furfural, as a prospective and irreplaceable raw material, is one of the new needs for the infrastructure of entrepreneurship in digital economy markets, and the prospects for its support are connected with the strengthening of technological sovereignty (import substitution) of furfural in Russia (DG Group, 2021).

11.4 Discussion

According to the analysis of theoretical and empirical materials on the issue of digitalisation of the entrepreneurial sector of the selected countries of Southern Europe, the needs for the infrastructure of entrepreneurship in the digital economy markets and the prospects for its provision are as follows:

- (1) There is a problem of the digital divide in the functioning of small, medium, and large enterprises and micro-businesses. It is connected with the need for investments in the purchase of ICT tools (digital applications for the promotion of products (services); production technologies that are necessary for the growth of the productiveness and quality of products, digital solution in the sphere of management of processes); the need to improve digital infrastructure by ICT market participants in a partnership with the government. These needs for infrastructural support are peculiar to Italy; the focus on meeting these needs is the basis of long-term growth, and it will allow the representatives of SMEs to create preconditions for international integration. To realise the perspectives of entering international markets, there is a need for improvement of the infrastructure of logistics chains in the main direction, which was damaged during the COVID-19 crisis.
- (2) The problem of ensuring the cybersecurity of business is especially relevant for the entrepreneurial sector, which, without preliminary organisational, technological and institutional preparation, copes with the quick implementation of digitalisation projects. These projects are connected mainly with the requirements for doing business which are set by the government. The resolution of this problem implies the satisfaction of the main needs of enterprises in the context of cyber protection. It should be stimulated by the government (Pereira et al., 2022). The perspectives of its provision could be the improvement of cybersecurity in the banking and financial system and in large digital platforms that are used for the promotion of products (services).

- (3) Effective functioning of SMEs is connected with the need for better access to ICT, which could be satisfied with the help of new forms of financial support, including collective security. Such a focus on digitalisation in the sphere of entrepreneurship should be supported by the government (consultations, training), which will allow companies to reach better integration in international markets.

11.5 Conclusion

This research demonstrated a wide range of opportunities that open before enterprises that aim at implementing the leading and innovative digital tools. These opportunities and prospects include the growth of sales volume, which ensures an increase in national GDP, international integration, and resilience to external and internal challenges.

Analysis of the infrastructural state of the entrepreneurial sector of certain countries of Southern Europe allowed identifying the directions for activation of ICT implementation. The sphere of coworking, which implies the provision of attractive and convenient conditions of work and digital support to entrepreneurs, and the sphere of digital infrastructure are very important. However, the countries of the considered region do not have a high level of digital economy, though they demonstrate a large level of economic development (e.g. Italy). The analysis also helped discover problem aspects of the digitalisation of the given countries' entrepreneurial sector, which include financial and cybersecurity problems and the absence of stimuli for ICT implementation from the government.

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Part II
Digital Tools for Crisis Management
of Sustainable Development
of the Economy

Chapter 12

Contribution of Financial Management to the Digital Competitiveness



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Abstract The merits of financial factors for the competitiveness of countries and firms have been well documented, thus explaining why the public and private sectors are so sensitive to any amendments in this field. Along with that, the digitalization of the global economy influences all industries, including finance, turning it into key basic grounds for further dissemination of Industry 4.0 technologies. The paper aims to consider how financial factors contribute to competitiveness, including digital competitiveness. As there exist at least two essential elements of successful competition policy (intent of policymakers and incentives of firms to implement changes), we treat the competitiveness of firms through the macroeconomic lens, focusing on the two major rankings of national competitiveness—the World Economic Forum (WEF) and the International Institute for Management Development (IMD). We start with investigating different approaches toward the concept of competitiveness on national and firm levels. Next, we examine the input side of competitiveness, which has evolved from a focus on costs and productivity to country capabilities under the pressure of the Fourth Industrial Revolution. The research findings include the definition of indicators in both rankings that are connected with the finance component and look at how they influence “outcome” competitiveness under digital perspectives.

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12.1 Introduction

During the last decades, the competition of enterprises is becoming increasingly intense. Nowadays, a wide variety of business operations require systemic and scientific planning (Zeng, 2019). Historically, there are many competing theories in the field of strategy and competition: starting with Barnard (1938, 1948) and moving to Lindblom (1959), Mintzberg (1973, 1978), and Ansoff et al. (1979), who presented the concept of strategic management which further shaped and influenced theories of strategic thinking and management.

Simultaneously, research in the field of competition theory was emerging as a popular direction. Michael Porter was the one who shaped a generation of academic research and business practice in this area. Porter's toolkit is particularly popular due to its high applied ability. His methods of analyzing competitiveness have been included in the curricula of many educational institutions worldwide. The practical application of Porter's developments helps to analyze the problem and draw conclusions. In 1979, Porter proposed one of the first models of the level of industry competition—the Five Forces model (bargaining power of suppliers, bargaining power of customers, the threat of new entrants, threat of substitute products or services, and jockeying the positions among current competitors) (Porter, 1979).

Unfortunately, the scope and range of this chapter will not permit the full development of each school of strategic thought within the competitiveness space. Although the foundation of this paper is mostly based on Porter's research in the field of competitiveness and its further developments within the WEF and IMD methodology, the authors understand the limitations and potential differences of opinions relating to the degree and range of attributions of various schools of thought in strategic management. Moreover, the authors recognize that there are many contributors to the field of competitiveness who will not receive adequate examination due to the limited scope of this paper.

12.2 Methodology

This research relies mostly on non-empirical research, in which the authors adopted deductive and inductive reasoning to theorize logical assumptions about the contribution of financial factors to the competitiveness of businesses and states, with a special focus on digital competitiveness. The research gathers relevant data from the

Global Competitiveness Report by the World Economic Forum and World Competitiveness Ranking/World Digital Competitiveness Ranking by International Institute for Management Development, along with a systemic literature review and meta-analysis on the research topic. Therefore, the research methodology is based mainly on the qualitative exploration of secondary sources and data.

12.3 Results

12.3.1 *Competitiveness at the Microeconomic Level*

Michael Porter was the first person to soundly suggest that the level of competition is influenced not only by direct competitors but also by the external environment. Barriers to entry in the market predetermine the opportunity for entry of new competing firms within the industry, along with the possible reaction to these actions by competitors. Among the main sources of barriers, he highlighted the economies of scale, product differentiation, suppliers' access to wholesale and retail sales channels (distribution channels), capital intensity, the cost of switching customers to alternative products from other suppliers, legal barriers, and government policy. Thus, the pressure on the established market depends on substitute products with minimal prices that lead to a reduction of potential profitability in the industry. In turn, the market power of consumers is characterized by the presence of a group of buyers who can dictate their conditions to suppliers (Porter, 1979).

The conditions for increasing the market power of suppliers (or producers) over industry participants largely repeat the conditions for the market power of consumers. Currently, the main factor and a necessary condition for the stable position of the enterprise is the assessment of its economic potential (Fursov et al., 2021). Porter attributes the following to the conditions under which the power of manufacturing companies evolves: high level of concentration; the industry as a consumer occupies a small share among other consumers; the supplier's goods are an important resource in the consumer's business; a group of manufacturers poses a real threat to the vertical integration of subsequent production stages.

Competitive advantage, showing the location of each type of activity within the value chain, is its function, where the spatial component takes an important role. However, Porter introduces localization as a new set of competitive advantages. Enterprises with distributed activities enjoy the advantages of proximity locations, along with the advantages that are based on their coordination. These lead to the creation of a global network of activities.

Coordination of activities that are located in different regions makes it possible to increase the flexibility of the organization's response to changes in the external environment and reduces its dependence on the degree of competition in a particular region. Coordination can strengthen the competitive advantage of an organization by increasing its reputation in the eyes of "mobile" consumers who move across

regions, get access to manufacturer's goods in different parts of the world, and exploit additional advantages as differences in the exchange rates or resource prices (Porter, 2008).

The advantages attributed to the location of production factors are based on their specialization and quality. Demand can be justified by sophisticated buyers, unusual local demand in special global segments, and the availability of customer needs that exceeds the needs in other regions.

Thus, the five forces control the profit structure of the industry, determining how the economic value it creates is distributed. However, the most important assertion of Porter's theory of competition is that a high level of competition strengthens the company's competitive advantage and is a necessary condition for its development.

12.3.2 Competitiveness at the Macroeconomic Level

The issues of economic growth and international competitiveness are constantly discussed on national and international levels as they are frequently a part of the analysis of countries' macroeconomic performance. Although some concepts of competitiveness have been criticized (Dunning, 1992; Krugman, 1994; Krugman & Smith, 1994) for the mere fact that the term and concept of national competitiveness appeared, many countries have implemented government programs to improve their position in world markets. Most of these programs are based on Porter's diamond model, developed back in the early 1990s (Porter, 1990).

However, the theoretical approach and the model are often criticized for a rather abstract definition of global competitiveness, which Porter does not clearly present. The ideas in his research suggest that competitiveness is strongly intertwined with productivity (Paul Krugman states that "... they wish, to use the term "competitiveness" as a poetic way of saying productivity, without actually implying that international competition has anything to do with it" (Krugman, 1994)). In this regard, we can conditionally distinguish between two main approaches to the definition of competitiveness on a global scale.

The first connects competitiveness with productivity, thus reflecting Porter's approach, and determines the well-being level. In a study in 2012, Porter and his colleagues introduced the definition of foundational competitiveness, interpreted as "the expected level of output per working-age individual that is supported by the overall quality of a country as a place to do business" (Delgado et al., 2012). Thus, productivity stays an important element of competitiveness, but it is neither the only source of competitiveness nor its only indicator.

The country's foundational competitiveness is determined by microeconomic and macroeconomic factors. Microeconomic factors include company operations and strategy (strategy and operational effectiveness, organizational practices, and internationalization of firms) and national business environment (factor (input) conditions, context for strategy and rivalry, supported and related industries and clusters, and demand conditions). Macroeconomic factors include social infrastructure and

political institutions (basic health and education, political institutions, and the rule of law) and monetary and fiscal policy (Delgado et al., 2012, p. 42).

Such an approach to the concept of national competitiveness references to the concept of “welfare” and largely focuses on governments and public institutions aimed at maintaining positive stable rates of economic growth and national welfare in a medium- and long-term horizon (Mezinova et al., 2019). “Europe 2020,” the strategy for the advancement of the economy of the European Union (European Commission, 2010), was largely based on the vision of national competitiveness in the combination of productivity and welfare.

The other approach still intersects with Porter’s basic model, even though indirectly, as it connects competitiveness with companies’ costs and their share of the global market. Improvement of management mechanisms based on self-regulation and self-development systems brings great potential positive impacts on the development of the territory (Lazareva et al., 2021). This, in case of falling costs and growing global share, assists in keeping the necessary macroeconomic balance in the country. Such a vision initially appeals to the micro-level and has a short- or medium-term horizon (maintaining the current level of growth). However, the same vision might also be projected onto the macro level. The ability of a country to conquer a bigger share of some global markets is associated with the concept of national competitiveness by many policymakers. Thus, China strives to become a world-leading manufacturing power with its Made in China 2025 strategy (Ministry of Industry and Information Technology, 2015). India aims for a 5% share of the global additive manufacturing market by 2025 within the National Strategy on Additive Manufacturing (Ministry of Electronics and IT, 2022), etc.

However, both approaches complement each other. As always, the process of economic growth and development is complicated depending on a large number of interrelated factors. A good example of the combination of the outlined views on competitiveness is the two most well-known rankings (and indices) of national competitiveness, published by the World Economic Forum (WEF) and the International Institute for Management Development (IMD).

12.3.3 Competitiveness Indexes

Porter’s theoretical developments are complementary to the Global Competitiveness Report, first introduced by World Economic Forum in 1996. It widely used Porter’s appellation to the stage of the country’s competitiveness development in the ranking until 2018 (Mezinova et al., 2019; WEF, 2016). The current ranking (the last available version was introduced in 2019; later assessments were not presented due to the COVID-19 pandemic); emphasizing the defining role of the Fourth Industrial Revolution in economic success (WEF, 2018) has 103 variables, about 55% of which are hard data (the source of official statistics from national statistical agencies and international organizations) and the other 45%—the surveys of global companies

conducted by the WEF. Variables are aggregated within 12 benchmarks (8.3% each), which, in turn, are compiled according to four groups of factors:

1. Enabling environment (4 benchmarks);
2. Human Capital (2 benchmarks);
3. Markets (4 benchmarks);
4. Innovation Ecosystem (2 benchmarks) (WEF, 2019).

The WEF ranking mainly characterizes microeconomic factors that determine the country's level of productivity and well-being in the medium- and long-term periods.

The second ranking is the World Competitiveness Yearbook, published by the International Institute for Management Development in 1989. IMD assesses only 63 countries (while WEF assesses 141) and ranks them according to their progress in managing competencies to achieve long-term value creation. In other words, IMD ranks countries based on their ability to create and maintain an environment in which competitive companies arise. The ranking analyzes 334 variables, 163 of which are hard data (the source of official statistics from national statistical agencies and international organizations), 92 are the results of IMD surveys of the expert community (entrepreneurs, officials, and researchers), and 79 are background data which is not ranked. Variables are aggregated within 20 benchmarks (each with a fixed weighting factor of 5%), which, in turn, are compiled according to four groups of factors (components) of competitiveness (with a fixed weighting factor of 25% each):

1. Economic performance;
2. Government efficiency;
3. Business efficiency;
4. Infrastructure (IMD, 2021).

Since 2017, IMD has been presenting the World Digital Competitiveness Ranking, which measures the capacity and readiness of 64 economies to adopt and explore digital technologies as a key driver for economic transformation in business, government, and wider society. IMD believes that digital transformation takes place mostly at a firm level but has a strong impact on governments and societies (IMD, 2021).

The ranking analyzes 52 variables within nine sub-factors, which are then aggregated into three factors:

1. Knowledge;
2. Technology;
3. Future readiness.

In general, for most countries, there is a more or less stable correlation between positions in the traditional and digital world rankings (see data for the Top 20 economies in both rankings for 2021 in Fig. 12.1).

However, the positive correlation is less witnessed if we compare the ranks of the leading countries in WEF and IMD rankings. We took data for the 2019 ranking (as this is the latest one for the WEF) to check the hypothesis (Fig. 12.2).

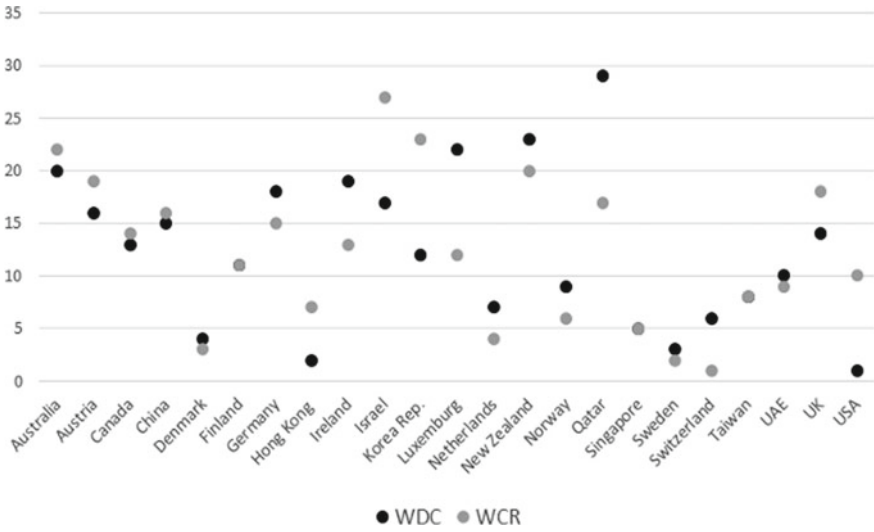


Fig. 12.1 Top 20 economies in IMD world competitiveness ranking (WCR) and world digital competitiveness ranking (WDC) 2021 (rank of the country). *Source* Calculated by the authors based on IMD (2021)

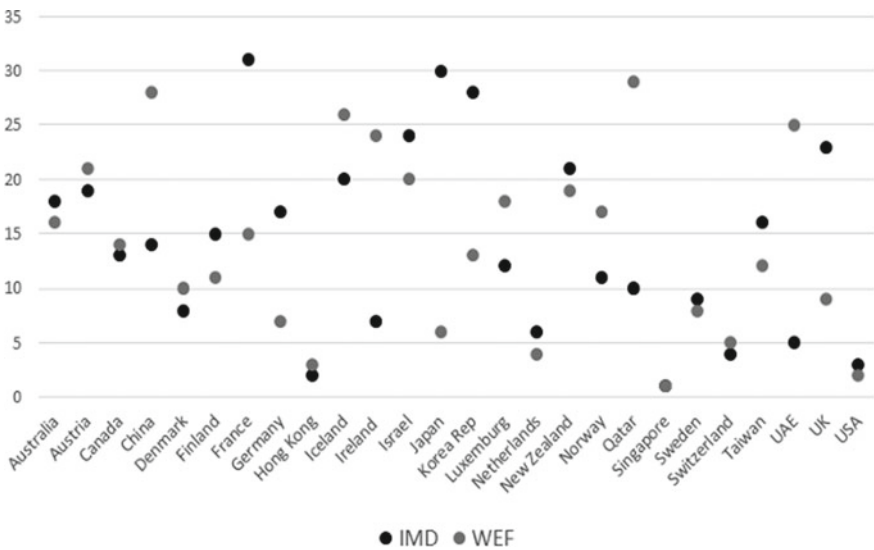


Fig. 12.2 Top 20 economies in the WEF global competitiveness ranking and IMD world competitiveness ranking 2019 (rank of the country). *Source* Calculated by the authors based on IMD (2020) and WEF (2019)

Out of 26 countries studied, the biggest proximity (with a difference of less than three ranks) is shown by less than half economies: Singapore (number 1 in both rankings), Australia (16 WEF/18 IMD), Austria (21 WEF/19 IMD), Canada (14 WEF/13 IMD), Denmark (10 WEF/8 IMD), Hong Kong (3 WEF/2 IMD), the Netherlands (4 WEF/6 IMD), New Zealand (19 WEF/21 IMD), Sweden (8 WEF/9 IMD), Switzerland (5 WEF/4 IMD), and the USA (2 WEF/3 IMD). Out of these 11 countries, 7 countries are from the top 10 of both rankings. Bigger run-up is typical for the countries in the bottom of one of the rankings: China (28 WEF/14 IMD), France (15 WEF/31 IMD), Germany (7 WEF/17 IMD), Ireland (24 WEF/7 IMD), Japan (6 WEF, 30 IMD), the Republic of Korea (13 WEF/28 IMD), Qatar (29 WEF/10 IMD), the UAE (25 WEF/5 IMD), and the UK (9 WEF/23 IMD).

12.3.4 Governments and the Private Sector on the Way to Digital Economy: Does Financial Sector Matter?

Even though the financial sector has a minor direct impact on the nation's economic performance, its indirect influence is very important. In most cases, the economic role of financial institutions is associated with transforming and managing risks because these types of institutions primarily intermediate between those that provide funds and those that need funds (IMF, 2004). The financial dimension is closely connected with digital infrastructure and skills. Both are already giving way to an economic divide. Nowadays, financial markets facilitate the management and transformation of risk and play an important role in identifying market prices ("price discovery"). Simultaneously, digital aspects are something that gives proper roles to the government and the private sector. Both sectors need to collaborate to maximize the growth opportunities that present themselves. If done well, governments will be able to deliver prosperity to citizens, and the private sector will be able to offer transformational products, enter new markets, gain more customers, and achieve higher incomes (IMF, 2021). Faster and better responses to consumer demand are the specific feature of value chains forming under Industry 4.0 pressure, enabling win-win relationships among chain actors, thus increasing the competitive advantages of all parties involved (Balanova et al., 2020).

Nowadays, 11 indicators in the WEF ranking are directly connected with the financial dimension, and nine indicators are connected with the digital dimension. In IMD ranking, there are 31 and 13 indicators, respectively (*see Data Access section*).

Although both tables show no strict correlation between the countries, most of them belong to the group of developed economies with strong political institutions coupled with monetary and fiscal policies, developed clusters, and a favorable national business environment and business climate—all factors that play a crucial role within Porter's competitiveness model. Along with this, the same nations have a significant number of experienced firms with proper strategies, adjusted to sophisticated consumers and the pressure of the Industry 4.0 challenges.

12.3.5 Further Research Directions

Building an inclusive digital economy should be a collective effort of a wide set of stakeholders. Its accelerated development is impossible without proper financial management at the governmental and company levels. However, digitalization of the financial sector has a wide range of consequences due to the movement of ever-increasing volumes of financial activity into virtual space, changes in the formation of interaction, and the emergence of Fintech companies (IMF, 2021; Reshetnikova et al., 2021). To ensure that the digital revolution benefits the competitiveness of economic actors of different levels, the enhanced focus should be placed on strategies that these economic actors use. This is a recommended area for future research, which can use country-level, industry-level, or firm-level datasets to perform more fine-grained quantitative research to better understand the importance of each group of factors on competitiveness.

12.4 Conclusions

Given the importance of the competitiveness issues for economic actors of all levels, we identified the main methodological approaches to assessing national competitiveness within the World Economic Forum and International Institute for Management Development rankings. Though using more or less close groups of factors within governmental, economic, political, social, and infrastructural dimensions, rankings have substantial differences in leaders' positions. We also provided evidence of the importance of financial and digital factors for competitiveness in both major rankings. As such, they are an important consideration for the results of this paper.

By extension, it would be reasonable to argue that antecedents of national economic and investment policy would be of interest. A good example is organizations from advanced economies, with best practices in financial management, generating new technologies and further developing digital tools and skills, whether in the public or private sector. Their cumulative competitive performance also enhances national competitiveness, being a good example of synergistic interaction between business people and policymakers.

Data Access

Data for indicators in WEF and IMD ranking, associated with financial dimension and digital dimension, are presented in Tables 1 and 2, which are available at the repository by the link: <https://doi.org/10.6084/m9.figshare.21346914.v1>.

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Chapter 13

Development of a Software Complex for Managing the IT Industry Based on the IAD of the Financial and Economic State of Enterprises



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Abstract The paper presents the software implementation of computational algorithms for analyzing the financial and economic state of the industry in the region based on data on the financial state of enterprises in the region and tax and insurance payments. To automate labor-intensive research calculations, an integrated software package has been developed. This software package processes and imports data from external sources, analyzes financial and economic indicators, and provides their graphical representation and export. The authors applied a technology based on a unified structural analysis and programming language, which allows for building high-level models of the architecture of complex systems and ensures continuity within the modeling cycle from business models to requirements models and design solutions. The software uses data on the financial condition of enterprises and tax and insurance payments obtained from open sources and presented in the form of spreadsheets as an information and analytical database. It allows for analyzing financial and economic indicators for individual enterprises, their groups, or the industry as a whole, as well as a graphical presentation of statistical data. The developed software makes it possible to form a comprehensive assessment of the dynamics of the industry development based on fuzzy-multiple algorithms for aggregating financial

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and economic indicators. The formation of a comprehensive assessment of the financial condition of groups of enterprises is accompanied by conclusions and recommendations based on a fuzzy-multiple aggregation of financial and economic coefficients. Using the developed software package, the authors assessed and analyzed the financial condition of companies (on the example of companies in the IT sector of the Rostov Region).

Keywords Financial analysis · Fuzzy logic · Ratio analysis · Software · Comprehensive assessment · Financial and economic state

JEL Classification C51 · C58 · C61 · C63 · C81 · G18 · G28 · R58

13.1 Introduction

The effectiveness and validity of strategic decisions made by a company are largely determined by the quality and completeness of analytical information and the relevance of its assessment methods. As a result of strategic analysis, the optimal information base makes it possible to partially reduce the uncertainty in making strategic decisions and justify the choice of company strategies (Zheltova & Fomicheva, 2015). The strategic analysis involves the construction and verification of models for assessing the financial condition of companies (and the industry as a whole) based on a large number of weighted criteria (Derbicheva, 2018). The efficiency of verification, initial testing, and actual use of these models on large amounts of data is achieved by automating labor-intensive computational data processing algorithms.

Currently, financial analysis programs are implemented mainly in two forms:

1. As separate financial and analytical modules of corporate information or accounting systems (e.g., 1C Accounting), which accept data from the internal economic activity of the enterprise as a source of information;
2. Internet services that calculate sets of financial indicators based on public reporting data but, as a rule, have limited capabilities for analyzing, predicting, and interpreting results (e.g., Audit Expert, Audit-IT, Online Financial Analysis, etc.) (Neguch, 2019).

In this paper, the authors used a technology based on a unified language for structural analysis and programming to develop a financial analysis program. A unified structural analysis and design language make it possible to build high-level architecture models of complex systems, providing continuity within the modeling cycle: from business models to requirements models and design decisions.

The paper aims to develop an integrated software solution for automating research calculations to analyze the financial and economic state of the industry in the region. For this purpose, the authors solve the following tasks:

1. To analyze the subject area, construct and analyze financial and economic models, and, on their basis, form requirements for the developed software system;

2. To conduct structural and object-oriented analysis, design software system architecture, algorithms, interfaces, and data structure, and select optimal methods and development tools;
3. To develop code for software modules, their integration, and system deployment;
4. To conduct functional testing, appropate the system on the initial data, and analyze and discuss the results.

The software implements intelligent algorithms for a fuzzy-multiple model of financial analysis, which distinguishes it from the currently existing financial and analytical programs.

13.2 Methods and Materials

The methodology of financial and economic analysis involves the analysis of the dynamics of financial and economic indicators of a given industry during a specified period. The initial information base of enterprises is built based on data obtained as a result of parsing open Internet sources (“Zachestnybiznes” [For an honest business], “Audit-IT,” “Export Base,” etc.) in the form of an Excel file of a certain structure. The database is based on enterprises in accordance with a given classifier code, which makes it possible to identify them in all-Russian data systems by name and Taxpayer Identification Number (TIN). Based on the data of the Export Base website, a database was obtained for each enterprise containing information about the company name, OKVED code [Russian National Classifier of Types of Economic Activity], TIN, OGRN [Primary State Registration Number], contact details, company size, date and place of registration, etc.

As a result of parsing the pages of the “Zachestnybiznes” website, the authors formed a set of basic data for financial and economic analysis. The formed set includes the following:

1. Enterprise status;
2. The average number of employees of the enterprise;
3. Tax regime;
4. Paid insurance premiums (according to the Federal Tax Service of Russia), including payments for mandatory social, pension, and medical insurance;
5. The main reporting indicators for the year (according to the Federal Tax Service of Russia): the amount of income, the amount of expenses, paid tax levied in connection with the application of the simplified taxation system, paid non-tax income, etc.

The authors use the method of fuzzy-multiple evaluation of the industry development dynamics. The methodology for assessing the financial and economic state of the industry based on a set of indicators “profit, taxes, insurance” is based on the use of standard multi-level classifiers [0, 1] (Arapova et al., 2020). Standard 5-point classifiers form a five-point scale for a linguistic variable that determines the

level of the studied parameter. The carrier of the linguistic variable is the domain of the parameter definition. The term sets of values form fuzzy subsets from “very low” to “very high” levels of the parameter. For a system of membership functions is constructed on a five-point scale. The standard way to define membership functions is a system of trapezoidal fuzzy numbers (Kramarov & Sakharova, 2017).

The universal set for a linguistic variable is the numeric segment $[0, 1]$; that is, its numeric value must belong to the segment $[0, 1]$. To assess the dynamics of the development of the industry, for each group (1—microenterprises; 2—mini-enterprises; 3—small enterprises; 4—medium enterprises; 5—large enterprises; 6—not specified), the authors proposed the following algorithm:

1. Data on the studied indicator for each group are summarized in a table for 2019, 2020, and 2021;
2. The data are normalized, that is, divided by the highest value of the indicator, after which the aggregated value of the indicator for three years is calculated, considering the temporal significance, in accordance with the Fishburn formula: $P_{gr} = 0.167 P(2017) + 0.333 P(2018) + 0.5 P(2019)$;
3. A summary table of aggregated values of the studied indicators for six groups is compiled, after which the linguistic recognition of the terms to which they belong is performed (i.e., the dynamics of each of the groups is evaluated for each of the indicators);
4. A comprehensive assessment of the industry is being formed based on the system of indicators “profit, taxes, and social insurance,” as well as a system of fuzzy-logical conclusions, standard five-point classifiers $[0, 1]$, followed by linguistic recognition of the result.

Automation of calculations involves the development and integration of several software modules that load, process, and generate output data in accordance with the requirements of the operator. These software modules are as follows:

1. The data processing module performs the validation of the structure and content of the initial data imported from the excel file, processing and preparing the data for loading;
2. The data import module (data loading module) loads and imports data into the database;
3. The data module implements a user interface for working with database information, including the flexible configuration of displayed fields, filtering, sorting, and searching for the required data;
4. The data analysis module represents a software solution and user interface for data analysis by years, a graphical display of summary data based on the methodology of financial and economic analysis;
5. The data dynamics module—a software solution and a user interface for analyzing the dynamics of changes in the indicators of the financial condition of the industry by years, performed based on fuzzy-multiple analysis methods;

6. The coefficient analysis module performs fuzzy-multiple aggregation of the coefficients that determine the financial status of the enterprise, with the formation of conclusions and recommendations.

A high-level design of the architecture of the considered system is carried out based on a unified language for structural analysis and design, proposed by Kalyanov (2017). The conceptual model is based on the data flow diagrams (DFD) technology, thereby providing visibility, ease of understanding, and use of the model, as well as continuity within the modeling cycle: from business models to requirements models and design decisions.

In the context of this task, it is advisable to create an integrated structural model based on two groups of modeling tools:

1. DFD illustrate the business processes of the system and their interfaces. The main purpose of these diagrams is to show how information flows circulate within the system: from the moment they are received from external sources until they are received by external receivers;
2. ERD (Entity Relationship diagrams) that model the structure of data and their relationships.

The most important connecting part of the complex conceptual model (Kalyanov et al., 2019) is the DFD, which shows data recipients external to the system and highlights internal logical functions (business processes) that link their information flows, as well as data storage (Fig. 13.1). $\sum_{i=1}^6 A_i$ is a system that performs the transformation and redistribution of input information flow, corresponding to the basic functions: creating directories (A1), loading and validating data (A2), importing into a database (A3), filtering data (A4), data analysis (A5), and evaluation dynamics of indicators (A6). $\sum_{i=1}^7 D_i$ is a system of related data stores implemented mainly as separate relational database entities (D1–D3, D5–D7) or DataTable objects (D2). According to Kalyanov (2017), the second component of the complex conceptual model of the information system includes ERD—a model, the construction of which involves the allocation of entities and relationships (links between them) (Romanov, 2017) (Fig. 13.2).

The architecture of the software solution must provide a multi-user parallel mode within the local area network. This model is provided by the “client–server” architecture, built on a three-level logical model. The advantages of such a model lie in the isolation and independence of each level, which encapsulates a set of tasks to be solved, which speeds up development and simplifies the modification of each level. Separating application functions from database management functions greatly simplifies the optimization of the entire system (Makeeva et al., 2021).

Each level, defining a set of tasks to be solved, takes its place in the hierarchical architecture of a distributed system (Davydova & Shershakov, 2017):

1. The level of presentation of information implements the presentation logic of the application; it is physically implemented as a graphical user interface (GUI), providing intuitive human–machine interaction;

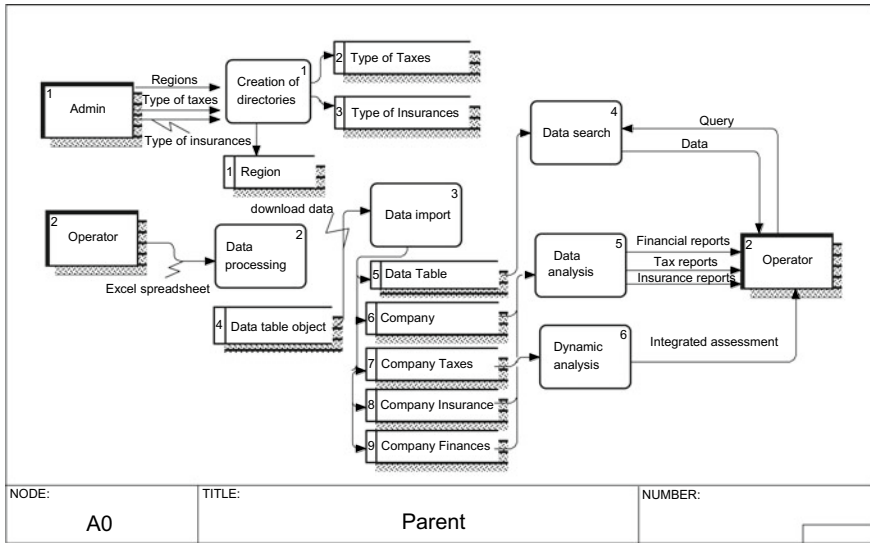


Fig. 13.1 DFD model of the first level. Source Developed by the authors

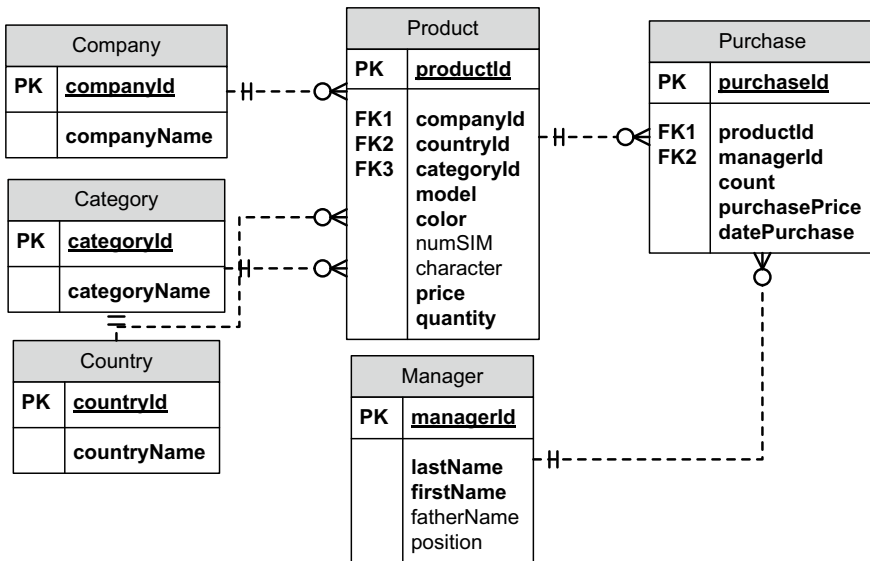


Fig. 13.2 Diagram of the database model (crows' feet notation). Source Developed by the authors

2. The business logic layer connects all levels of the architecture, defining the basic functionality and performance of the system;
3. The data storage layer implements the logic of storing and modifying data, ensuring their integrity, reliability, security, implementation of separated transactions, and prompt presentation of data at the client's request.

In the remote access model, the database is stored on the server, where the business logic is implemented, which is executed in the form of stored procedures. The relational nature of the database involves the interaction between the server and client parts of the application through a structured query language (SQL). The implementation of such an architecture is provided by ActiveX Data Objects (ADO). The object model of net technology is based on two classes: data provider and data set. This approach makes it possible to separate the logic of connecting to the data source from the logic of their processing, allowing one to freely transfer data between different providers (Tanatkanova & Zhambaeva, 2019).

The client application provides the GUI and the implementation of modules for loading, processing, and analyzing data. Requirements for cross-platform applications are implemented using the .Net Core platform. It is an open, completely standalone platform that does not require dependence on the kernel of Windows-based systems, which allows one to run .Net applications on Unix-like systems without the use of third-party technologies (in particular, Mono) (Petukhov, 2016). The data processing logic is implemented on the basis of the C# 9.0 object-oriented programming language, which, being a powerful language, has a number of additional advantages (Romanov, 2016), including flexibility, object orientation, type security, garbage collection, syntactic sugar, and others.

The algorithm for calculating a comprehensive assessment of the dynamics of the financial and economic state of the industry is built by fuzzy-logical aggregation of complex assessments obtained for individual groups of enterprises based on a standard five-point [0, 1] classifier according to the method described above. The algorithm for obtaining complex values of indicators is implemented in several stages:

1. Obtaining the total values of indicators by years in the context of groups of enterprises;
2. Calculation of relative values of indicators in terms of one enterprise of the group under study;
3. Calculation of aggregated values of indicators by groups (Makarov & Shchenikova, 2020).

The algorithm for obtaining a complex fuzzy-set estimate is as follows:

1. The data is normalized, that is, divided by the largest value of the indicator;
2. The calculation of the aggregated values of the indicator for three years is performed considering the temporal significance in accordance with the Fishburn formula (1);
3. A summary table of aggregated values for the six groups is compiled;

4. Linguistic recognition of the terms to which they belong is performed. The values for certain types of taxes, insurance, and profit are aggregated into an overall comprehensive assessment.

The formation of a comprehensive assessment of the industry is carried out based on the system of indicators “profit, taxes, and insurance,” as well as a system of standard five-point [0, 1] classifiers, followed by linguistic recognition of the result. The software implementation is a coefficient analysis module integrated into the software package. The financial and economic state of the industry for the year is assessed based on a set of indicators available in free mode on the TestFirm website (Sarsimbayeva & Saimagambetova, 2012).

Loading data are the values of the indicated coefficients for IT enterprises in the Rostov Region obtained from the TestFirm website. They are represented by a file of a certain structure in Excel. A comparative analysis of the financial and economic state is performed based on the aggregation of three groups of indicators, switching between which is carried out by selecting the appropriate menu commands. The previously described fuzzy-multiple methodology is used to aggregate the coefficients of financial and economic analysis. The linguistic variable S is introduced into consideration—“estimation of the coefficient X_i .” It corresponds to the term-set $S = \{S_1, S_2, S_3, S_4, S_5\}$, where the value of the terms determines the value of the coefficient: critical, unsatisfactory, satisfactory, good, and excellent. Then, for each group of enterprises, data is aggregated for each of the ten coefficients. The aggregate of indicators for aggregation is the values of the coefficients of enterprises for each group: microenterprises, mini-enterprises, small enterprises, medium-sized enterprises, and large enterprises.

13.3 Results and Discussion

Using the software package obtained from the research results, the authors analyzed the financial and economic state of the information technology industry in the Rostov Region. For the assessment, the authors used data from the “Zachestnybiznes” website for 2019–2021 (TestFirm, n.d.). It was revealed that 447 enterprises have the data necessary for analysis for 2019, while 144 (32%) enterprises have no information. For 2020, information is provided on 446 enterprises; there is no information on 97 (22%) enterprises. For 2021, information is provided only for 336 enterprises (75% of the companies of the previous year); information is missing for 58 (15%) enterprises.

Using the software package, the results of the distribution of IT companies in the Rostov Region by groups were obtained: microenterprises, mini-enterprises, small enterprises, medium-sized enterprises, and large enterprises. For enterprises of these groups, based on data for 2021, the total values of profit, tax, and insurance payments are calculated. Based on the results obtained above (as well as similar results for 2020

and 2019), using the software package, the authors carried out a fuzzy-logical analysis of the dynamics of the development of the IT industry of the Rostov Region by groups (microenterprises, mini-enterprises, small enterprises, medium-sized enterprises, and large enterprises) based on a set of indicators “profits, taxes, and social security.” It has been established that the most dynamically developing groups are mini-enterprises and medium-sized enterprises. The smallest growth dynamics are observed in the groups of microenterprises and small enterprises. Simultaneously, the rate of increase in social payments overtakes the rate of increase in taxes. There is significant heterogeneity in the growth rate of profits by groups. The most significant dynamics of profit growth are observed in the groups of microenterprises and medium-sized enterprises. Calculation of complex values of estimates of indicators of the dynamics of the industry showed the following:

1. Taxes by type (unified tax payable under a simplified system of taxation, income tax, land tax, property tax, value added tax, and transport tax) correspond to the term G3; that is, there is a “tendency to stagnation”;
2. The amount of insurance premiums by type (social, pension, and medical) corresponds to the term G4; that is, there is an “increasing trend”;
3. Profit, in general, corresponds to the term G4; that is, there is a “growth trend.”

A picture of the distribution of profits by groups of enterprises in the IT industry for three years was obtained. Since the number of enterprises for which data are available for 2019–2021 varies significantly, the authors considered not the absolute values of the indicators but relative ones in terms of one enterprise of the studied group. Based on five-point fuzzy-logical classifiers, the authors calculated aggregated values of indicators and analyzed the dynamics of profit (for three years) by groups. Based on this algorithm, the aggregated values of tax and insurance payments were calculated.

According to the results of a fuzzy-multiple analysis of the development of the IT industry in the Rostov Region, the term G3 prevails—“tendency to stagnation.” The analysis allows us to draw the following conclusions.

The year of COVID-19 pandemic has seen the following changes in the IT industry of the Rostov Region. First, large enterprises have completely disappeared, and the number of medium-sized enterprises has significantly decreased; medium-sized enterprises were transferred to groups of small enterprises and mini-enterprises as a result of staff optimization. Second, mini-enterprises and small enterprises have seen an absolute increase in profits, taxes, and social payments. Microenterprises have the opposite trend: reduction in profits, taxes, and social benefits. The group of medium enterprises observed stagnation. Third, the coefficient analysis showed an extremely low performance of all enterprises in 2020. The best indicators were observed in the group of small enterprises. Microenterprises experienced critical financial stability in 2020. Profit of all groups of enterprises, except for microenterprises, has increased significantly, apparently due to the increased demand for IT services and technologies in the context of the transition of many enterprises to online mode.

13.4 Conclusion

The paper presents a software implementation of computational algorithms for analyzing the financial and economic state of the industry in the region based on data on the financial state of enterprises in the region, as well as tax and insurance payments. To automate labor-intensive research calculations, the authors designed and developed an integrated software package that processes and imports data from external sources, analyzes financial and economic indicators, and provides their graphical representation and export. To develop a financial analysis program, the authors used a technology based on a unified language for structural analysis and programming. A unified structural analysis and design language make it possible to build high-level architecture models of complex systems, providing continuity within the modeling cycle: from business models to requirements models and design decisions.

The practical features of the developed software include the following:

1. The use as an information and analytical database on the financial condition of enterprises, as well as tax and insurance payments received from open sources and presented in the form of spreadsheets;
2. The analysis of financial and economic indicators for individual enterprises, their groups, or the industry as a whole, and graphical presentation of statistical data;
3. The formation of a comprehensive assessment of the dynamics of the industry development based on fuzzy-multiple algorithms for aggregating financial and economic indicators;
4. The formation of a comprehensive assessment of the financial condition of groups of enterprises with conclusions and recommendations based on a fuzzy-multiple aggregation of financial and economic coefficients.

Using the developed software package, an assessment and analysis of the financial condition of companies were carried out (on the example of companies in the IT sector of the Rostov Region).

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Chapter 14

Benefits and Risks of Digitalization of Providing Social Services by the State



Olga V. Andreeva , Natalia G. Vovchenko , Svetlana S. Galazova ,
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Abstract The paper aims to determine the advantages, challenges, and problems of digitalization in building an advanced system for providing state and municipal social services. The analysis included quantitative data on the results of the activities of the multifunctional centers “My Documents,” the data of the Unified Portal of State and Municipal Services, and the data of the Unified State Information System of Social Security. Structural analysis served as the basis for classifying the risks of digital transformation in the provision of state and municipal services in the social sector. The authors classify conservative consumers who do not use the digital format for receiving social services to determine the possibilities of their connection to this process. Additionally, the authors identify external challenges for the existing system of providing public social services through multifunctional centers and ways to neutralize them. Moreover, the authors highlight the difficulties of implementing the social treasury model. The author’s classification of the risks of digital transformation of providing social services by the state is given. The identified risks that accompany the development of digital technologies in the provision of public social services require building an adequate system for managing these risks.

Keywords Digitalization · Risk management · Public sector · Social services · Social sphere · Social treasury · Sustainable development

JEL Classification H41 · H44

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14.1 Introduction

The digitalization of all areas of life is an increasingly urgent requirement of the current era, an imperative for countries aiming to secure a strong position in a constantly changing world (Sharonov, 2020).

The development of electronic services for the provision of state and municipal services was named among the priority tasks of the Address of the President of the Russian Federation to the Federal Assembly on April 21, 2021. By 2022, the principles of the social treasury should be introduced into everyday practice when all social benefits, pensions, and other payments are made online in a single-window format (Presidential Executive Office, 2021).

It is planned that in two years, the absolute majority of state and municipal services should be provided to the population of Russia remotely in a round-the-clock format.

Thus, the digital transformation of the economy and social services is currently conceptually considered a mandatory process aimed at improving the quality of the population's life, emphasizing the needs of ordinary citizens, including the need to obtain the necessary socially significant services.

It is necessary to consider these issues in the context of sustainable development because achieving Sustainable Development Goal 10 (which calls for reducing inequalities within and among countries) requires an active public policy. Of particular interest are the findings of Szymańska (2021) about the significant role of expenditure on social protection in affecting income disparities and the impact of demographic factors in emphasizing the differences in socioeconomic situations across the EU countries, obtained from a recent study of the dynamics of the SDG 10 indicators for the EU27.

The provision of social services is the initial direction of the implementation of the country's social function. Its genesis in Russia has been studied in detail by Oleynikova (2011). According to Korobov, the content of the social function of the country is one of the key directions in its activities carried out in the social sector of public relations to provide citizens with a decent standard of living, solve social contradictions, and implement the agreed interests of citizens based on social standards recognized in a given society and legally enshrined" (Korobov, 2000, p. 6). There is a close connection between the social and economic functions because the implementation of the social function is impossible without sufficient financial support. During the global transformation of the social function in the post-Soviet period, significant qualitative changes in social legislation continued, including those associated with the reduction of comprehensive state paternalism in the social sector, while maintaining the dominant role of Russia in solving the social problems of society. This process, as well as new processes caused by digital transformation, requires high-quality state risk management (Romanova et al., 2020).

The introduction of a full-scale forecasting and risk management system in the public sector was announced in 2012 (Rossiyskaya, 2012). In the current system of providing state and municipal services, especially in the social sector, affecting

the interests of all citizens of the country, risk management is the most important direction of the government's activity.

The paper aims to identify risks in the new digital realities of providing state and municipal social services to respond to emerging challenges adequately. The concept of digital transformation of the social sector presupposes, first of all, the improvement of the provision of social services aimed at increasing their targeting and efficiency, increasing the efficiency of using funds from the budgets of the country's budget system, including optimizing the costs of carrying out these activities. However, the active large-scale application of new digital tools by the government is connected with risks. It is an urgent task for the scientific community to identify and propose ways to minimize these risks.

Within the framework of this research, the authors understand the risk of digital transformation as the probability of an event that may occur in the fields of public life (economic, social, political, and spiritual), leading to a positive or negative impact on the processes of electronic and proactive provision of state and municipal social services in the context of objective and subjective factors. It is uncertain that the process of digitalization of state and municipal social services will follow the expected scenario and lead to the expected results.

These problems are analyzed in the scientific literature. According to Wang, we should emphasize the economic and financial modeling driven by digital elements to depict social needs accurately. In the long run, the outbreak of the pandemic has exposed some problems in economic and social development and provided a window period for promoting reforms (Wang, 2021). It is important to assess the need for citizens to participate in various social programs; in this case, digitalization provides undeniable advantages. In this regard, the study by McKernan et al. (2021) is of particular interest. These researchers concluded that safety net programs use information collected by one public benefit program to help enroll low-income people for other benefits for which they qualify. As a result, an expansion of SNAP outreach spending and Medicaid eligibility thresholds could have a direct impact on enrollment to the Aid to Families with Dependent Children (AFDC) and the Temporary Assistance for Needy Families (TANF) programs (McKernan et al., 2021). The conclusions of Jorgensen and Siegel (2019) on social risk management are important. Strengthening the role of the government in this process is emphasized by Stiglitz (2021). In 2013, Russian scholars emphasized that the risk management system in the public sector should be understood as an urgent need (Petukhova, 2013). However, it has not yet been possible to make serious progress in this direction, while most risk management studies consider only the stages of risk analysis and the development of response actions. One of the examples is the procedure for risk analysis when making a government decision and the main methods of risk management used at the state level (Avraamov, 2020; Egorov & Severova, 2020). In theoretical terms, we also highlight the study by Arkadyeva and Berezina (2019), where the authors highlighted the issues related to the formation of the elements of the risk management mechanism in the public administration sector, as well as the structure and composition of the directions of risk management. Therefore, further development of this topic is required.

14.2 Materials and Methods

During the research, the authors analyzed materials from the available official information sources, including the Federal State Statistics Service of the Russian Federation (Rosstat), federal legal acts, and bulletins of the Federation Council of the Federal Assembly of the Russian Federation.

The analysis included quantitative data on the results of the activities of the multi-functional centers “My Documents” (MFC), the data of the Unified Portal of State and Municipal Services, and the data of the Unified State Information System of Social Security (EGISSO).

To measure the processes of secondary digitalization, in 2014, the Moscow School of Management “SKOLKOVO” developed a model of “digital life,” which includes seven dimensions. The developed model was tested in Russian cities with a population of over one million. In the new wave of research, the sample of cities included all the regions’ capitals of the Russian Federation and a number of large “non-capital” regional centers, a total of 91 cities (Sharonov, 2020). This expansion of the field of analysis allowed comparing the digital divide between cities that are very different in size, income level, economic structure, and history.

The structural analysis made it possible to determine the advantages, challenges, and problems of digitalization in building a current system for providing state and municipal services. The analysis served as the basis for classifying the risks of digital transformation in providing state and municipal services in the social sector.

14.3 Results

Over the past decade, Russia has achieved a quantum leap in improving the quality and convenience of providing public services via digital technologies. One of the effective and demanded tools of interaction between the authorities and the population was the Unified Portal of State and Municipal Services, launched in 2009, which contains reference data for individuals and legal entities on the provision of public services, including in electronic form. In 2020, the number of citizens registered on the Single Portal of State and Municipal Services exceeded 126 million. The number of services provided through the portal in 2020 amounted to 228 million, which is almost ten times more than in 2015.

The most demanded service in 2020 was the service of informing registered persons about the status of their individual personal accounts in the compulsory pension insurance system. The number of citizens’ requests for this type of service amounted to more than 10 million (Ministry of Economic Development of the Russian Federation, 2020).

However, there are currently a relatively large number of conservative consumers in Russia who, for various reasons, do not use digital options to receive services. Conventionally, such citizens could be divided into three large groups:

1. Citizens who have a low material status and do not have the opportunity to purchase the necessary equipment or pay for communication services. Thus, according to the Federal State Statistics Service of the Russian Federation (Rosstat), in 2020, 17.8 million people (12.1%) of the total population had incomes below the subsistence level (Rosstat, n.d.). These citizens are potential recipients of state and municipal services in the traditional format.
2. Citizens with low digital skills. This category mainly includes people of the older generation. In 2020, there were 36.6 million people over the working age in the Russian Federation (Public Opinion Foundation “FOM,” 2021), and a further increase in their number is predicted.
3. Citizens who do not want to receive services through information technology. This reluctance may be due to the lack of confidence of the population in digital products and technologies, fear of personal data leakage, etc.

In this regard, it is necessary to preserve the ability of conservative consumers to access the services they need in a traditional format.

Currently, the multifunctional centers “My Documents” (MFC) remain a key face-to-face channel of citizens’ access to state (municipal) services, including digital ones. Service centers similar to the MFC mentioned above operate in more than 80 countries worldwide. The most effective are the systems of those countries where the principle of “work to serve the interests of citizens” is fully implemented. A similar sustainable trend is emerging in Russia.

Currently, the MFC network has more than 47 thousand windows and more than 13,000 offices within walking distance. It provides about 350 thousand services daily and processes more than 90 million calls annually. In 2019, the costs of supporting the operation of the MFC network amounted to 59.1 billion rubles; the cost of servicing one applicant amounted to 644 rubles.

However, the current MFC framework requires changes in accordance with the contemporary needs of society and the ongoing technological changes, including the following interrelated external factors:

- A sharp acceleration of changes in all sectors of human life due to the transition to digital technologies triggered large-scale cultural and social changes;
- The growing needs of the population to receive the widest range of services in comfortable conditions in the shortest time possible, new standards of quality of work;
- The active introduction of digital technologies in public administration, including in the provision of public services with a low readiness of the population to use these technologies, the transition to the digital economy;
- Unpreparedness for the digital transformation of services in a number of regional and municipal authorities, whose services are presented in the MFC;

- Vague responsibility for untimely or illegal decisions of departments in connection with the transition to the provision of integrated services (super-services), applicants' dependence on technical failures, the opacity of decision-making algorithms, and, consequently, consumer vulnerability from errors or bad faith of the service provider.

To solve the accumulated problems, the authorities implement several reforms to improve the provision of state and municipal services based on new principles.

The highlighted principles are as follows:

- Proactive mode, i.e., the provision of services in a proactive format with the applicant's consent. This principle assumes the automatic renewal of expired services and the automatic generation of a set of documents;
- The principle of seamlessness, i.e., the possibility of obtaining public services through the infrastructure of non-governmental organizations (e.g., banks), including electronic ones. The government will determine a list of such organizations and requirements for them, criteria for their selection, conditions and requirements for appeals through the infrastructure of organizations, and requirements for the protection of personal data and information;
- Extraterritoriality within the region, i.e., receiving public services regardless of the place of residence or place of stay for citizens and entrepreneurs;
- Registry model, i.e., information resources, not paper documents, become a source of reliable information about the legal status of persons;
- The electronic form of personal storage documents, i.e., the MFC converts personal storage documents into electronic form and confirms their authenticity. This will make it possible to refuse personal storage documents in paper form and reduce the list of documents submitted by the applicant;
- Digital administrative regulations, i.e., "end-to-end" automation of the service provision process.

An important task remains to increase the availability and quality of public services in the field of social protection of the population.

Simultaneously, despite the great activity in the development of social protection, citizens note that the process of obtaining benefits and payments for them remains very laborious. According to the Russian Audit Chamber, about 20% of poor Russian families do not receive any social benefits at all; there is a high share of citizens dissatisfied with the quality of social services they receive.

One of the tools aimed at solving these problems is the "social treasury" model.

The social treasury is a model for providing social support measures and public services in the field of social protection of the population using a single digital platform, which ensures the implementation of the principles of client-centeredness of the government and the addressability and effectiveness of social support measures.

Let us highlight several problems of introducing the principles of social treasury into the Russian system of social protection:

- The decision to provide social support in a digital format entirely depends on the completeness and correctness of filling in the information bases of the authorities. Nevertheless, these information bases often contain outdated information about citizens or information that does not correspond to reality. Therefore, it is necessary to develop mechanisms for reconciling and updating data, as well as a procedure for citizens to confirm their rights to social benefits in the event of a refusal to receive them;
- As noted earlier, the citizens of the older generation who are most in need of social assistance, for the most part, do not have the skills to use digital technologies; many people in this group have disabilities. For such citizens, the effectiveness of introducing digital technologies into the field of state and municipal services often equals zero;
- Against the background of increasing digital transformation of the system for the provision of state municipal services, there is an increase in fraud activities. In this regard, additional measures are required to protect the confidential information of citizens from cyberattacks and possible leaks associated with the actions of the system operators.

14.4 Discussion

Thus, the process of digitalization of state and municipal services, including within the framework of social security, is associated with certain risks, including the following:

1. The risk of lagging legislation and law enforcement practice from the rapidly changing realities of the digital economy and the changing needs of the population. In some foreign countries (Israel, Singapore, the UK, Australia, and the USA), this type of risk is managed within the framework of the so-called regulatory or “digital sandboxes,” which are special legal regimes for testing new technologies within certain boundaries (territorial or temporary) to distribute such technologies throughout the country safely.
2. The risk of achieving uneven access to social services in the inter-territorial context. In some regions of the country, there are still a considerable number of sparsely populated areas with no Internet connection. Residents of such regions cannot receive services in electronic form.
3. Risk of deepening the interregional digital divide. The breakthrough of digital technologies into all aspects of everyday life is becoming an increasingly important factor in the socioeconomic development of regions. Most of the world has moved from “primary” digitalization (the creation of the necessary infrastructure for access to the Internet) to secondary (creating as many separate digital solutions as possible, combined into integral multidimensional systems, patterns,

and frameworks). In such systems, a network effect arises, reflecting an increase in value for users, outstripping the growth in the number of participants in the system. The study indicated that the digital divide of the second level between the regions of Russia is very significant. The value of the final index of the digital life of the leading cities (Krasnodar and Yekaterinburg) is almost five times higher than that of the closing city (Magas-Nazran). Simultaneously, the distribution of supply is much more even. The difference between the leading and trailing cities is reduced by up to three times. The overall digital divide is largely determined by differences in the level of digital demand, determined by the population's digital skills.

4. The risk of information and digital inequality of the population due to low digital skills, low material status, or unwillingness to use digital technologies when receiving necessary services. New economic and technological conditions require assistance to citizens in mastering the key competencies of the digital economy, ensuring mass digital literacy. Particular attention should be paid to those categories of citizens who, for one reason or another, cannot receive the necessary information remotely using technical devices.
5. The risk of understaffing. With the transition to a digital format for the provision of state and municipal services and the provision of social support measures based on the social treasury model, there may be a shortage of professional staff, primarily IT specialists. Thus, according to the Internet Initiatives Development Fund, the Russian economy will experience a shortage of about 2.0 million IT specialists by 2027. Simultaneously, at the beginning of 2018, there were about 1.9 million IT specialists in Russia (2.4% of the working-age population, while in the USA, Germany, and the UK—4.3%).
6. Risks of excessive use of technologies and new opportunities associated with digitalization, with unauthorized use of someone else's information, using someone else's resources, fraud, etc. According to some expert estimates, over the past four years, there have been about eight billion cases of leakage of personal data records. The task of the state is to minimize these risks.

14.5 Conclusions

There are other risks accompanying the development of digital technologies in providing state and municipal social services. However, the authors attempted to identify, generalize, and analyze the key risks, including the following:

- The risk of lagging legislation and law enforcement practice from the rapidly changing realities of the digital economy and the changing needs of the population;
- The risk of failure to achieve uniformity of access to electronic social services in the inter-territorial context;
- The risk of deepening the interregional digital divide;

- The risk of the emergence of information and digital inequality of the population due to low digital skills, poor financial situation, or unwillingness to use digital technologies when obtaining necessary services;
- The risk of a shortage of professional staff;
- The risk of abuse of technology and new opportunities associated with digitalization, with the unauthorized use of someone else's information, other people's resources, fraud, etc.

We believe that ignoring the above risks is accompanied by the threat of choosing the wrong benchmarks when making decisions in the process of digital transformation of the sphere of public and municipal social services, which will not allow us to succeed in reducing inequality in citizens' incomes, as required by the SDG 10.

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Chapter 15

State Programs in the Context of the Development of the Digital Economy



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Abstract The challenges posed by the consequences of the COVID-19 pandemic and economic sanctions against all sectors of the Russian economy have not changed the strategic goal of state development. Shifting the vector of development from raw material orientation to a high-tech and socially oriented economy in the context of the new technologies of Industry 4.0 becomes the most important task of today's public finance policy. A variety of budgetary instruments are used to implement this policy, including state programs. The paper aims to consider the content of such budgetary tools as state programs, its role in today's conditions, and the problems of its functioning and areas of improvement. The research substantiates the need for further development of the institution of state programs, which will promote the efficient use of limited financial resources, the choice of priority areas of funding, and increased budget transparency. The conclusions are based on the analysis of open data from the Ministry of Finance of the Russian Federation.

Keywords Government programs · Federal budget · National projects · Economic growth · Social welfare · Government initiatives

JEL Classifications H50 · H61 · H69 · C82

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15.1 Introduction

In recent decades, the world has faced global change, which has raised the question of forming the digital economy as a new development paradigm. In the process of transforming the economy to new technologies, the strategic goal of the Russian Federation is sustainable economic growth on a new scientific, technological, and digital basis (Takmazyan & SamoiloVA, 2022, pp. 46–53).

Nowadays, the economy is focused on improving the population's welfare and the resource economy's sustainability, social justice, equal rights of the generations, dynamic growth, and financial security (Andreeva & Dmitrieva, 2022, pp. 159–169; Samoylova et al., 2022, pp. 638–644).

The implementation of the sustainable and responsible development model proposed by the President of the Russian Federation in 2018 as national development goals continue in today's challenging environment.

The achievement of national development goals is the most important primary task of financial policy in the country (Ministry of Finance of the Russian Federation, 2021a). To implement this financial policy, the subjects of management, given the limited budgetary resources and the priorities of budget expenditures, use a variety of budgetary instruments, including state programs.

The paper aims to reveal the content of one of the most significant budgetary tools—state programs, contributing to the achievement of strategic national priorities and the implementation of current tasks, identifying problems of their development.

To achieve the research goal, the authors solve the following tasks:

- To study the program documents of the President of the Russian Federation and the Government of the Russian Federation, budget legislation, and the results of recent scientific research;
- To consider the main changes in the system of management of state programs.

15.2 Materials and Method

Problems of formation, implementation, and evaluation of the effectiveness of state programs introduced in the Russian budgetary practice in 2010 are considered in numerous scientific publications of Russian scientists.

In 2019, Masterov (2019, pp. 85–88) drew attention to the fact that the main goal of the transition to a program budget was not achieved because there was no relationship between the volume of budget allocations, activities, and specific results to be achieved. In 2021, this point of view was confirmed by Afanasiev, Belenchuk, and Shash. These researchers note that the advantages of the program-targeted instruments, which open wide opportunities for improving the flexibility of budget resource management and efficiency of budget services, as well as contribute to cost minimization, have not been fully realized in the decade (Afanasiev et al., 2021, pp. 8–15). The accumulated problems have led to the need to transform the institution

of state programs. In 2021, a new system of management of state programs of the Russian Federation was legally formalized. The current stage of transformation of the institution of state programs opens new directions for scientific research.

The research methodology is based on the methods of scientific knowledge of economic and social phenomena in their interrelation and interdependence. The information base of the research includes federal legislation, publications in Russian scientific journals, and open data from the Ministry of Finance of the Russian Federation.

15.3 Results

In 2021, the Government of the Russian Federation formed a set of structural and institutional measures, the implementation of which will create the basis for long-term economic growth and ensure social welfare and structural modernization of the economy (Government of the Russian Federation, 2021b).

State programs, national projects, and measures to implement the Presidential Addresses can be classified as the main tools for achieving national goals. The analysis of the data of the Ministry of Finance of the Russian Federation confirms a steady growth of allocations from the federal budget to finance priority expenditures. These priority expenditures are mainly socially oriented; their share of the total funding exceeds 40%.

A new tool for achieving national development goals was a set of 42 government initiatives grouped into six areas (Government of the Russian Federation, 2021b):

1. Social sector;
2. Ecology;
3. Construction;
4. Digital transformation;
5. Technological breakthrough;
6. The state for the citizens.

Strategic socio-economic development initiatives aim to accelerate the achievement of national development goals.

The projected volume of federal budget allocations for the implementation of 42 government initiatives will amount to about one trillion rubles over three years, of which more than 60% falls on the social sphere and technological breakthrough (Ministry of Finance of the Russian Federation, 2021a).

A feature of the federal budget for 2022–2024 is that its program part is grouped into eight areas, which basically correspond to the national development goals.

In our opinion, this is due to the possibility of implementing the goals of state programs only through the joint efforts of several federal executive agencies.

The most significant number of state programs in the Russian Federation (10 state programs) is implemented in the area of “Ensuring national security and international cooperation.” The largest amount of funding is envisaged for the direction

“Preservation of population, health, and well-being”: 3452.3 billion rubles (share in program expenditures—18.4%), 3604.8 billion rubles (18.6%), and 3785.4 billion rubles (19.1%), respectively (Ministry of Finance of the Russian Federation, 2021a).

15.4 Discussion

As already noted, state programs are the most important budgetary tool for achieving national development goals. The requirements for state programs are derived from strategic planning documents; the mechanisms and amounts of financial support are established by laws on the federal budget.

From 2022, the institution of state programs will be transformed in accordance with the Resolution of the Government of the Russian Federation “On the system of management of state programs of the Russian Federation” (May 26, 2021). (Government of the Russian Federation, 2021a). Based on the experience of implementing pilot state programs and national projects, this process aims to overcome the shortcomings of the existing management model of state programs. These include a mixture of project and process activities, a low level of coordination of indicators characterizing the final socio-economic effect, an insufficient set of activities to achieve the goals and objectives, the lack of linkage of program activities with specific results, the persistence of paperwork, and others.

Among the new approaches to the development and implementation of state programs, it is necessary to highlight the division of state programs into sectoral and integrated, as well as changes in the system of goal-setting, structure, and content.

Changes in the system of goal-setting and the structural elements of state programs are oriented toward achieving the national development goals of the Russian Federation. The goals of state programs must be relevant, specific, measurable, and achievable. For each goal of the state program, indicators are formed that reflect socially significant effects and are contained in the Unified Plan to achieve the national development goals of the Russian Federation and other documents of strategic planning and national security (Government of the Russian Federation, 2021a).

The development of state programs is based on the principles of project management, allowing its structure to clearly distinguish the project part, which contains federal and departmental projects, and the process part with a set of process measures.

State programs have become informative, well-structured, and, therefore, understandable not only to experts and specialists but also to the public. All tools used by the Russian Government to achieve national goals are integrated digitally.

The analysis of open data of the Ministry of Finance of the Russian Federation indicates an annual increase in the planned volume of federal budget expenditures on financing state programs of the Russian Federation in 2022–2024: 18,763.3 billion rubles, 19,364.7 billion rubles, and 19,849.1 billion rubles. Accordingly, program expenditures of the federal budget in absolute terms will increase by 105.8%. (Ministry of Finance of the Russian Federation, 2021a, 2021b).

To optimize and accelerate decision-making processes, a simplified mechanism for working with state programs and their elements is in effect throughout 2022, providing for the inclusion of anti-crisis measures in their composition, the suspension of the additional planning process, and the introduction of changes to the state program passport in case of changes in the consolidated budget estimates of the federal budget.

Let us consider the implementation of these changes on the example of the state program of the Russian Federation “Information society,” which is the most important in the digital transformation of social and economic processes (Fig. 15.1).

The implementation of the digital development paradigm requires the identification of sources of funding for program activities. The federal budget is the key source of financial support for state programs, including those in the considered area. The analysis of open data of the Ministry of Finance of the Russian Federation shows that its resource capacity allows it to finance national priorities and government initiatives implemented through state programs.

The state program “Information society” is no exception; the only source of funding for the current budget period is the federal budget.

The dynamics of financing the state program (complex program) of the Russian Federation “Information society” is shown in Fig. 15.2.

We can see an insignificant decrease in the total amount of funding for program activities. Simultaneously, there has been an increase in the volume of interbudgetary transfers allocated from the federal budget to the subjects of the Russian Federation, which is associated with the implementation of the federal project “Digital region” in the regions (Bogoslavtseva, 2022, p. 21).

15.5 Conclusion

The experience gained in financing state programs and the need to solve the problems of their implementation, accumulated over a decade, contributed to the transformation of the process of their management and the tools associated with them, beginning in 2022.

The analysis of open data of the Ministry of Finance of the Russian Federation confirmed that the most important source of financial support for state programs is the federal budget. Its resource capabilities allow it to finance national projects, strategic government initiatives, and anti-crisis measures implemented through state programs. The new management system of state programs turns them into an effective tool that will give impetus to the further development of domestic program budgeting.

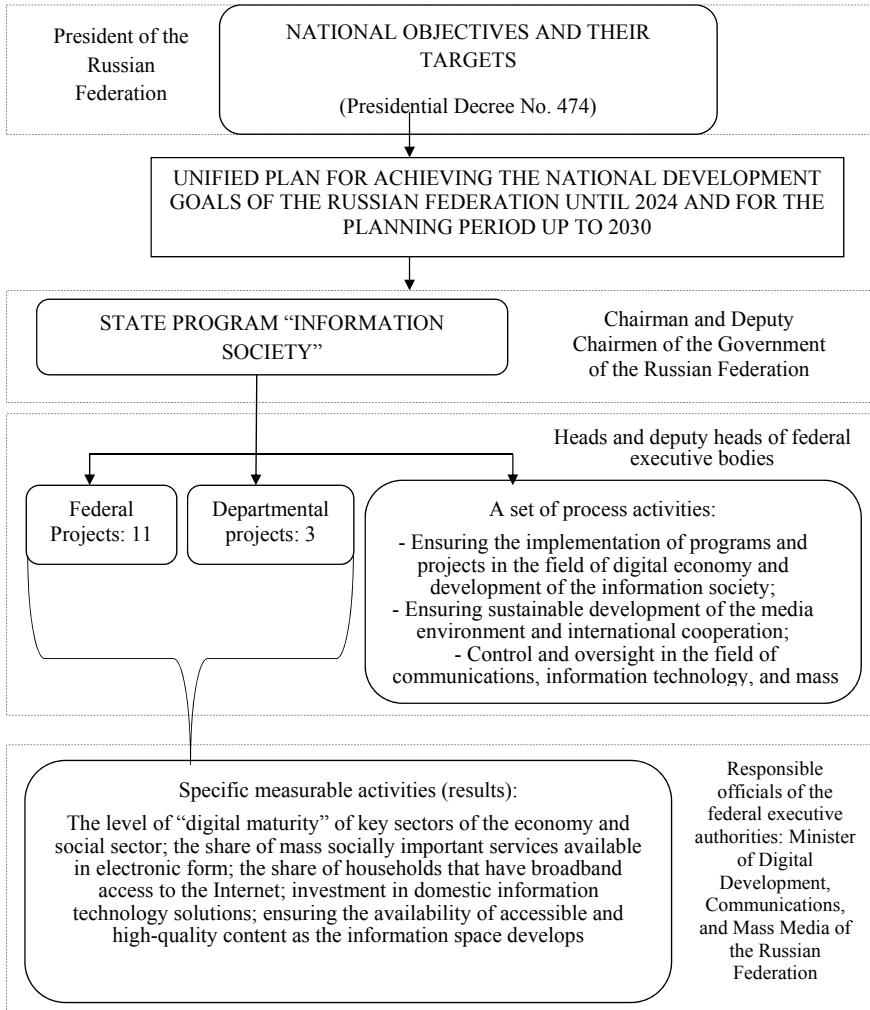


Fig. 15.1 New architecture of the state program (integrated program) of the Russian Federation "Information society" of the Russian Federation from 2022. *Source* Compiled by the authors based on Government of the Russian Federation (2014, 2021a)

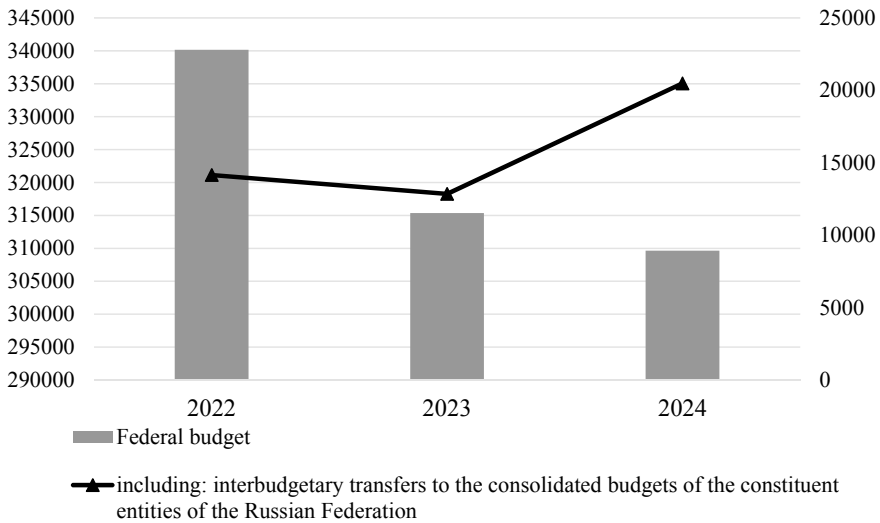


Fig. 15.2 Dynamics of financing the state program “information society” in 2022–2024. *Source* Compiled by the authors based on Government of the Russian Federation (2014)

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Chapter 16

A Development of the Assessment of Information Disclosure Quality in Social Reporting of Commercial Organizations in the Context of Digital Transformation



Irina V. Alekseeva , Elena M. Evstafyeva , Evgeniya A. Pryadkina ,
and Shamil Yu. Umavov 

Abstract The research explores the main problems of the quality of disclosed information, which is considered one of the priority areas in the field of social reporting of commercial organizations. The authors highlight the approaches to the essence of the definition of social reporting. The author's substantive definition of social reporting is given in a narrow and broad sense. The authors present a matrix of the ratio of the quality problems of disclosed information in social reporting in the studies of Russian scientists. Based on the Concept for the Development of Public Non-Financial Reporting and the Action Plan for its Implementation, the authors provide an action plan for developing a system for monitoring and assessing the quality of non-financial reporting and improving the quality of disclosed information. Complete and reliable reporting demonstrates a serious attitude to the needs of stakeholders and strengthens confidence in the company.

Keywords Social reporting · Non-financial reporting · Problems · Digitalization · Quality of information disclosed · Principles of information disclosure · Commercial organizations

JEL Classification M49

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16.1 Introduction

Currently, significant changes are occurring in the accounting and reporting systems of Russian and foreign commercial organizations. Many researchers demonstrate a shift in the focus of information requests from traditional accounting (financial) reporting to its new types, which fill gaps in the information necessary for stakeholders to make effective management decisions.

Simultaneously, new conditions emerge in the Russian Federation for the conduct of economic activities by economic entities due to the approval of a number of official documents and national projects: strategies for the development of the information society, digital economy, guidelines for social responsibility, etc. The distinctive features of the adopted direction of strategic development are the formation of a competitive economy by expanding participation in foreign economic activity and the accumulation of mutual investments, increasing information openness and transparency of the activities of economic entities, and achieving social well-being and environmental safety.

Alekseeva and Osipova noted that “recently (especially abroad), there has been a surge in interest in the formation of new types of reporting modification and an expanded presentation of information on ecology, social sphere, and corporate governance” (Alekseeva et al., 2015a). Such reporting acts as a source of missing information for all stakeholders, allowing for the most correct and comprehensive analysis of the economic entity’s performance and effective management decisions.

In this regard, social reporting is updated as an information resource containing financial and non-financial information that reflects the results of the activities of organizations from the point of view of economic sustainability and social and environmental responsibility.

Despite the active inclusion of Russian organizations in the disclosure of socially significant information, several methodological, organizational, and economic factors restrain the further development of social reporting in domestic practice. The disclosed information is partly haphazard, weakly comparable, unbalanced, untimely, and unsuitable for purposes of vertical and horizontal analysis. Moreover, it is not always accessible to various groups of stakeholders. The lack of regulated procedures for verifying social reporting casts doubt on the reliability of published information and opens up ample opportunities for deliberate distortion of data. High costs for the formation of social reporting, its confirmation (certification) by an independent auditor, publication, and further promotion through communication channels are not rational for organizations of medium and small businesses but create an additional burden on large businesses.

Social reporting is particularly relevant in the digital economy. Widespread digitalization creates new problems (threats to information security, cybercrime, etc.) and exacerbates the existing ones. One of the examples is the problem of unemployment because “the daily growing automation of jobs can lead to the displacement of human capital from the structure of the global economy” (Borisova & Komarov, 2019). New requirements are imposed on the format, speed, and volume of obtaining

information, as well as its availability to users. New threats are born: information security and unfair changes in published information.

Feoktistova and Alenicheva rightly note that “improving the quality of reporting information is the most important task today, since, as noted by various stakeholders, it is the current state of non-financial reporting that is an obstacle to the wider use of this information for making decisions based on them” (Feoktistova et al., 2017).

The theoretical basis of the research was the work of Russian and foreign scientists engaged in the study of the formation of social reporting of commercial organizations. General issues of the evolutionary-transformational mechanism of social reporting of commercial organizations are considered in the works of Aligadzhieva (2018), Blagov and Petrova-Savchenko (2012), Borisova and Komarov (2019), Chaldaeva et al. (2015), Semenov (2011), Zhukova and Bayanova (2015), and others.

However, despite the presence of separate developments in the field of the quality of non-financial reporting, the problems of the quality of information disclosure in social reporting of commercial organizations in the context of digital transformation are rather poorly developed. This is what makes the topic of research relevant.

The scientific novelty of the research results lies in the justification of the qualitative characteristics of information disclosure in the social reporting of commercial organizations in the context of digital transformation.

The research aims to scientifically justify and develop theoretical and methodological provisions and formulate practically oriented proposals for improving the quality of information disclosure by social compilation of commercial organizations. In accordance with this goal, it is necessary to solve the following research tasks:

1. To disclose the economic interpretation of the definition of social reporting based on the studied contemporary approaches;
2. To investigate the concept of quality in the philosophical, economic, and legal aspects;
3. To develop a matrix of the ratio of the quality problems of disclosed information in the studies of Russian scientists;
4. To identify the main problems related to the quality of information disclosure in social reporting of commercial organizations.

16.2 Methods

In conducting this research, the authors applied the methods that were used to fulfill the tasks set in the introduction, including classification, systematization, problem and comparative analysis, synthesis, induction, deduction, and the method of grouping data. The special methods used in the research include evolutionary, logical, and cyclical approaches, which confirm the practical implementation of the research results.

16.3 Results and Discussion

“The absence of uniform standardized criteria for non-financial reporting and the disparity of information sources leads to the emergence of insufficient quality analytics in the field of sustainable development of the company, as a result of which investors receive distorted or incomplete information on the company’s ESG profile. The lack of uniform standards also complicates the preparation of consolidated non-financial statements for groups of companies and reduces its quality. It is necessary to define a basic set of indicators of non-financial reporting, as well as the format and methodology for their disclosure, which is the same for all companies from the consolidation loop” (Alekseeva et al., 2021).

An analysis of the key provisions of various theories allows us to conclude that, despite their diversity, they are all based on the thesis of close interaction between the economy, politics, and the social sphere. Simultaneously, it should be noted that the attractiveness of social reporting for reporters and their stakeholders lies in the detailed disclosure of the following issues: the organization’s contribution to the economy of the region of presence and the state, environmental protection, energy and resource use, waste management, business ethics, support for local communities and own staff, charity, and others.

Despite the increased interest in the considered issue, there has been no unified approach to defining the definition of “social reporting,” which significantly complicates its regulation, formation, and development. The semantic load of the term itself, which the authors put into it, also differs.

However, changing economic conditions—the transition to a digital economy—also transform the essence of social reporting. The digital format of the report erases the already fuzzy boundaries of the definition of “social reporting.” Business entities submit entire sections of their corporate websites to stakeholders in the public domain, accumulating information on sustainability and social responsibility with various types of reports presented in the .pdf format: social, environmental, integrated, and sustainability reports. Online access provides information on the implemented social and environmental programs, identifies the strategy, and discloses short- and long-term plans. Digital social reporting takes on different forms than traditional social reporting (Fig. 16.1).

Based on the identified approaches, we present the definition of social reporting in a narrow and broad sense. Social reporting should be broadly understood as a systemic set of information comprehensively disclosed by the business entity in accordance with the information needs of stakeholders, reflecting the social, economic, and environmental results of activities during the reporting period, as well as planned activities that can have a significant impact on any of its related stakeholders.

In a narrow sense, social reporting is a set of reports that reveal certain aspects of the activities of an economic entity in the social, environmental, and economic spheres during the reporting period. It is the subject of regulation of international and national standards.

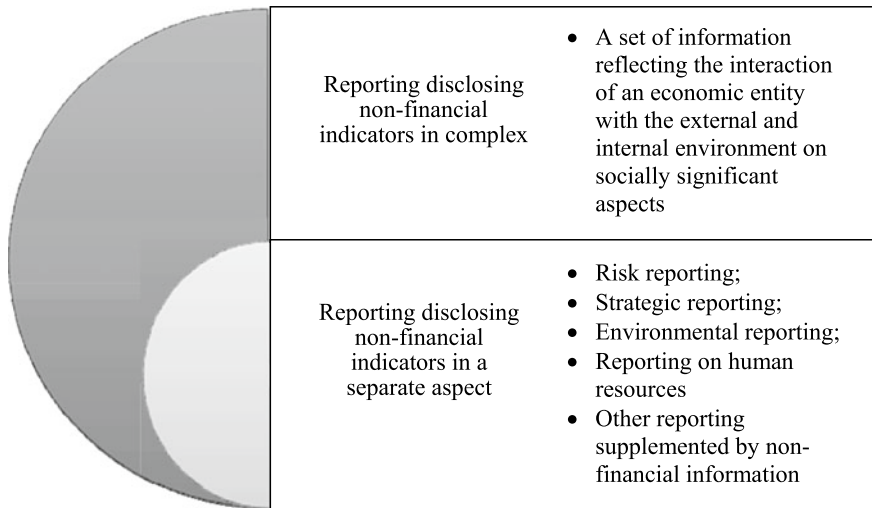


Fig. 16.1 Approaches to the definition of “social reporting.” *Source* Developed by the authors

The key factor of confidence in the activities of commercial organizations is to increase their information openness to stakeholders through the presentation of high-quality social reporting. Based on this, it should be considered what constitutes high-quality social reporting. Quality is one of the most complex, multifaceted scientific categories that a person has to face in their activities.

Nowadays, scholars explore the quality category in various aspects: philosophical, economic, and legal. Based on the presented approaches to the scientific quality category, it should be noted that it must be “considered as a scientific tool to increase competitiveness in the unity of quality management science and economics” (Semenov, 2011).

Within the framework of this research, this scientific category is considered in relation to the social reporting of commercial organizations, that is, the process and the result of its formation.

To date, foreign researchers have determined the following two main directions for studying quality issues (Habek, 2017):

1. Studies focused on quantitative analysis based on the volume of information disclosed (meaningful analysis and linguistic analysis);
2. Studies focused on qualitative analysis of disclosed information (analysis of aggregated quality indicators and assessment of disclosed information).

The results of the analysis of the Russian scientific literature are framed in the form of a matrix, the main components of which are the problems of the quality of non-financial reporting disclosed information (Table 16.1).

Among the works of Russian scientists, Chaldaeava, Krasikova, and Fedchin managed to reflect the quality problems (Chaldaeava et al., 2015) most fully. They identified five major groups that are found to varying degrees in the works of

Table 16.1 Matrix of the ratio of the quality problems of disclosed information in the studies of Russian scientists

Researcher	Disclosure quality issues				
Chaldaeva et al. (2015)	Lack of a uniform standard of non-financial reporting	Non-financial reporting problem: abstract wording, information asymmetry, and the lack of analysis of previously presented data	The problem of choosing the amount of information disclosed	The problem of interaction between organizations and stakeholders	The problem of choosing the amount of information disclosed
Alekseeva and Osipova (2015b)	–	–	The disclosure of excessive information that does not meet the needs of users	–	–
Blagov and Petrova-Savchenko (2012)	Inability to follow up on obligations when changing the form of the report	Lack of information on previously raised problems. Mentioning only problems without ways to solve them. Declarative reporting. Abstraction of formulations. No indicators to assess performance. Silencing of information	–	The non-inclusion of information perceived as widely known and unreliable mention	–
Aligadzhieva (2018)	Creative nature of reporting	–	–	Displaying the desired rather than the actual state of the enterprise. Misleading stakeholders	–
Russian Union of Industrialists and Entrepreneurs (Feoktistova et al., 2017)	Difference of calculation methods and metrics of indicators. The possibility of different interpretations of the information presented. Concealment of negative information and facts	–	Insufficient completeness of non-financial information	–	Lack of verifiability of non-financial information

Source Developed by the authors

other scholars. The listed studies of domestic and foreign scientists have made a serious contribution to the study of the quality problems of the reporting information. However, the issue of increasing the confidence of stakeholders in social reporting remains relevant.

Simultaneously, the quality of the sustainability reporting information and its proper presentation are covered by sections in existing reporting standards. The use of the GRI G4 standard allows reporting organizations to produce reports of the highest quality, as management has serious requirements for reflecting the results of their activities in the field of sustainable development. It clearly sets out the principles for ensuring the report's quality, which includes balance, comparability, accuracy, timeliness, clarity, and reliability (GRI, 2013, pp. 18–20). The national standard of the Russian Federation GOST R ISO 26000-2012 contains recommendations that organizations should consider when preparing reports, as well as ways to increase confidence in reports and statements about social responsibility (Rosstandart, 2012). In turn, the ten fundamental principles of the UN Global Compact allow for the variability of the information provided, as a result of which the published reports can be rather vague. Therefore, the lack of a single standard is one of the causes of reporting quality problems since existing standards have different disclosure principles.

Currently, measures are being taken at the state level to solve problems of the quality of disclosed information in the field of sustainable development. Thus, in the Concept for the Development of Public Non-Financial Reporting, approved by Government Decree No. 876-r of May 5, 2017 (Government of the Russian Federation, 2017), a special section is devoted to the topic of monitoring and assessing the quality of public non-financial reporting; an action plan has been developed to develop a system for monitoring and assessing the quality of reporting and improving the quality of information (Table 16.2).

Thus, the presented plan of measures for the development of the system of control and assessment of the quality of non-financial reporting and the improvement of the quality of disclosed information was implemented within the framework of fixed positions. However, all processes reflected in the plan are not static and require serious methodological and methodological work to improve the system of control and assessment of the quality of non-financial reporting.

16.4 Conclusion

A critical analysis of the given approaches to the quality of accounting information makes it possible to determine key provisions in relation to social reporting because it is the main source of information on the social policy of commercial organizations. One should agree with Zhukova and Bayanova, who indicate the following key provision of social reporting: “the availability of qualitative characteristics and properties; usefulness of information, that is, the focus of qualities and properties on meeting the information needs of stakeholders; possession of a certain value and value; grouping

Table 16.2 Action plan to develop the system of control and assessment of the quality of non-financial reporting and improve the quality of disclosed information

Name of the event	Implementation period	Results of implementation of planned measures
Implementation of the practice of using ratings and indices in the field of sustainable development, social responsibility, and development of a stock index of sustainable development	October 2018	The practice of using ratings and indices formed by the Russian Union of Industrialists and Entrepreneurs (RSPP), RAEX Rating Agency, and stock indices was introduced into the practice of sustainable development formed by the Moscow Exchange Annual reports on the results of the use of ratings and indices in the field of sustainable development and social responsibility
Development of methodological recommendations for reporting preparation	December 2018	Information letter on recommendations on disclosure by public joint-stock companies of non-financial information related to the activities of such companies dated July 12, 2021 No. IN-06-28/49
Development of guidelines for reporting evaluation	December 2018	Development of the public non-financial reporting process. Use of international reporting assessment methodologies (GRI G2, KPI, etc.)
Analysis of the existing reporting system, identification and analysis of the best international experience	Since 2019 (annually)	An analysis of the existing reporting system is carried out. The results of this analysis are published as part of the RUIE reviews, annual reports on the results of the existing reporting system in the Russian Federation
Enhance the practice of confirming reports	Since 2019 (annually)	Large companies confirm non-financial reports with public or professional assurance
Improving external reporting assessment	June 2021	Audit companies offer quality assessment services for non-financial reporting based on Russian and international standards

Source Developed by the authors based on Government of the Russian Federation (2017)

of qualities and properties depending on the materiality and insignificance of their nature” (Zhukova & Bayanova, 2015).

Additionally, a theoretical analysis of the literature shows that the problem of the quality of social reporting has been considered quite widely. However, certain issues remain poorly developed. It is worth noting that only a few scientists offer solutions to existing problems. They mainly refer to current non-financial reporting standards, their recommendations, and disclosure principles. It is necessary to single out another promising area for research in Russian science—measuring the quality of disclosed non-financial information and developing indicators for assessing quality.

In conclusion, it is important to emphasize that improving the quality of information disclosed in the social report demonstrates the serious attitude of the business entity to the needs of stakeholders, thereby serving as a fertile ground for building confidence in the company itself.

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Chapter 17

Human Resource Management in the Digital Transformation



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Abstract The paper aims to determine how digital transformation affects human resource management (HRM) in today's global economic environment. The considered example is the UK economy during COVID-19 and Brexit, in fact, how macroeconomic shocks since 2019 have affected the country's markets. The author analyzed the current state of research on this issue. The author divided the main areas of research in world science into financial sector HRM. It is determined that the digital transformation in HRM carries positive trends for the development of Industry 4.0. Based on the study of the situation in the UK, the author concluded that Brexit and COVID-19 negatively affected the entire service sector of Foggy Albion to a greater extent, and digital transformation did not stand aside. Based on empirical analysis and data, the author identified international trends in the transformation of customer needs and behavior.

Keywords Human resources (HR) · Technology · Productivity · Transformation · Digital economy · Threats and challenges · COVID-19

JEL Codes E15 · J11 · J24 · O15 · F14 · F16 · F17 · F62

17.1 Introduction

Most important resource for socio-economic development during the transition to an innovation economy is a person, his skills, knowledge, skills, and competencies. A significant number of scientists directly link economic growth with the development of human capital.

According to analysts, at the beginning of the twenty-first century, rapid digital transformation of socio-economic processes in healthcare, education, culture,

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science, and environmental protection is especially relevant. It requires the standard of living assessing methods that meet the requirements for the correctness of cross-country comparisons and allow analyzing the dynamics in comparable terms (UNCTAD, 2021).

Simultaneously, in our opinion, it is necessary to ensure a deep transformation of such concepts as the system of interaction of economic entities, economic processes of the enterprise, and national and global business models.

Nowadays, businesses need to focus on shaping a comprehensive vision of the foundations of digital transformation: from technology trends, new business models, and data-driven management to the necessary transformation of the organizational structure and corporate culture. These processes can be called secondary digitalization.

17.2 Materials and Method

Foreign and Russian scientists conducted research within the framework of the methodology for transforming the business models of a company (enterprise).

B. Carlsson claims that the ongoing changes (1990–2000) in the US economy are associated with the digitization of information (Carlsson, 2004). In turn, the digitalization of information in combination with the Internet is a form of universal technology that gives rise to a huge new array of possible combinations, the so-called New Economy.

Ignat (2017) analyzes how companies update their business models to new technological trends. The authors concluded that digitalization forces us to focus on new solutions.

Consoli (2012) analyzes the implementation and use of ICT and its impact on organizations.

Brocke et al. (2014) and Oswald and Kleinemeier (2017) analyze the understanding of business process management, offering a set of ten principles (Brocke et al., 2014). These principles characterize business processes as an area of research and determine their successful use in the organizational practice of an enterprise.

Vertakova et al. (2019) conclude that “the adaptability of the digital environment creates the possibility of optimizing business processes in the most complex management models”.

The literature review shows that the transformation of business models requires to improve the methodology of company management and the development of appropriate models and algorithms for digital transformation. One of the options for its implementation can be a microservice architecture, which is the development of a service-oriented architecture (SOA) of information systems.

There are problems related to the organization of joint activities of people and more rational use of their physical capabilities and professional abilities. Twentieth century left a rich legacy of approaches, theories, and points of view on how to understand and influence people’s behavior in an organization. When mastering the science

of management, future and current managers of all levels study various concepts, starting from scientific management, including the concepts of human relations, the theory of human capital, the concepts of personnel management and others.

Barriers of solving this problem are determined by new threats and vulnerabilities of a global nature: the COVID-19 pandemic, increased volatility in commodity and financial markets, and stable financial development are accompanied by unprecedented external, economic, political, and informational pressure.

To illustrate the diversity and abundance of proven approaches, scientific concepts, and management injections, the author provides a brief description of some of them in Table 17.1.

DiRomualdo et al. (2018) and Amladi (2017) described HR’s guide to digital transformation as ten examples of using the digital economy to transform human resources in manufacturing.

Card and Nelson (2019) analyzed how automation and digital disruption shape the workforce of the future.

Table 17.1 Theories, approaches, concepts, and schools related to HRM

Theories, approaches, concepts, and schools related to HRM	The main aspects and the subject of research	Approach to people in the organization, factors of influence on behavior
1. Scientific management F. W. Taylor	Organization of labor, labor regulation, material incentives; production worker	Personnel is a factor of production; proper organization of work and material incentives
2. Classic management H. Fayol	Management principles, management functions; organization as a unity of material and social	Personnel is the object of management; governance is based on adherence to principles. Methods of humane, competent, and moral management
3. School of human relations. E. Mayo and F. Roethlisberger	The importance of attitudes toward work, social relations in the team, and group processes for productivity growth; production team. Hawthorne experiment	Personnel is the personality of the group: at the level of the psyche and at the individual level, considering the attitude toward work in a team. Methods of social and industrial psychology
4. System approach L. von Bertalanffy and P. Drucker	Everything around us and we ourselves are systems with numerous systemic properties. The general properties of living systems are as follows: (1) Integrity; (2) Structurality; (3) Relationship between the system and the environment	Personnel, work groups, and workers are large and complex living systems; control, considering the system essence of the object and its properties

Source Compiled by the author

New technologies are ineffective if they are not implemented correctly. Often, companies put the organizational structure and the presence of an IT department as the basis for managing digital transformation. However, the factor becomes much more important—how employees can quickly and effectively adapt to new realities and technologies embedded in the work organization process. To maximize the benefits of new solutions, HR professionals must lead the process of training and retraining specialists and their transition to new positions.

17.3 Results

Nowadays, the world is Industry 4.0—“digital”—a rapidly changing system with an ever-increasing flow of information and technology.

Fursov et al. (2019), Gornostaeva et al. (2019), Khubiev et al. (2021), Reshetnikova et al. (2022), and Zakharchenko et al. (2021) raise the topics of HRM, automation processes, digital platforms, and other innovations change the basic nature of the workflow and impact human resources (HR).

The needs and expectations of users of financial services have changed significantly. Thus, the use of remote banking services in the world increased by 23%, and mobile banking applications increased by 30%.

Customers have become more demanding. The consumer experience is gaining importance: 68% of the users of financial services globally say COVID-19 has increased their expectations of digital capabilities for businesses.

Simultaneously, the cost and value of a product or service become the primary factor influencing the choice of consumers. Important elements of consumer experience that influence the client’s choice are the security of personal data and brand trust.

Consumers prefer convenient, simple, and fast services that do not require re-authorization and entering their personal data. Financial institutions are also adapting to these changes by offering customer-centric services and integrating financial services and traditionally non-financial products.

In this regard, the author proposes to consider possible ways to support and stimulate the service sector in general and foreign trade in services in particular. The COVID-19 pandemic and the uncertainty associated with Brexit the UK government needs to be more assertive in subsequent free trade area agreements with the EU. The decision of a country to withdraw from the EU single market reduces its attractiveness for investment and is the reason why there is an outflow of economic activity to the EU countries.

The first subgroup is stability in making political decisions. Now that the exit from the EU has been completed and the UK is pursuing the tightest possible break for the services sector, UK policymakers must prioritize the stability and regulatory coherence of this sector.

The UK government must ignore domestic political pressures and pursue a stable trade regulation policy.

Trade agreements with third countries and investment agreements could potentially play a role in stabilizing the dynamics of trade flows because these measures could make it harder for future governments to make destabilizing decisions if any.

The second subgroup is the most favorable operating conditions to remain attractive to European and international skilled workers. This means new challenges in attracting and retaining EU workers for UK service firms. In this situation, as a preventive measure for labor shortages in some sectors of the economy, there are new restrictions on worker activities that involve short-term travel.

17.4 Conclusions

Considering goals set and contemporary trends and the needs of citizens, businesses, and market participants, the author determined the key areas and tasks:

1. Development of regulation;
2. Implementation of infrastructure projects;
3. RegTech and SupTech;
4. Experimental legal regimes;
5. Information security.

As a result, it was concluded that digital transformation in HRM carries positive trends for the international trade. Problematic questions have been identified, the answers to which will form the basis of future research on this topic.

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Chapter 18

Organization and Protection of Electronic Document Management in the Youth Entrepreneurship System Based on IT Technology



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Abstract The authors conduct a structural analysis of the state and dynamics of IT companies in the Rostov Region as a factor influencing the choice of IT technology to organize and protect document management and accounting and analytical data in the peasant (farm) economy in the system of youth entrepreneurship. The authors present analytical expert reviews in the structure of the forecast economic indicators and the scenario for 2022 in developing a peasant (farm) economy. Based on the results obtained by I. V. Rudnitskaya, the authors attempted to present the concept and give a theoretical and methodological rationale for the need to develop a new architecture of IT system “P(F)E: Young Entrepreneur.” This new architecture is required to build effective and secure business processes and organize and protect document management and accounting and analytical data in the system of youth entrepreneurship in the peasant (farm) economy for the future.

Keywords Regional economy · Law · Peasant (farm) economy · Entrepreneurship · Youth entrepreneurship · IT industry · IT companies · IT technology · IT system · Organization · Protection · Electronic document management · Financial management · Accounting and analytical data · Pandemic · Post-coronavirus crisis · Rostov Region · Russian Federation

JEL Classifications E00 · K10 · L26 · L86 · M13 · M15 · Q10

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18.1 Introduction

Transformation and digitalization of the Russian economy retain a steady tendency to develop and expand the boundaries of IT management to address priority and strategic objectives to achieve:

- National development goals of the Russian Federation until 2030 (Presidential Executive Office, 2020);
- National security strategy of the Russian Federation (Presidential Executive Office, 2021);
- Strategy of economic security of the Russian Federation until 2030 (Presidential Executive Office, 2017).

These strategies and goals aim to ensure national and economic security and protection in all areas of the economy from the impact of external and internal challenges and threats at the federal, regional, municipal, and sectoral levels. T. V. Epifanova defines IT technology in entrepreneurship as one of the strategic factors that influence the economic and dynamic processes in the system of entrepreneurial activity of economic entities in the regions of Russia. According to Epifanova, past experience and present results serve as a target indicator and regulator for the formation of strategic goals and objectives in the knowledge-intensive and technological sphere, as well as for the implementation of the strategic direction in the field of digital transformation of public administration (approved by the Government of the Russian Federation (Government of the Russian Federation, 2021) at the end of 2021) to develop and implement directions for the introduction of artificial intelligence, big data, and the Internet of Things in the economy. According to L. A. Khabalyuk, IT technology of the present is a tool of economic and technological reality and legal regulation of entrepreneurial activity in the mechanism of public administration, which, in its specificity, create certain conditions and format for the development of a healthy and competitive national economy. L. A. Khabalyuk notes that IT technology is a tool to strengthen integration processes in terms of economic and legal globalization, expand horizons, and modernize all areas of business activities. Yu. S. Goloborodko notes that information technology today is the experience of yesterday and the innovations of tomorrow. The prerequisite for this is as follows:

- The need for strategic implementation and provision of IT technology for the digitalization of small- and medium-sized businesses;
- The need for incremental of business ideas in the innovative investment and technological process using high-tech design developments, software systems, and testing modules for effective business management;
- The need for a strong and competitive national economy regulated by law.

In today's conditions, effective financial management and accounting and analytical support of business with the support of IT technology contribute to the economic and legal dominant in the system of entrepreneurial management. According to T. V. Epifanova and I. V. Rudnitskaya, the system of youth entrepreneurship is a

progressive and strategic direction where the opportunities and benefits of using IT technology in business financial management are aimed at achieving the goals and objectives of the young entrepreneur. In managing financial and economic activities, a young entrepreneur faces high costs for the organization and protection of electronic document management. Young entrepreneurs are not always ready or unable to rely on their own capital or additional funding and support from the government.

Ambitious plans and results of state programs to support youth entrepreneurship and their scale over the past 5–7 years show a high rate of growth and increase in the system of youth entrepreneurship in the Rostov Region. The Rostov Region holds one of the leading positions in the Southern Federal District and Russia. The region has a favorable economic and geographic location and developed institutional and economic infrastructure.

The authors of this research conclude that the problem of organization and protection of document flow determines the multidimensional nature in the process of selecting an IT company capable of ensuring the safe organization and protection of financial databases in the business and financial processes of peasant (farm) enterprises (P(F)E) for the system of youth entrepreneurship. The development and establishment of agrarian Russia, a powerful farmer movement, and young entrepreneurs are one of the strategic directions of public policy; these processes affect the formation and growth of agricultural products and IT services in the industry. Thus, among the competitive IT companies of the Rostov Region, it is necessary to select the IT company that, by the results of ranking and rating, is ready to ensure a high level of organization and protection of electronic document management for the economic security of business and finance in the face of new challenges and threats, achieving the goals of economic security of Russia.

According to the authors of this research, the organization and protection of electronic document management using IT technology in P(F)E in the system of youth entrepreneurship determine the prospects and future adaptation of new IT technology in the management of financial flows, given the impact of new challenges and threats, the effects of the COVID-19 pandemic, and post-coronavirus crisis. IT technology is also a strategic tool used at all stages of financial electronic document management for remote areas of the Rostov Region with developing agricultural infrastructure, as well as for areas where the creation of a new P(F)E is planned by a young entrepreneur, but there is an unresolved problem of providing access to the Internet and weak access to communication, technological, and technical capabilities in the use of innovative IT products. According to I. V. Rudnitskaya, the solution to the problem of organizing and protecting electronic document flow is as follows:

1. Providing an accessible, rational, reliable, cost-effective, and economically safe systematization;
2. Synchronizing and storing accounting and analytical data during the performance of organizational, financial, and technological functions in the management of

business results of a young entrepreneur in the P(F)E in remote areas of the Rostov Region, where the following acute problems are observed:

- Poor availability of high-speed Internet (low frequencies or the lack of the Internet);
- Weak (or absent) system of advisory services for optimal and effective management of accounting and analytical data in the activities of a young entrepreneur;
- Weak (or absent) protection of electronic document flow in the financial management of P(F)E relying on IT technologies.

18.2 Methodology

The research methodology is based on the general scientific, formalized, and system-logical approaches to the research problem. The research methods include structural, content, and reflexive analysis, assessment and diagnosis of indicators, and functional theoretical modeling of business processes. Based on the methodology for developing regional, innovation, and institutional economics and technological breakthroughs in IT, the authors present the key role of structural and technological shifts in the cyclical processes of the economy and the conditions of the development of IT, naturally affecting the progressive development of IT technologies and economic systems in the region.

18.3 Results

Out of the 100 largest IT companies in the Southern Federal District of Russia (Ekspert Yug [Expert South] Magazine, n.d), let us present a structural analysis of the economic performance of the 43 largest IT companies in the Rostov Region (Ekspert Yug [Expert South] Magazine, n.d). The activities of the analyzed companies are aimed at implementing stable and secure IT products (services) in financial management and business processes in any business structures and business systems of small and medium enterprises.

IT companies in the Rostov Region account for almost 50% of the total number of major IT companies located in the Astrakhan, Volgograd, and Krasnodar Regions, the Republic of Crimea, and Sevastopol. This fact generally defines the priority positions of the Rostov Region in the development of the IT industry on the main types of activities: virtual operator, information security, implementation of IT technology, consulting activities, and work in the field of computer technology, computer software development, etc. Dynamically developing large suppliers of the IT industry steadily work to improve IT technologies aimed at solving problems presented at the beginning of this research. In this case, the area of youth entrepreneurship in the P(F)E has one of the key positions, and financial and business process management

with the support of IT technology to ensure the organization and protection of the document flow plays a key role. Thus, at the first stage, it is important to select an IT company (among a sufficient number of competitors) that can provide economic and other security of any information in the management of finance, accounting, and analytical data of the organization.

According to the analysis (Table 18.1, Fig. 18.1), the volume of net income in the activities of IT companies in 2019–2020 shows an increase despite the negative trends in the regulation of the country's economy during the COVID-19 pandemic.

Assessing the information security of IT companies in the Rostov Region during this period, we can see not quite a favorable trend. Out of the 43 largest IT companies, only two IT companies deal with and provide targeted security and protection of any information in the managerial, organizational, financial, and other processes for business (organizations), with 85 million rubles of revenue in 2020 (more than in 2019). This fact generally shows the strategic measures taken to regulate economic activity and the rapid adaptation of IT companies to the new business conditions due to the beginning of the COVID-19 pandemic. Assessing the revenue and net profit of IT companies in the Rostov Region for 2019–2020, with an increase as of January 1, 2021, the authors conclude that there is no negative inertia of economic processes in the main types of activities. According to the analysis of the net profit of IT companies on the main types of activities by January 1, 2021 (Table 18.1), despite revenue growth of almost 1.5 times, an unchanged tax rate of 20% for 2020, a year of pandemic processes and dramatic changes, an analysis of the resulting net income of IT companies by major activity, as of January 1, 2021 (Table 18.1), shows significant cycles: fluctuating economic activity and a “prolonged” depression. This trend is visible in an increase in the cost of sales of IT products (services), administrative and commercial expenses, and other income and expenses. Nevertheless, this indicator has not approached the critical level, indicating the inefficiency of the commercial activities of IT companies in the Rostov Region in 2019–2020, despite new challenges and threats since March 2020, the COVID-19 pandemic, and the post-coronavirus crisis.

The total revenue of IT companies in the Rostov Region (as of January 1, 2019) amounted to 1162 million rubles (Ekspert Yug [Expert South] Magazine, n.d), compared to 19,396 million rubles in 2015 (Ekspert Yug [Expert South] Magazine, n.d). This suggests that the total revenue received by companies from the sale of IT products (services) varied from the set price and sales volumes. In 2016, the total revenue of IT companies decreased to 17,725 million rubles. By 2017, we can see an increase in total revenues by 1866 million rubles (Ekspert Yug [Expert South] Magazine, n.d). By January 1, 2019, the gross profit of IT companies increased by 158.47 million rubles compared to 2015. In 2018, compared to 2017, this indicator decreased and amounted to –36 million rubles. A decrease or lack of growth in gross profit may be due to increased advertising costs, non-targeted applications, implementation and testing of software, etc. There could be many reasons. As of January 1, 2019, the share of IT companies in the denominator of total revenue increased by 2.63% compared to 2015. In 2016, the share of total revenue has decreased relative to other periods; it amounted 55.56%. By early 2019, the average estimated profit

Table 18.1 Structure of some economic indicators of IT companies by type of activity in the Rostov Region for 2019–2020, increase as of January 1, 2021

The main activities of IT companies in the Rostov Region	Total IT companies, pcs	Revenues, mln. RUB 2020	Revenues, mln. RUB 2019	Increase in revenue, mln. RUB as of January 1, 2021	Net profit, mln. RUB 2020	Net profit, mln. RUB 2019	Increase in net profit, mln. RUB as of January 1, 2021
Advisory activities and work in the area of computer technology	3	356	270	86	56	21	35
Activities related to the use of computers and IT technologies, other	4	438	392	46	75	80	–5
Information security	2	197	112	85	21	–4	17
Development of computer software, consulting services, and other related services in this area	29	3867	2755	1112	758	265	493
Development of websites, mobile applications, web applications, and mobile games	5	993	812	181	213	158	55
Total:	43	5851	4341	1510	1123	520	595

Source Compiled by the authors

after all tax and depreciation deductions for IT companies increased by 1.20 million rubles compared to 2015. The average profit figure for 2018 is 1.98 million rubles; a decrease of 0.26 million rubles compared to 2017. In general, the analysis of the main economic indicators of IT companies for 2015–2018 in the Rostov Region showed a positive trend (Fig. 18.1).

As of early 2022, the cautious forecasts by experts had a resonant position. Nevertheless, despite the pandemic effects and the post-coronavirus crisis, experts made

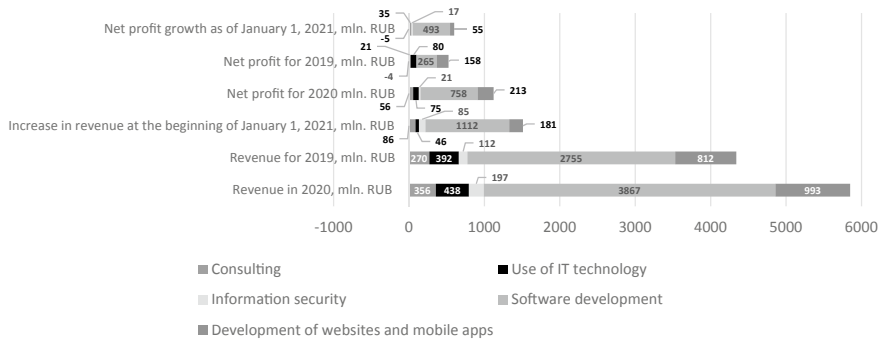


Fig. 18.1 Structure of the development revenue and net profit of IT companies by main activities in the Rostov Region for 2019–2020 with an increase as of January 1, 2021. *Source* Compiled by the authors

optimistic predictions. Thus, the predictive data of the analytical center “Rusagrotrans” predict that the gross yield of grain will be approximately 127 million tons at the end of the first decade of December 2022. According to preliminary data from the Ministry of Agriculture of the Russian Federation, a total of 19 million hectares were sown with winter crops. The area under winter crops is 0.3 million hectares lower than in 2020 but 0.7 million hectares higher than in 2019. According to the Russian Federal Service for Hydrometeorology and Environmental Monitoring (Roshydromet), only in December, 3% of winter crops were in bad condition compared with 20% the year before (Pole.rf [Field] Magazine, 2022). In general, the forecasts of experts in the agricultural sector do not predict that 2022 will be more positive than 2021 because it is impossible to predict the level of income of enterprises and make plans for long-term development due to rising prices for all components of production and the unpredictable influence of the state on business. The effects of the COVID-19 pandemic and related quarantine restrictions continue to affect the sector in the first half of 2022. E. Ivanov, a leading expert of the Institute of Agricultural Market Conditions, indicates that in 2022, the Ministry of Agriculture of the Russian Federation plans to increase sugar beet sowing to 1.1 million hectares. In 2021, this figure was a little more than 1 million hectares. Thus, if this figure increases by 10% or more, then the Russian economy expects another overproduction of sugar, as in the season 2019–2020, to 8 million tons, thus influencing the price decrease (Pole.rf [Field] Magazine, 2022). M. Maltsev, Executive Director of the Russian Oil and Fats Union, predicts an increase in the areas under oilseeds for 2022 by 4–5%, which will affect the yield and gross yield, which could increase by 10% by the end of 2022 compared with 2021 (Pole.rf [Field] Magazine, 2022). A. Korbut, a vice-president of the Russian Grain Union, sees the solution to many problems and further development of P(F)E through measures of state regulation and reduction of administrative barriers: setting maximum prices and quotas for duty-free import to reduce the negative “momentum” in conditions of crisis and economic uncertainty (Pole.rf [Field] Magazine, 2022). At the end of the first half of 2022, indicators show that recent

developments in 2020–2021 have fundamentally changed the specifics of business management of P(F)E, where the system of youth entrepreneurship occupies key positions. Summarizing the analytical data and forecasts of experts in the sphere of collective farms in Russia is an apparent fact of the need to implement effective IT technologies that can provide an economically safe and profitable format for the development of new collective farms, considering the influence of new challenges and threats, as an important sector of the national and regional economy.

18.4 Discussion

As a result of this research, I. V. Rudnitskaya made an attempt to present the basic framework and theoretical and methodological presentation of the concept of the new architecture of the IT system “Peasant (farm) enterprise: Young Entrepreneur” (“P(F)E: Young Entrepreneur”). I. V. Rudnitskaya suggests that the architecture of the IT system “P(F)E: Young Entrepreneur” provides a fundamental basis for solving the main tasks aimed at safe financial management and accounting and analytical data in peasant (farm) enterprises:

- (a) To monitor and compare existing IT technologies with software complexes operating in the applied field of organizing and protecting document management in P(F)E, where the introduction of IT products has increased efficiency in financial management and accounting and analytical data for the reporting periods of 2020–2021, considering factors of pandemic influence and post-coronavirus crisis;
- (b) To analyze the parameters of IT technologies that have not been tested in the methodology on the principle of ranking, qualitative and technological criteria, or have not entered the system of rational financial management in the process of organization and protection of document flow in enterprises (organizations);
- (c) To structure economic, legal, and technological factors that influence the choice of IT technology for the organization of document management and protection of accounting and analytical databases in financial management in the activities of P(F)E; to present a theoretical–methodological and scientific rationale for the need to select the technical and economic parameters of IT technology that has a direct impact on the effective organization and protection of electronic document management for the system of youth entrepreneurship in the area of P(F)E based on IT technology;
- (d) To make a refined, detailed analysis of the idea, concept, and purpose of the IT system “P(F)E: Young Entrepreneur” in terms of optimality, economic benefit, and security of records of algorithms to organize and protect electronic document management in the activities of P(F)E for the development of youth entrepreneurship;

- (e) To present and substantiate the scientific novelty, practical significance, and value of this IT system for the IT industry, economy, and system of youth entrepreneurship in the area of P(F)E aimed at the following:
- Ensuring economic security of accounting and analytical databases;
 - Increasing the status of document management at all levels of financial activity;
 - Increasing the level of protection of financial data and results in the activities of a young entrepreneur in a peasant (farm) enterprise;
 - Ensuring financial controlling to concentrate control operations in the most important areas of financial and economic activities, possible ways to coordinate further action in determining the actual deviations from the planned results.
- (f) To form criteria and indicators for choosing an alternative and possibly free IT platform to create an IT system “P(F)E: Young Entrepreneur,” which actively integrates and interacts with other performing IT environments in financial management and business processes for operational and strategic management and financial decisions at any stage of business by a young entrepreneur.

In Table 18.2 I. V. Rudnitskaya presented the advantages and capabilities of the IT system “P(F)E: Young Entrepreneur” for the organization and protection of document flow in the system of youth entrepreneurship:

I. V. Rudnitskaya also highlights the disadvantages of “P(F)E: Young Entrepreneur:” outsourcing allows the young entrepreneur to transfer certain types of organizational and financial functions of doing business based on a signed bilateral agreement for at least one year, thereby determining the need for the entrepreneur to involve risk management methods when using outsourcing in the activities of the peasant (farm) enterprise.

During the research, I. V. Rudnitskaya formed the basic framework of the primary record and description of the content of some algorithms to develop the architecture of the IT system “P(F)E: Young Entrepreneur” to ensure the organization and protection of databases, accounting, and analytical data in financial management and reporting in the system of youth entrepreneurship:

- a1...—entry into the system (password, two-factor authentication);
- b2...—entering the activation mode of daily updates;
- a1 + b2 = c3—logout;
- a1...—entry into the system (password, two-factor authentication);
- b2...—consulting service—consulting in the P(F)E
- c3... d4...—consulting service—financial service in the P(F)E;
- (d4)—regulations of the financial management of the P(F)E;

$$s_{10} = a1 + b2 + c3 + d4 + e5 + z6 + k7 + l8 + i9$$

s₁₀—logout, etc.

For scientific presentation, I. V. Rudnitskaya disclosed a theoretical model of the tasks of the IT system “P(F)E: Young Entrepreneur” in a consistent systematization

Table 18.2 Advantages and possibilities of the IT system “P(F)E: Young Entrepreneur” for organizing and protecting document flow in the system of youth entrepreneurship

IT system “P(F)E: Young Entrepreneur”	
Advantages	Possibilities
Free version; no costs that lead to a reduction in economic benefits; 24/7 processing of documents	For individual entrepreneurs of P(F)E and small enterprises of P(F)E
Protection (two-factor authentication) of business processes in electronic document management of databases, accounting, and analytical data; protection of electronic document management; protection of work in the system and its information structure	Management of business and financial operations by the owner of P(F)E and small P(F)E
Ensuring the protection and storage of electronic documents in the document management	Systematization of business processes at the most efficient level based on consistent algorithms
Provided with a roadmap for counseling services	Adaptation to the current conditions of doing business in the context of digitalization, new challenges, and threats
Interaction with clients (individual entrepreneurs); outsourcing to transfer managerial and financial functions of P(F)E to professionally support individual systems in the management of accounting and analytical data	Reduction of financial risks and losses in financial management in an unstable economic, legal, financial, and informational situation for the young entrepreneur (beginner or existing)
Reduce business costs and minimizes risks in the process of organization and protection of electronic document flow in managing accounting, analytical, and reporting data; provide rational use of human resources	Provide possible alternatives in the management of finance and accounting and analytical data in financial, bookkeeping, and other accounting in compliance with the criteria of transparency, reliability, and security of this IT system

Source Compiled by I. V. Rudnitskaya

and description of processes aimed at organizing electronic document management in the organization of accounting and analytical data in Fig. 18.2.

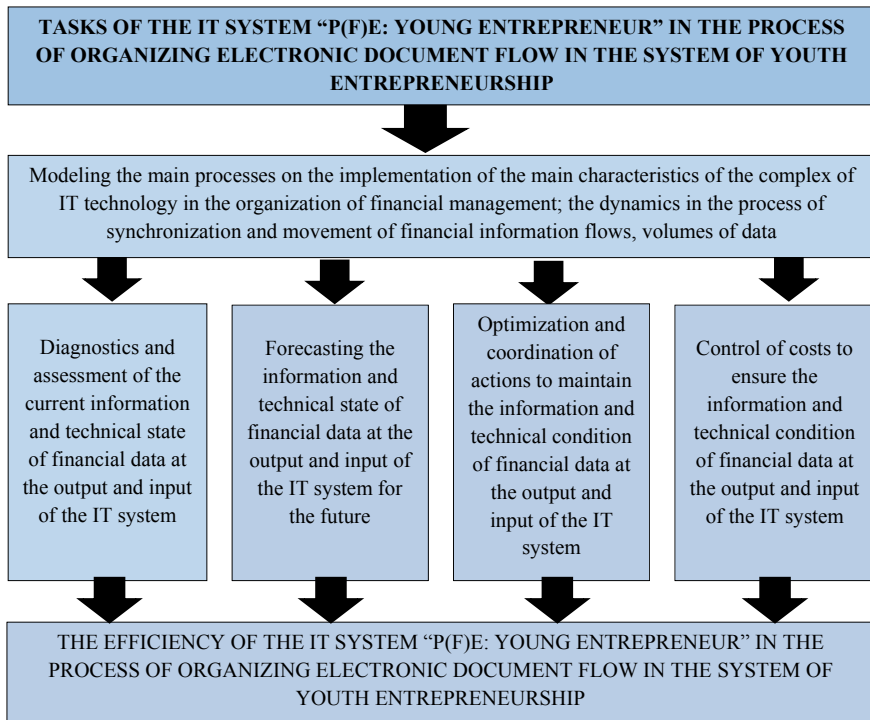


Fig. 18.2 Tasks of the IT system “P(F)E: Young Entrepreneur.” *Source* Compiled by I. V. Rudnitskaya

18.5 Conclusion

In conclusion, the authors note that the problem of organizing and protecting electronic document management with the support of IT technology in the system of youth entrepreneurship determines the further prospects and adaptation of new IT technology in the management of finance and accounting and analytical data in P(F)E. This problem can be solved by providing accessible, rational, reliable, cost-effective, and economically safe systematization, synchronization, and storage of accounting and analytical data in the process of organizational, financial, and technological functions in managing financial data. There remains a steady need for a comprehensive analysis of the largest IT companies in the Rostov Region that are capable of providing safe and effective organization and protection of financial and accounting and analytical data in business and financial processes in the P(F)E for the system of youth entrepreneurship. Indicators of the state and dynamics of economic indicators of IT companies in the Rostov Region are a factor influencing the choice of IT technology for the organization and protection of document management in youth entrepreneurship and a catalyst for theoretical and methodological justification of the

need to develop a new architecture for the IT system “P(F)E: Young Entrepreneur” to ensure optimal, affordable, economically safe, beneficial, and reliable organization and protection in the management of finance and accounting and analytical data in P(F)E.

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Chapter 19

Digital Technologies to Ensure the Technological Independence of the Labor Market



Assem B. Urekeshova , Zhibek B. Rakhmetulina , Igor N. Dubina ,
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Abstract The world is on the verge of a great technological revolution. It is impossible to predict the exact moment and scale of the upcoming changes. Nevertheless, without any doubt, our society is waiting for colossal changes caused by end-to-end digital technologies. Relationship between a person, the government, and the business will change dramatically. In terms of its scale and foundation, digital transformation will be unlike anything humanity has experienced before. It is necessary to constantly update and study the digitalization of the economy and the latest breakthrough trends to develop new legislative projects and consistency between the launched programs. Private business is stagnating in its development due to the lack of experience, budgets, and generally accepted standards for data analysis, storage, and processing. Many enterprises suffer from problems with the integration of electronic systems in different sectors.

Keywords Digital technologies · Digitalization of the economy · Labor market · Labor relations · Production process · Modernization

JEL Classification E2 · F16 · J24

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19.1 Introduction

Technological driver in the form of a sharp increase in computing power reduces the cost of storing and processing information (Burkaltseva et al., 2022; Kuksin, 2020; Makovetsky & Saitova, 2022; Rudyk et al., 2022; Sergeeva, 2021).

As country accelerates new infrastructure construction (e.g., 5G, large data centers, artificial intelligence, and industrial Internet), market participants accelerate the pace of digital transformation and modernization (Baigireyeva et al., 2021; Niyazbekova et al., 2021; Petrova et al., 2022; Pravikov et al., 2018).

19.2 Method

The issue of employment has always been at the center of attention in the country's development process (Khussainova et al., 2019; Popkova, 2013). Ensuring employment is associated with improving people's living standards. It is also a solid foundation for qualitative development (Zharicov et al., 2016; Sergi et al., 2019).

Emerging sectors (information and communication technologies, cloud computing, big data, etc.) continue to form, increasing the number of digital industries (Popkova, 2013). Jobs in digital industrialization rely on broad application scenarios and the huge scale provided by traditional industries (Popkova, 2013). Technologies increase social productivity and optimize the allocation of resources.

19.3 Results and Discussion

Currently, many relevant government departments, leading industrial enterprises, Internet platforms, financial institutions, research institutes, industry associations, etc., have actively reduced transformation costs, shorten the transformation cycle, and increase the success of the transformation (Evmenchik et al., 2021; Niyazbekova et al., 2022; Novitsky, 2016; Nurpeisova et al., 2021; Popkova & Sergi, 2020; Solodov, 2017).

Among these measures, human resource management is an important component of enterprise management. Its digital transformation can help enterprises ensure business continuity, increase the efficiency of labor operations, reduce risks, and control costs in times of market uncertainty.

Human capital is one of the key non-digital factors. In the traditional sense, and experience acquired by people that affect their productivity and ability to work and increase opportunities in the labor market (Evmenchik et al., 2021; Niyazbekova et al., 2022; Nurpeisova et al., 2021). Demanded workers should have a wide range of knowledge and competencies in scientific and technological fields (Gorbacheva, 2020; Khussainova et al., 2019).

For many companies, it is not easy to increase the efficiency of labor operations, but labor costs are getting higher and higher. In particular, although some large- and medium-sized enterprises have long been well aware of the need for digital transformation and modernization of human resource management, they still face the challenges of intelligent human resource management, such as technology and talent in the transformation process.

The digital economy is entering a period of rapid development. Companies in various industries are accelerating their digital transformation, including human resource management. Providers of intelligent digital transformation services are also on the “lance,” but digital transformation should stimulate people, businesses, and data.

The potential of these three allows them to create synergies in business model, service model, research and development model, operational model, production model, and decision-making model in the enterprise (Sergi et al., 2019).

There is no relatively stable digital standard in this process; some enterprises may need several operational services for a specific transformation and implementation. Therefore, centralized, unified, and specialized digital transformation service providers still need further development.

Thus, the destruction of some jobs will naturally create new jobs. Nevertheless, the jobs created by new technologies require certain skills, knowledge, and competencies. The increase in overall productivity is based on technological progress, but the most important way is the transition from agriculture to the high-performance sector based on labor.

Rural labor is hard and has risks. In this process, the sector from which labor leaves has low productivity, the sector into which it enters has high productivity, and overall labor productivity improves. That is, an increase in labor productivity cannot depend on a simultaneous increase in the productivity of all enterprises. Capital is a factor, and the distribution of the market is sufficient. Nevertheless, the peculiarity of labor and the factor of production is that a carrier is a person (Zharicov et al., 2016).

One of them is the market mechanism of supply and demand. The second method is to focus on how to allow workers to get a labor market system after the emergence of new forms of employment. Some people think that the labor market is developing too slowly that increases the restrictions imposed by enterprises on workers and increases costs. In general, it shows the result of labor.

19.4 Conclusion

It is necessary to constantly update and study the digitalization of the economy and the latest breakthrough trends to develop new legislative projects and consistency between the launched programs.

Private business is stagnating in its development due to the lack of experience, budgets, and generally accepted standards for data analysis, storage, and processing.

Many enterprises suffer from problems with the integration of electronic systems in different sectors.

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Chapter 20

Digital Transformation in the Modern Educational System



Ibodullo S. Khotamov , Elshod G. Umarov , Victor P. Kuznetsov ,
Zhanna V. Smirnova , and Maksim M. Kutepov 

Abstract This article discusses the digital transformation in the education system at the present stage. The article discusses one of the most priority areas of preparing society for transformation in innovative activities, namely the informatization of labor, is the educational system. In the course of the study, the theme of the development of information technologies in educational institutions is substantiated. The purpose of the study is determined to analyze the model for the development of digital transformation in educational activities. In the process of research, the author identified the main aspects of the digital transformation of the educational system. The components influencing the formation of the basic principles of learning for students in the event of digital changes in educational activities are considered. To solve the problems posed, a model of digital transformation in the educational system has been developed. The author analyzed the results of the study and made a conclusion on the transformation in the education system—the introduction of information technologies into educational activities as digitalization in the education system. As a result, online education is becoming cheaper and more comprehensive.

Keywords Transformation · Digitalization · Education system · Informatization · Digital technologies

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JEL Classification R11 · R12 · R 58 · Q13 · Q18

20.1 Introduction

The socio-economic development of Russia today is aimed at the formation of innovative human resources in the country. One of the most priority areas of preparing society for transformation in innovative activities, namely the informatization of labor, is the educational system.

It is in the process of professional training that the necessary result can be achieved—the training of a specialist. Questions on the implementation of digital transformation pose new challenges for the education system.

The relevance of the issue under study will be the use of digital technologies in educational activities, which are determined by the processes of transition to a digital economy and the digitalization of society.

20.2 Methodology

Transformation digitalization broke into the educational system with the onset of the COVID-19 pandemic. Most educational organizations have switched to distance learning, which has led to the need to use information technology in educational activities. The heads of educational institutions are faced with the issue of developing a planned digital development of digital transformation, providing each student with a smooth transition to the information educational environment.

One of the problems of digitalization is the solution of a number of basic tasks: the development of the content of educational activities using digital technologies, the supply of the material and technical base in full, the development of relevant assessment tools, as well as the use of digital transformation in general: artificial intelligence, databases, and blockchain.

The impact of digital transformation on the education system has only led to a positive result, but despite the widespread use of transformation in educational institutions, a number of problems arise.

Most educational institutions still do not have the opportunity to purchase and install information educational technologies. Some schools lack computers, do not have access to the Internet, or have an outdated e-learning system. These problems require the management of educational institutions to update the technologies of the learning system itself before introducing digital transformation (Kuznetsova et al., 2022).

In the process of our research, we substantiated the theme of the development of information technologies in educational institutions. The purpose of this study is to analyze the development model of digital transformation in educational activities.

20.3 Results

The transition of educational institutions to digital transformation is a step forward into an innovative educational environment with automated information and multi-functional actions.

The main opportunities for the transition of the learning process in higher education institutions are the use of new methods and forms of learning: interactive video, the use of artificial intelligence in knowledge testing, micro lessons. This format of education contributes to the active participation of students in educational activities (Andryashina et al., 2022).

Digital transformation in the educational system includes a number of key aspects:

- common vision of information;
- development of general cultural principles;
- creation of a rich educational environment;
- creation of conditions for continuous development;
- personalization of the educational process;
- professional development of all employees of the school.

The very educational system of digital transformation includes organizing them in accordance with the modern possibilities of the information society and the digital economy.

This system influences the formation of key indicators of their professional activity among students of educational institutions:

- fundamental natural science and humanitarian training;
- digital and technological literacy;
- ability to self-education, qualities of the digital economy.

To date, schools and universities are not entirely interested in developing digitalization strategies. They either don't have the time, or they don't know how to implement this or that technology. That's why they usually don't have a clear idea of what they need to change or implement. This slows down the process and at first does not bring the expected results (Lebedeva et al., 2022).

System failures can occur due to hacker attacks or technical problems (for example, with servers). This can lead to significant leaks and data loss, which is unacceptable for a reputable institution. Lack of technical knowledge and knowledge of cybersecurity fundamentals are key factors that can affect the e-learning system.

To solve the problems posed, we have developed a model of digital transformation in the educational system (Fig. 20.1).

Digital innovations in education are evolving and constantly evolving. There is a clear pattern of implementation of certain systems in many educational institutions.

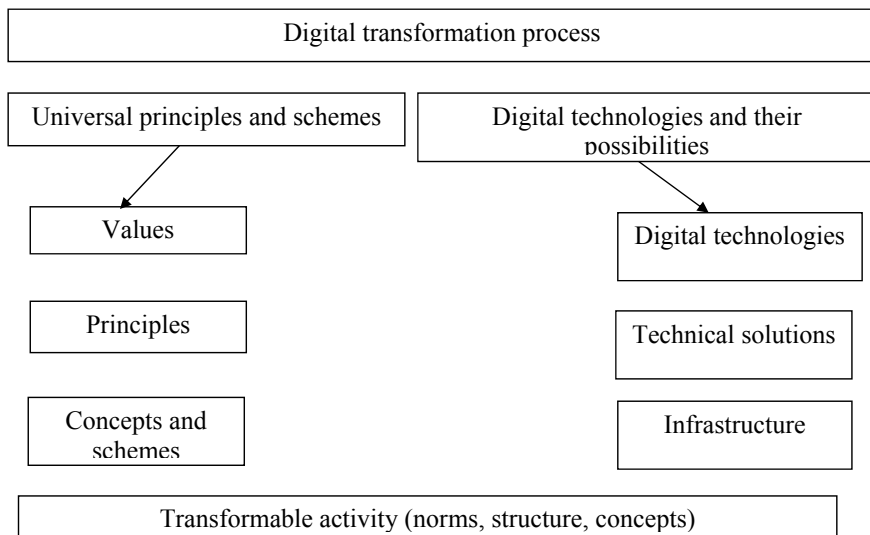


Fig. 20.1 Model of digital transformation. *Source* Developed and compiled by the authors

Consider the most popular trends:

1. Internet of Things

The Internet of Things has the potential to bring big changes to both online and offline learning experiences. Thanks to this, colleges and schools can create smart campuses, automate many repetitive tasks and provide everyone with access to high-tech tools that make life easier for a student (Mizikovskiy et al., 2022).

2. Blockchain

This is a fairly convenient option for storing personal data of employees and students. In addition, the use of blockchain technologies helps to maintain security, which is the main condition for its implementation. In addition, the technology allows authentication, which reduces the likelihood of plagiarism and fraud.

3. Big Data

Big data is ideal for managing, organizing and analyzing vast amounts of information. In education, big data can help track student progress and find ways to improve learning.

There are countless examples of digital transformation in higher education. The progress in the industry is quite fast. The transition to smart boards and online schools is a significant improvement that continues to bring new changes to the way we learn (Mizikovskiy et al., 2022).

20.4 Conclusion

Thus, based on the foregoing, we can conclude that it is impossible to overestimate the importance of digital transformation in education and science. This opens up more opportunities for students and teachers, gives people with disabilities a chance for more accessible learning environments, and helps increase student engagement (Romanovskaya et al., 2022).

It's also a great way to improve your teaching skills. As the number of digitalization processes grows around us, teachers, tutors, and school principals will eventually have to get used to technology. Digital transformation brings more convenience, provides better data security, improves accuracy, and provides a more objective assessment of student performance (Romanovskaya et al., 2022; Smirnova et al., 2021, 2022; Suglobov et al., 2020; Tsymbalov et al., 2022; Yelenevskaya, 2018).

The digital transformation in education aims to increase engagement and accessibility through interactive and customizable learning. As a result, online education is becoming cheaper and more comprehensive.

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Chapter 21

Development of the Labor Market in the Context of the Formation of the Digital Economy



Assem B. Urekeshova , Zhibek B. Rakhmetulina ,
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Abstract The use of digital technologies helps eliminate difficulties in solving structural issues in various fields that require non-standard approaches, modernize the stagnant production process, and improve the system of industrial labor relations. Informatization and digital technologies have a connection with the development and promotion of robotics. It is based on advanced technologies, Internet networks, computer programs, and gadgets. Society fundamentally changes its structure. There is a process of global changes. The nature of work is changing, the role of intellectual creative work is growing, and the nature of employment is shifting (remote work through advanced information and communication technologies). General criteria for the education system and professional qualities have grown. The economic process of industrialization is characterized by an increase in the physical parameters of production—the intensification of equipment, an increase in the number of employees, and significant mandatory investments that can be made only by established enterprises with stable production, established sales, and positive income dynamics or simply financially wealthy players can make. A significant vector in the implementation of the digital economy program is the self-digitization of the country, which means the process when measures to promote the main directions of the innovation or network economy are implemented by the country itself, represented by state corporations and companies with state participation.

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Keywords Digitalization of the economy · Labor market · Labor relations · Production process · Modernization

JEL Classification E2 · F16 · J24

21.1 Introduction

The state apparatus plays a decisive role in developing the country's economy, forms the labor market, and is responsible for its productivity.

According to experts, as a rule, traditional competition mechanisms do not fit within the usual framework in such countries.

Modernization of the national economic space within the framework of digitalization of the economy can have global socio-economic results because it transforms the state apparatus, giving it an additional impetus to build an effective management system.

The introduction of an innovative economy can change the views of citizens on participating in the economic life of the country and improving their own well-being through the development of social and entrepreneurial activity (Burkaltseva et al., 2022; Kuksin, 2020; Makovetsky & Saitova, 2022; Rudyk et al., 2022; Sergeeva, 2021).

21.2 Background and Methodology

COVID-19 has caused significant economic damage to most countries worldwide. Digitalization has become an effective tool for minimizing economic losses and solving the problems encountered.

Isolation, aimed at ensuring the safety and non-proliferation of the infection, caused work and training on a remote basis. Thus, 70% of the world's population was trained using digital technologies; more than 50% of employees of global companies switched to remote operations.

This was made possible by the existence and ease of use of digital technologies. Experts believe that the period of economic recovery after the crisis caused by the COVID-19 pandemic is three years, but the consequences will be felt within a decade (Baigireyeva et al., 2021; Niyazbekova et al., 2021; Petrova et al., 2022; Pravikov et al., 2018).

21.3 Discussion and Results

Nowadays, the development of the labor market in the conditions of the digitalization of the economy is impossible to imagine in any branch of economic activity that does not use computer technology, gadgets, or digital technologies in its activities. The digital era was marked by the accelerated formation, evolution, and introduction of information and communication technologies in various areas of human activity, as well as by a radical change in ICT, including the emergence of new areas of the economy.

Optimizing the labor process and reducing production costs, companies move into the virtual space and increase productivity, decision-making speed, material and financial turnover, and the level of human capital (Evmenchik et al., 2021; Novitsky, 2016; Niyazbekova et al., 2022; Nurpeisova et al., 2021; Popkova & Sergi, 2020; Solodov, 2017).

A global market has been created in the World Wide Web, a world trading platform with almost complete absence of borders and barriers, fierce competition, and extreme mobility of the market components—transnational corporations and national companies, goods and services as an element of export–import operations, and producers and consumers of products of a giant conglomerate of participants in economic relations.

In the new technology, the favorites in the economic struggle are companies and countries that achieve the highest speed of analytical work and develop the ability to operate with significant flows of information compared with competitors and effectively manage the advantage obtained (Evmenchik et al., 2021; Niyazbekova et al., 2022; Nurpeisova et al., 2021).

The dominant position is the ability of business structures to hear consumer requests, often acting ahead of the curve, predicting demand, or, even more effectively, conducting competent marketing research to create and regulate demand by offering new products.

To promote their products, companies widely use promotions and almost limitless possibilities of the Internet.

Thus, the price of companies is determined by real tangible assets, raw materials, production capacity, output volumes, and “communication presence,” that is, an intangible asset that can play a significant role in the monetization of the company and goods and services offered to the consumer.

One of the important characteristics is the recognition and popularity among users of the World Wide Web of a particular brand, the number of visits to the company’s pages, and the time spent by users to get acquainted with the products, positive reviews, and complaints about the product produced (Gorbacheva, 2020).

21.4 Conclusion

Thus, digitalization is an engine of economic and social development, a tool for creating new opportunities.

According to experts in the field of digital technologies and economists, with the differences in the areas of the economy, the speed of modification from the existing to the digital format, and the lack of equal conditions for using the advantages of digital technologies, it is difficult to overestimate the importance of digitalization in today's life in general and economic processes in particular.

Experts agree that the process of digitalization is the only possible progressive way of effective development of an enterprise, industry, and economy, even in those areas that are not distinguished by an excessive desire for the introduction of digital technologies.

It is known that the EU, the USA, Canada, South Korea, the Russian Federation, Japan, and many other countries, realizing the importance of the digital revolution in the economy and having the necessary means to implement it, are implementing a large number of programs in the direction of digitalization of the economy.

These strategically important areas are a high stage of creation and existence of digitalization of the economy and the economy of states, integrating private individual technological developments in one or several industries into a single whole and acting in the form of a specific application or program as a whole. The combination of state measures to support the digitalization program of the economy gives impetus to the adoption of promising innovative solutions, which often leads to highly effective results (Khussainova et al., 2019).

Any action in the economy aimed at creating a product requires simple solutions, clear commands, rapid transfer of information, and operational work anywhere in the world to counter risks and external challenges that can negatively affect economic processes in the country.

The UN, the IMF, and the EBRD have set goals to reduce differences and reduce inequality between these countries. The number of gadgets connected to the Internet is growing, and more people are using digital services. Therefore, the number of value chains connected to the digital network is growing. There is an urgent need for digital data transformation and obtaining the latest technologies.

Thus, according to the possibilities of access to the global information space and the need to transform the data obtained into digital intelligence, digitalization has become one of the criteria for the competitiveness of national economies. Governments of developed and developing countries try to stimulate rapid digitalization by developing government and strategic documents.

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Part III
Place and Role of Artificial Intelligence
(AI) in Managing Sustainable Development
and Economic Security

Chapter 22

Perspective Trends of Standardization in the Field of Quality and Information Security of Contemporary Organizations



Karina F. Mekhantseva , Inna V. Ukraintseva ,
and Svetlana V. Solenaya 

Abstract The practice of information security management has been dramatically changed in the last two years. The speed and scope of work with information and, as a result, the security requirements have been changed. Massive proliferation of remote work formats and changing teamwork structures add risks. The territorial dispersal of teams during the transfer to remote work from home has added points for information attacks. The easing of restrictions during the stabilization of the situation with the COVID-19 pandemic was replaced by a new wave of restrictions of a different nature with the development of events in Ukraine, layering new risks of different natures. The management of constant changes and their associated risks in the information economy is becoming an essential part of management, requiring the embedding of information security management systems into the integrated management systems of modern organizations. The research aims to identify the main aspects and trends in developing security techniques in information technology management, as well as directions in its standardization of a key system tool. Information and statistics were brought from the official sites of the International Standard Organization (ISO). The authors applied such research methods as grouping, stratification, comparison, and mnemonic analysis. It is proposed to expand the practice of standardization in the service sector because services cover more and more significant and to continue harmonizing the families of standards based on the ISO 9000 family, the ISO 14000, and other standards that support sustainable development ideas. The authors conclude that standardization will be the core of information security management systems. Standardization will extend to new objects in information technology.

Keywords Organization · Information security · Quality · Standardization · Contemporary organizations

JEL Classification L15 · L23 · M15 · D81 · O47

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22.1 Introduction

Nowadays, information is placed in possession of the organization and is pursuing the beneficial cost. Thus, information should be protected. Vulnerabilities in the open security of any assets that are not eliminated and achieved in time can manifest themselves in catastrophic losses of financial resources and reveal irreparable damage to business processes.

In the early 1980s, information protection could be organized with the help of specially developed organizational measures and encryption software and hardware. Information security issues have become more acute with the invention of local and global networks and satellite communications. Information management issues should be addressed throughout the organizational process—the process of managing an organization's security disclosure related to actually providing security disclosure and mitigating the identified security disclosure risks to its business. Any information that can be used to ensure information security, quality, cost, and environment should be useful to such a management process. Any actions taken as a part of the performance of any activity must be completed in the information security management process.

What is good for one organization may not be good for others. Therefore, they require various forms of organizational structure, processes, and mechanisms that require a secure state for their privacy audit and enhance it by implementing accepted security auditing. Therefore, this research investigates information security management, as well as directions in its standardization of a key system tool.

22.2 Method

Official open sources containing legal and regulatory information, statistical data, and research data are used. Legal regulatory information was brought from the official sites of the International Standard Organization (ISO) (ISO, n.d.). Calculated results are based on the statistical data from the official sites of the ISO Survey (ISO, 2021) and other sources cited in the research.

22.3 Results

22.3.1 Standardization

Nowadays, we can confidently say that the world community has done significant work toward standardizing information security management systems and their processes. This work is actively continued. In accordance with these standards, ensuring information security in any organization consists of performing the following actions:

- Determination of the purposes and objectives of ensuring information security;
- Application of information security tools and assessment of its current state;
- Use of methodologies (with a clear system of criteria and protective measures or measures to ensure information security) in managing information security risks.

ISO/IEC 27000 describes the main definitions used in information security standards. The same standard presents a grouping of family standards with a correlation of standards developed at the time of publication. We analyzed the current and family standards under development in 2022. It should be noted that the number of standards is growing quite proportionally and chronologically. It is also necessary to note the systematic nature of development, which makes this family of standards in demand and, as a result, the most rapidly developing.

Information security management systems ensure the creation of documented procedures for selecting and implementing adequate means, methods, and tools for information security management and their effective management. Contemporary security management systems are aimed at implementing the mission and goals of the organization (Disterer, 2013).

Standards summarized the contents and experience of using the Orange Book, developed the European and Canadian criteria, and embodied the concept of typical US federal criteria protection profiles into real structures. They classify a wide range of IT security requirements and define their grouping structures and principles of use. The main advantages are the completeness of safety requirements and their systematization, flexibility in application, and openness for further development. All standards were updated in 2022.

ISO/IEC 15408 standards are designed to meet the needs of three groups of professionals who use this document equally: manufacturers and consumers of IT products and experts in evaluating their security level. These standards provide regulatory support for selecting an IT product, which has requirements for functioning in the face of certain threats, serve as guidance material for the developers of such systems, and regulate the technology for their creation and the procedure for assessing the level of security provided.

This group of standards considers information security as a combination of confidentiality and integrity of information processed by an IT product, as well as the availability of resources to external parties. They set the task of countering threats that are relevant to the operating environment of this product and the implementation

of the security policy adopted in this operating environment. Therefore, the concept of ISO/IEC 15408 includes all aspects of the process of designing, manufacturing, and operating IT products designed to work in the presence of certain security threats.

The requirements of ISO/IEC 15408 are an almost complete contemporary encyclopedia of information security. Thus, they can be used as a reference for IT security. However, the ISO 27000 family of standards provides a systemic opportunity to apply the best information security management practices.

22.3.2 Analysis of the ISO 27000 Family Basic Standards

The increased number of cyberattacks and the complication of information technologies, with the help of which these attacks are carried out, have led to the need to create and implement secure information technology management systems and use information security management tools and methods (Cisco, 2020; Computer Weekly, 2022; NIST, 2021a, 2021b). Therefore, the ISO/IEC 27002 standards are often updated; its last edition was released in 2022.

In general, the family of standards has a fairly traditional structure and is developing dynamically. In this regard, we would especially like to note the attention to industries and their features while maintaining a common systemic approach. Unfortunately, the financial sector is ignored during the update, which, however, is sufficiently compensated by the national and corporate standards of financial organizations (Giordani, 2021; Hornetsecurity, 2022; KPMG, 2022). Russia was no exception.

22.3.3 ISO 27000 Family Supporting Standards

The family of standards ISO/IEC 27033 is represented quite widely. However, the dynamics of their updating look very modest. The main reason for the rapid growth of changes in networks of a different nature is the COVID-19 pandemic and a series of international crises. The standards will be revised. The most recent is “Part 2: Organization normative framework,” which ensures harmonization with most standards of the entire family.

The ISO/IEC 27035 standards establish the principles of incident management and provide guidance on planning and preparing for incident response. The last part (Part 3) in the ISO/IEC 27035 family of standards was developed in 2020. Thus, the family needs updating. The ISO/IEC 27036 “Cybersecurity—Supplier relationships” family of standards distinguishes cybersecurity into a separate group, which gives clearer boundaries for the security of IT technologies, information security, and cybersecurity.

The international practice of e-disclosure is now having a tremendous impact on the practice of managing documents and information due to the high “price of the

issue,” in which Russian companies operating in foreign markets or interacting with foreign partners also have to consider. Within Russia, e-disclosure has not yet gained such importance. Nevertheless, the situation may change in the medium term. All ISO/IEC 27050 “Information technology—Electronic discovery” standards are quite actual.

22.3.4 Analysis of Thematic and Industry Standards

An analysis of thematic and industry-specific information security standards included in the ISO/IEC 27 000 family shows that they are quite relevant, represent a coherent system, meet the goals and objectives of the main standards, and are harmonized with them. Moreover, each standard can be extended to a group if necessary. It is impossible to ignore the cybersecurity standards 27 1xx developed over the past three years, which significantly reveal the possibilities of cybersecurity in response to the current situation worldwide.

We would also like to note such an industry as health care, in which the wave of automation and development of quality management in information security systems is observed.

An analysis of the groups of standards in the ISO 27 000 family showed that its development is complex. Simultaneously, the standards that describe the means, methods, and tools of information security management are mostly subjected to change; standards with terminology, connections, and new development directions are being revised to support them. Industry standards are traditionally represented by the most massive sectors of the economy.

22.3.5 Statistical Analysis of Applying the Basic Standard Practice

The ISO 27000 family of standards is included in the list of standards for which ISO monitors issued certificates. Monitoring for this family has been carried out since 2006. It should be noted that the number of certificates does not coincide with the number of organizations because they can be issued for departments and systems that include several organizations.

ISO 27001 certificates of conformity show a positive trend (Fig. 22.1), which indicates its demand and quality. The overall dynamics remain positive, despite the fall in 2017–2018.

The stratification of certificates by country made it possible to single out the leaders for the studied period. The superiority remains with Japan; China has consistently occupied the second place over the past few years; and the third place is occupied by the UK and India (Fig. 22.2). Thus, the top ten included Italy, Spain,

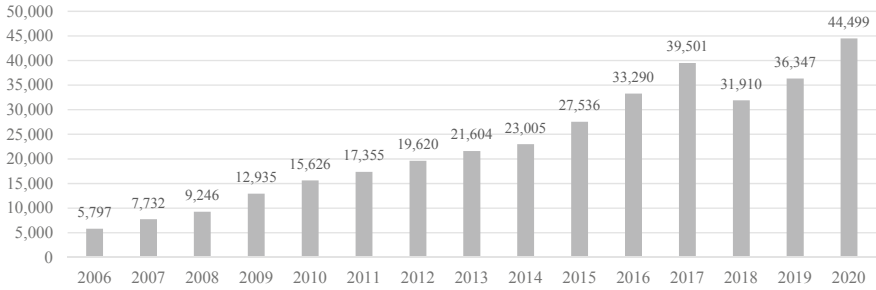


Fig. 22.1 Analysis of the dynamics of issuing certificates of conformity with ISO 27001. *Source* Authors based on ISO

Germany, the USA, Romania, and the Netherlands. China shows the best and most stable dynamics.

An analysis of the number of certificates by industry shows that the saturation of the main market of information technology continues, which occupies almost 60%. In terms of building information security systems, the top five, with a very strong backlog, included other services (10%); transport, storage, and communication (4%); construction (3%); and electrical and optical equipment (the same 3%). There is growth in other industries, with the greatest dynamics in other services, transport, storage, and communication.

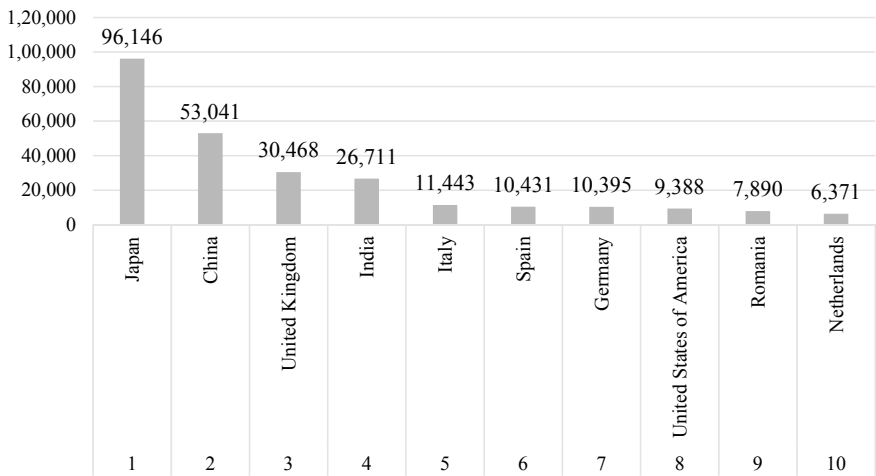


Fig. 22.2 Stratification of countries by the number of received ISO 27001 certificates from 2006 to 2020. *Source* Authors based on ISO

22.4 Conclusions

It is too early to say that information security management systems will become an integral part of modern integrated quality management systems of any organization (Giordani, 2021; KPMG, 2022). So far, there is a saturation of those sectors of the economy where information is part of a product or service, which was shown by a statistical analysis of the dynamics of obtaining certificates of compliance with the ISO 27001 standards.

The consumer market is transforming at an enormous speed (Hornetsecurity, 2022). Consumer trust becomes a key quality characteristic of products, services, and processes as information technology increasingly affects the quality of life. Consumers are becoming increasingly cautious about transferring their personal data, connecting to various devices, and using biometric systems. Against this background, privacy issues are still quite acute. As soon as the technology that provides privacy becomes available, the market will seriously change.

Modern IoT systems determine the development of all smart things—smart transport, smart medicine, smart homes and buildings, smart industrial and agricultural enterprises and organizations, and, as a result, smart cities. Studies show that people now connect to the Internet through several devices and there are twice as many on average. Some experts believe that by 2025, on average, each Internet user will perform about 4,900 transactions per day using an IoT device (Check Point Software, 2022; Verizon, 2021). On the one hand, such an expansion certainly improves the quality of life. On the other hand, it brings new risks and requirements for information security systems.

The analysis carried out is far from complete. Nevertheless, it clearly indicates the necessity of:

- Transformation of the request for real security and prevention of significant threats;
- Formation and development of ecosystems for cybersecurity;
- Development of remote access protection systems;
- Increase in the number of cloud services and cloud security threats;
- Demand for information security services;
- Growth in the intensity of attacks and their success;
- Formation of a new approach to training personnel in information security management;
- Import substitution;
- Standardization (national and sectoral).



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Chapter 23

The Adaptive AI-Based Digital Twin of Accounting and Analytical Management System of Organizations



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and Aleksei A. Riabchenko 

Abstract Authors arranged the key components of the company's AAS, identified data flow, and designed the author's custom digital twin of an AI-based adaptive model of the AAS of the enterprise focused on the implementation and use of a set of tools for functional and cost analysis. The authors utilized an interdisciplinary approach in designing the AI-based management framework and software product for value analysis, emphasizing its contribution and impact in the structure of the economic activity of companies. The accounting and analytical AI-based management system is a comprehensive management digital platform that significantly contributes to the structuring and classification of information in relation to the economic indicators of financial and economic activities to collect, analyze, and provide analysts and managers with the data necessary for conducting the financial analysis and making qualified and effective management decisions.

Keywords Function cost analysis · Value analysis · Accounting and analytical support · Information system · Information flows · Digital twin

JEL Classification M19 · M40 · M49

23.1 Introduction

The formation of a digital analytical environment is predetermined by the quality of information resources, methods and tools for their processing and transmission, and the consistency of various information sources. The efficiency of information use is ensured by the timely aggregation of the information flow.

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Having analyzed recent scientific works, the authors highlighted new forms of economic interaction and form new requirements for treating accounting and analysis objects within the hybrid management and technological framework of the today's companies, causing new paradigms in identifying and structuring economic information within the companies' frameworks and its processing using information technologies to make proper managerial decisions (Bogataya & Evstafieva, 2019).

As we can see, the topic of informational support coupled with the development of accounting and analytical systems (AAS) of business entities is pushed on the scientific and business agenda (Duvanskaya, 2016).

23.2 Materials and Methods

The quality, analyzability, and relevance of the information and data flows are the determining factor in the success of the functional cost and value analysis (VA). Information flows and data generated in the company's departments could be used for VA purposes. The aggregate data of the AAS and design and technical information act as the basis of a successful VA and make it possible to create a comprehensive economic model of the organization.

The quality depends on how the key management functions of a commercial organization are synchronized: accounting, analysis, and control (Bulyga, 2017).

The effectiveness of the comprehensive management framework depends on various factors, including the following:

- Features of business specifics of the company;
- Features of the legal framework of the organization;
- Internal performance standards;
- The organization's scale;
- The organizational background of the company;
- Forms and flows of information support;
- Feasibility and achievability of the development strategy;
- Organizational structure;
- Management and interaction structures;
- Management levels and patterns (Bukhov, 2015a).

When developing the AAS, we should follow the basics of a systemic approach and consider the company as a comprehensive system that includes numerous subsystems (Duvanskaya, 2016). Introducing a digital twin concept for the company's accounting and analytical framework could be a certain way out of arranging and processing the data flows connected with VA purposes.

Digital twins involve comprehensive cross-cutting technologies that define further development of this direction. The application of digital twins involves the utilization of mathematical models that reflect economical patterns and processes originating from the company. We consider advances in hardware and software backgrounds as a key trigger in growth of the digital twins' application in the companies' activity.

Particularly, design of business departments involves the space for the end-to-end technologies in the analysis and accounting aspects. Another obstacle is the ability of the staff to handle the processes related to the accounting and business analysis activity. Digital technologies open new horizons and prospects for applying artificial intelligence in decision-making frameworks of the company, and the digital twins become the pure solution. New possibilities of artificial intelligence promote rapid generation of ideas and managerial decisions. And, the role of the company's staff here tends to be minimized. Digital twins could make decisions autonomously, coordinate with other digital twins, perform self-diagnostics, and independently troubleshoot problems. The interworking interface should provide combining digital twins. The process of combining digital twins will continue providing opportunities to resolve management issues at different levels. And, the managerial incentives in utilizing cross-cutting technologies in business entities' activity tend to be scaled up.

Connecting the comprehensive information flows, including the data taken from various subsystems (i.e., statistical, operational, accounting, etc.), into an integrated AAS provides more transparent and detailed information about the analytical entity to make proper managerial decisions (Lozhkina, 2015).

23.3 Results

Value analysis is an effective and comprehensive strategic and management tool improving the quality of an organization's business processes by optimizing organizational and management structures and rationalizing the costs of producing products and providing services.

The company's framework is based on a comprehensive AAS defined typically by the information needs of its staff, regulatory framework, and basics and administrative AAS hierarchy.

The authors consider that the automation of processing, analysis, interpretation, and routing of data in the integrated AAS of the organization turn to be the most relevant processes. The authors propose the use of a complex AI-based software—the Information System for Value Analysis (IS VA) (Bukhov, 2015b).

The IS VA has a modular structure and makes possible using software blocks with different functionalities and information (Fig. 23.1) including:

- AI-based import and analysis of data on the VA subjects;
- AI-based data structuring, ranking, and arranging of the necessary information for VA;
- AI-based calculations and obtaining new data required for the VA;
- Generating customized working documentation and final reports (Bukhov, 2015c).

Currently, the first module has been developed. It is responsible for assessing the costs of implementing the functions of the output products of the analyzed organization: the registered software product is called "Determination of reserves for

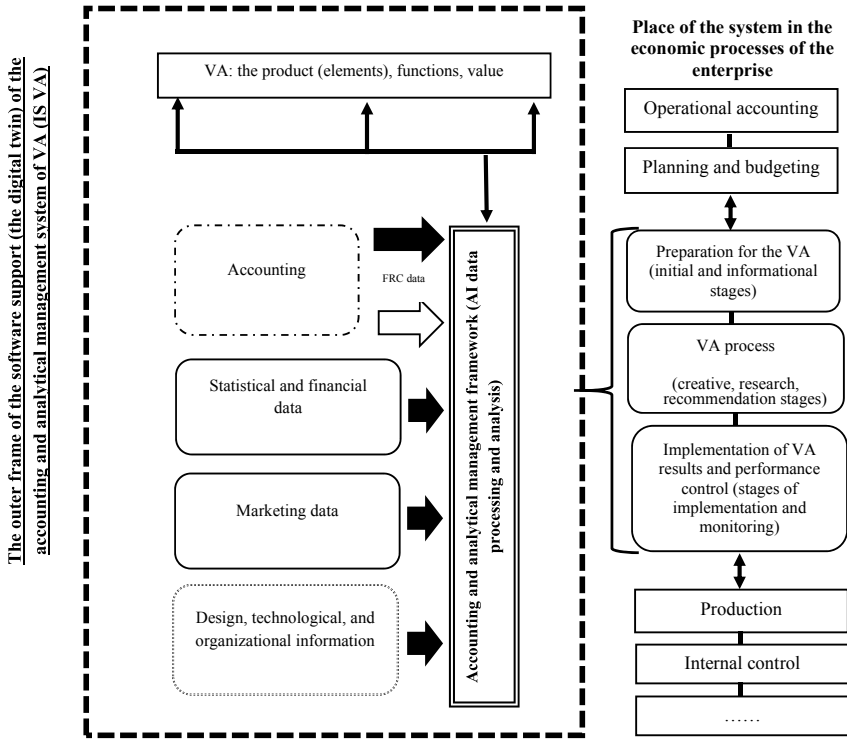


Fig. 23.1 Adaptive model of the AI-based enterprise. Source Developed by the authors

reducing costs for the implementation of product functions based on functional cost analysis” (Zhilina et al., 2019).

The key task of the software is to determine the reserves for reducing the costs of products manufactured and services provided based on the methodology of the VA, using manual and automatically obtained data from the AAS. The initial data on the functions performed, and the total volume and share of costs for their implementation are imported through the UI and a conclusion is generated. The program provides for manual data entry and automatic collection, processing, and interpretation of basic indicators for the analysis within the IS VA framework.

This method of information processing for VA purposes has the following advantages:

- The use of complex data flows for the accounting and analysis reasons (Usenko et al., 2008);
- Collection, analysis, and processing of data in a unified system (AI-based);
- Increasing the performance of the analytical group due to the high transparency, complex nature of information flows, and the ability to quickly and automatically combine them and make the necessary calculations;

- The ability to adapt the type, number of elements, and algorithms for obtaining and processing data and calculating analytical indicators of the companies related to the analytical and accounting activity;
- The ability to be integrated with the automated frameworks of accounting, analysis, controlling, design, and technical developments utilized in the companies' activity (AI-based software stack algorithm).

23.4 Discussion

The digital economy and its cross-cutting technologies directly affected the progress in accounting and analytical framework and the decision management framework, in particular:

- New objects of accounting appear, and old ones are modified;
- Transformation of existing and creation of new information technologies are used for accounting and reporting;
- AI-based deeply customized recommendation and analysis systems are integrated into the accounting and analytical frameworks of organizations;
- The technology and procedure for the provision of financial statements are changing;
- Improved and new software tools for conducting various types of economic analysis are developed.

The AAS should be flexible and mobile, depending on changes in the business environment of the company (Usenko et al. 2018). They should include the following basics:

- Consistency;
- Comparability of information;
- Comparability and transparency of the in- and out-data flows;
- Foresight and strategy development;
- Intercompatibility of the cross-cutting technology stacks for the accounting and business analysis purposes;
- Compliance of the created system with available resources and flexible human resource utilization and AI implementation ratio (Usenko, 2015).

23.5 Conclusion

The accounting and analytical AI-based management system is a comprehensive management digital platform that significantly contributes to the structuring and classification of information in relation to the economic indicators of financial and economic activities to collect, analyze, and provide analysts and managers with

the data necessary for conducting the financial analysis and making qualified and effective management decisions.

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Chapter 24

Increasing the Transparency of Tax Administration and Accounting and Analytical System of Management Based on AI and IT Technologies in Support of Unshadowing of Business



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Irina V. Verzhbitskaya , and Svetlana S. Zoricheva 

Abstract Overcoming the negative impact of tax minimization and the fight against the shadow economy are becoming increasingly relevant under the influence of the economic recession and the growth of budget deficits faced by most states. In this regard, the government demands for transparency of business activities are increasing. Tax administrations implement risk-oriented tax audit strategies based on the study of datasets obtained during interaction with taxpayers, as well as in the process of interdepartmental and interstate exchange. The increased control activities in relation to potentially closed business areas involve the introduction of innovative approaches to the technological support of tax control in order to analyze a significant amount of information to verify the reliability of tax indicators. At the same time, not only public institutions but also the business community as a whole are interested in expanding the scope of AI and IT technologies for the purposes of accounting, tax and financial calculations, and analysis of the effectiveness of business processes, since transparency of information about the activities of economic entities reduces the risks of unscrupulous behavior, loss of competitiveness, excessive transaction costs.

Keywords Unshadowing · Tax control · Taxation management · Automation of tax audits · Electronic document management

JEL Classification H 26 · H 39 · M 48 · O 17

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24.1 Introduction

At the end of the twentieth century, the United Nations, based on the consolidated position of most countries and their inhabitants, formulated the concept of sustainable development (Sustainable Development Goals, 2016), the implementation of which requires significant efforts and overcoming a number of obstacles, one of which is shadow business structures that have become widespread in the economies of many countries. The sphere of activity of shadow business structures is interpreted differently in regulations and specialized studies, remaining poorly studied due to its closeness. The most common and cited definition of the shadow economy belongs to an authoritative expert in this field F. Schneider, which he considers as an entrepreneurial activity carried out beyond the reach of state bodies and intentionally hidden from them (Schneider & Krstić, 2015). Interpretation of the consequences of the shadowization of business, involving the deliberate concealment of entrepreneurial activity from public authorities, often emphasizes tax evasion, social insurance contributions, and other payments in favor of the state in order to maximize profits, which entails significant budget losses. In addition, the negative impact of shadowization is manifested:

- violations of labor standards (minimum wage, maximum working hours, safety requirements), which leads to an increase in social tension;
- ignoring mandatory administrative procedures (filling out statistical and other reports), which distorts information about the real state of the economy;
- in obtaining unreasonable competitive advantages over bona fide market participants who comply with all regulatory requirements, which causes the emergence of structural imbalances in the economy.

These factors require states to develop systematic measures to reduce the scope of shadow business and limit opportunities for its spread. The leading role in this process belongs to modern information and communication technologies and automation of procedures for control tax indicators using artificial intelligence, ensuring the effectiveness and fairness of taxation at a fundamentally new technological level.

24.2 Methodology

Global financial instability causes a decrease in income and an increase in public debt, which obliges public finance authorities to step up efforts to combat tax evasion. Tax base erosion is a consequence of minimizing tax liabilities as a result of hidden economic activity, as well as the use of schemes of shifting profits to low-tax jurisdictions. This not only violates the fundamental principle of tax fairness, distorting the distribution processes, but also entails direct material damage to public interests.

In order to overcome the current practice, the Organization for Economic Cooperation and Development (OECD) initiated the development and implementation

of an Action Plan on Base Erosion and Profit Shifting (the so-called “BEPS Plan”), aimed at curbing aggressive tax planning implemented by multinational corporations, entailing losses of approximately 10% of budget revenues (Base Erosion & Profit Shifting, 2013). This initiative has contributed to the development of requirements for the transparency of financial management of business processes, the conformity of accounting and tax reporting, as well as the expansion of the scope of cooperation between the largest companies with tax administrations. To achieve these effects, the states have made unprecedented investments in the creation of digital information systems for the activities of tax authorities and their communication with taxpayers and other mandatory payments, with financial sector organizations, other business structures and administrations, including those of other states that provide information about economic processes and transactions. However, in the conditions of the information society, its digital transformation based on transparency of information about economic activity, changes are also taking place in the shadow sector of the economy. This activates new studies, including terminological ones.

In our opinion, the most universal and correct definition of the digital shadow economy should be recognized as an activity in the digital space, in which its subjects violate existing legal norms and rules, pursuing illegal mutual interest and material benefit (Gasparyniene et al., 2016). To assess the threats of the spread of shadow economic processes in digital format, we will compare the shadow economy in traditional and digital formats (Table 24.1).

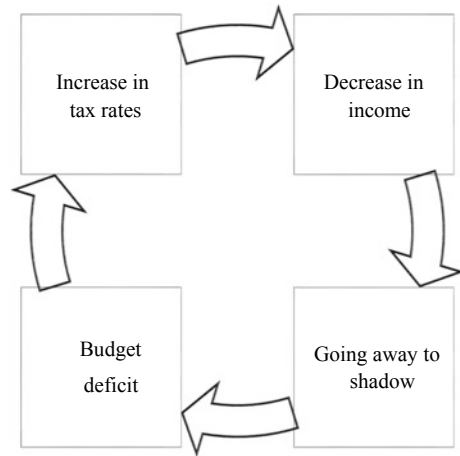
These characteristics are not exhaustive, but they demonstrate the growth of threats to shadow processes in digital format, namely: a significant reduction in control,

Table 24.1 Comparative characteristics of the shadow economy in traditional and digital formats

Characteristic	Traditional format	Digital format
Normative regulation	Extremely insufficient, for example, the system of national accounts provides rules for assessing the hidden economy (Chepurensko, 2019)	
Goal	Cost reduction, obtaining additional financial benefits	
Objects	Trade, services, almost the entire commercial sector	Electronic, as well as other businesses using digital tools
Subjects	Unlimited circle of persons	Suppliers, consumers, etc., more often anonymous, networks, global companies
Education of participants	Standard education, attracting unqualified persons	Higher education, more often advanced level
Scale, geography	It is more common in small businesses	Hidden geographical location, the scale is not limited
Calculations	Common form of payment, often in cash	Instant payments: cryptocurrency, electronic payments
Control	Control is reduced	It is virtually non-existent
Damage	Undermining competitors, reducing budget revenues, etc.	

Source Compiled by the authors based on their own data, as well as (Resolution No. 7, 2005)

Fig. 24.1 Vicious circle of the shadow economy. *Source* Developed by the authors



lack of physical contact, the use of cryptocurrencies, non-transparency, and less controllability.

Revealing the content of the shadow economy, most researchers emphasize its significant negative impact on the budget system, which can be graphically depicted as a “vicious circle of the shadow economy” (Fig. 24.1).

Sharing the point of view about the harmful influence of the shadow economy on tax revenues, we will consistently consider this impact at each stage of this process. Low incomes caused by various factors, primarily the impact of economic crises, lead to the withdrawal of business structures into the shadows. A necessary step to expand the shadow sector of the economy is to increase the budget deficit at all levels, which entails raising tax rates. In turn, the growth of tax liabilities of entrepreneurs provokes them to go to the shadow sector—“the vicious circle of the shadow economy” has closed.

A significant role in business development is played by investors, whose expectations are associated with increased transparency of financial and accounting information. It is important that the owners of the information open access to it. Transparency is understood as the absence of secrecy, the availability of any information (Large Modern Explanatory Dictionary, 2012). In the conditions of rapid development of digital technologies, an effective tool for ensuring transparency of financial, accounting, and analytical information is the use of information and communication interaction with tax authorities through Internet resources.

Analyzing the transparency of accounting information, it should be noted that we can talk about both access to all information generated in the organization’s accounting system (for example, the monitoring procedure by the Tax Service of Russia) and access to information previously grouped according to certain rules for reporting.

According to I. V. Zenkina, “transparency in the accounting sphere can be defined as a qualitative characteristic of accounting information in a narrow sense and of the

entire information space in a broad sense” (Zenkina, 2022). Thus, the transparency of the data generated in the tax-financial and accounting-analytical management systems has a significant impact on the information transparency of the economy both at the level of an individual state and at the international level. The purpose of information transparency of the economy is to increase its efficiency, as well as to reduce the scale of its shadow sector.

It should be noted that the last decade of economic development is characterized by a significant shift in the assessment of a commercial organization’s performance from efficiency (profitability, rationality) to the achievement of sustainable development goals, the elements of which are the environmental and social responsibility of the organization’s management in close relationship with economic indicators. Traditional accounting reporting does not meet the expectations of investors and has a number of limitations:

- lack of non-financial information that is more understandable to a wide range, primarily to investors with a minority stake;
- low level of visualization;
- characterizes a small part of the company’s activities, etc.

Integrated reporting is more informative, including both financial and non-financial information about the company’s activities. Such a model of data reporting is currently the main tool for increasing information transparency of management, which contributes to the process of unshadowing of business.

The first integrated reports appeared in Russia in 2009; however, despite more than a decade of development of integrated reporting, today only 129 reports from 26 companies have been registered in Russian Regional Network for Integrated Reporting (RRN) (About Integrated Reporting, 2015).

At the international level, there is active work on the application and development of unified approaches to integrated reporting. So, in August 2022, the IFRS Foundation completes the consolidation of the Value Reporting Fund (VRF) into the IFRS Fund in order to unite the staff and resources of leading international organizations on disclosure of information in the field of sustainable development (IFRS, 2022). Against this background, there is a certain “cooling” in Russia toward the formation and implementation of integrated reporting in the business practices of Russian companies, which is due to the following objective reasons:

- the lack of a regulatory framework regarding the requirements for the formation of integrated reporting. The draft Federal Law “On Public Non-Financial Reporting”, prepared by the Ministry of Economic Development of Russia, still exists as a draft;
- the introduction of economic and political sanctions by the USA and the EU against a number of Russian companies, and the subsequent adoption by the Government of the Russian Federation of the resolution of restrictions in terms

of disclosure of information in annual reports “in order to reduce the existing and possible negative consequences of restrictive measures” (Malinovskaya, 2022).

As a result of the influence of these factors, the leaders of the introduction of integrated reporting in Russia (companies in the nuclear and energy sectors of the economy) have suspended work in this direction.

According to Russian researchers, less than 5% of companies disclose information about their activities at the Premium, I, and II levels of transparency; only 12.2% of companies correspond to the III level of transparency, 22.6% to the IV level of transparency. Thus, the majority of Russian companies (59%) submit non-transparent reports on their activities (V level of transparency). At the same time, 90% of companies with the lowest level of transparency are organizations that are not required by law to disclose information, and 10% are public companies that are required by law to disclose information about their activities in detail. Public companies included in this group do not enter the stock exchanges and do not post relevant information on their website or official websites of information disclosure (Bulyga & Safonova, 2019).

It is obvious that effective management of public finances and countering shadow business operations and transactions in order to evade taxation or obtain unjustified tax benefits cannot rely on non-transparent information about economic activity and its results. This circumstance causes the attention of state bodies, first of all, tax administrations, to the use for fiscal purposes of information flows accumulated on the global Internet, as well as to the possibilities of automated processing of open data, providing public and business access to public services and the implementation of tax payments. The main Russian service through which it is possible to interact with government agencies in electronic format using a personal computer or mobile device, including payment of taxes and mandatory payments, is the Single Portal of State and Municipal Services (GOSUSLUGI.RU) (Gliniecka et al., 2020).

Artificial intelligence algorithms provide not only access to the necessary information, but also register any actions of users of the global data processing infrastructure, including the very fact of accessing a specific service or data. Thus, in Russian practice, tax authorities use information flows generated by various public structures, financial sector organizations, and potential taxpayers.

At the same time, the control measures of the tax authorities are based on the analysis of a wide scope of data accumulated in the taxpayer's electronic dossier, including his/her reporting, identified connections, features of the formation of the tax base, its usual structure and dynamics, information about transactions being implemented, and transactions being registered (Artemenko et al., 2020). Automated processing of the received information in the analytical systems of tax authorities not only improves the effectiveness of control procedures, increasing the volume of tax revenues, but also reduces administrative costs and disincentive effects for bona fide taxpayers (Devereux, 2002), contributing to the prevention of violations of tax legislation.

24.3 Results

The study made it possible to identify the negative factors of the shadow economy for Russia from the perspective of sustainable development. The shadow sector reduces the implementation of the triad of the concept of sustainable development—ecology, human social security, and economic development. The most significant negative effects of business shadowing include:

- reduction of budget revenues from taxes and other payments, which provokes a complex, systemic negative impact on the entire triad of sustainable development;
- lower revenues to extra-budgetary funds (pension, medical, etc.), which entail a decrease in the efficiency of the funds as a whole, a reduced or complete loss of personal social security of citizens (receiving social benefits, credit opportunities, mortgages, vocational training, labor protection, etc.);
- expansion of the corruption base, the growth of environmental, other violations due to non-compliance with established occupational safety standards, administrative procedures, and other violations, which affect all areas of sustainable development.

At the same time, some authors share the view that the shadow economy has not only a negative impact on society. In particular, positive factors such as the creation of additional jobs and additional output are noted. In addition, the income received in the shadow economy is mainly spent in the formal economy, and low entry barriers to the market allow a wider range of people to engage in entrepreneurship, etc.

However, the reduction of tax and other payments to budgets of all levels as a result of tax evasion, which is systemic in nature, leads to an increase in the tax burden on bona fide taxpayers, encouraging economically unjustified tax competition. Currently, the state overcomes such threats due to the technologies of intelligent processing of large information arrays, providing not only the collection of reporting data, but also the analysis of their reliability, as well as monitoring the taxpayer's operations in real time by integrating information from other government agencies and banks in the system of interdepartmental electronic interaction, obtaining information from financial organizations, payment systems, and electronic platforms about ongoing settlements and transactions.

The high level of data generalization of tax indicators has allowed the introduction in Russian practice of automated tax control systems, primarily in relation to the control of VAT calculations, as well as automated self-assessment systems that allow tax authorities to calculate taxes for self-employed citizens without the participation of the taxpayer, as well as a number of small businesses using a simplified taxation system.

In addition, the involvement of intelligent automation technologies in the practice of tax control significantly increases the preventive effect, providing the ability to manage the behavior of the taxpayer by establishing open, transparent, and clearly declared conditions for the interaction of counterparties in a particular market and their voluntary cooperation with tax authorities by joining industry charters. Due

to the increased transparency and openness of taxpayers' activities as a result of their accession to charters through websites specially created for these purposes on the Internet, cooperation between tax authorities and the business community at the industry level has become possible. This increases the efficiency of financial and tax calculations, which eliminates the possibility of using opaque companies with no business activities to minimize taxes and conduct shadow operations. Support for the provisions of industry charters creates equal competitive conditions and economic motivation, which determines intolerance to organizations that use the practice of evading mandatory payments.

The introduction of a horizontal tax monitoring system involves permanent tax control with direct access to taxpayers' information systems. This monitoring method is supported by such tools as electronic document management, mandatory registration of primary documents in electronic format (in particular, transport documents, including shipping documents and documents on the operation of vehicles), mandatory registration of certain transactions in state information systems (transactions using cash payments, transactions with goods whose turnover is specially controlled by the state (excisable, marked, traceable goods, animal products subject to veterinary control, grain, and products of its processing)).

24.4 Discussion

In Russia, the processes of shadowization of business have been insufficiently studied, and the regulatory framework for countering this phenomenon is represented by single acts. Thus, the term "shadow economy" is found in a few normative acts, court decisions, development programs, etc., but none of them gives either a definition of this concept or reveals the content, which makes it difficult to consider, analyze, and reduce its influence in society. In most cases, Russian authors use the definition of F. Schneider to analyze the shadow economy. The authors of this article agree with this interpretation, which influences the formation of the terminological base.

Along with the concept of "shadow economy", such terminological constructs as "informal economy", "hidden production", "illegal business activity" (Resolution of the Plenum, 2015), "unaccounted economy" are often used, which are similar in content, and in some cases are used as synonyms. Under the term "informal practice", such authors as E. Denisova-Schmidt and Ya. Pritula understand "corruption" (Denisova-Schmidt et al., 2014). At the same time, it is important to note that there are differences between them and they should be fixed, since the ambiguity of the use of terminology creates risks of significant discrepancies in discourse and reduces the possibilities of effective solution of problematic issues.

A. Chepurenko, considering the informal economy, mentions the organization of business with the involvement of individual entrepreneurs. In particular, the author gives examples of "translators hired for major events and registered as individual entrepreneurs" (Chepurenko, 2019). We believe that such examples do not fully characterize the informal economy, it is more appropriate to use them in topics

devoted to tax optimization and competitiveness, and since the forms of organization of interaction between business entities are quite wide, registration as an individual entrepreneur is completely legal. At the same time, the example with translators demonstrates the breadth of the concept of “shadow economy”, which explains a significant range of its interpretations. In our opinion, a clear definition of the qualification conditions for such a phenomenon as the shadowization of business, including in the field of information services provided in electronic form, will allow us to formulate the most effective measures to overcome its negative impact.

In our opinion, it is possible to reduce the sphere of shadowization of business in modern conditions by two main methods, first of all, by increasing the activity of tax authorities in identifying and suppressing unfair business practices.

Modern information technologies provide tax authorities with unique opportunities to identify the taxpayer’s territory of activity by registering the place of access to digital interfaces, IP addresses that he used, as well as by summarizing data on the volumes and characteristics of transactions. The introduction of intelligent technologies for processing and summarizing the data obtained, the identification and assessment of the risk of tax violations based on the results of the analysis significantly increases the effectiveness of tax administration.

In addition, intelligent computer technologies are also applicable in the activities of taxpayers themselves, providing in-depth study of tax legislation, tax accounting, generalization of the results of tax disputes, and forecasting the consequences of the implementation of tax rules and regulations in specific situations (Fidelangeli & Galli, 2021).

Another important area can be considered voluntary compliance by entrepreneurs with the rules of accounting, registration of transactions and financial transactions, the requirements of tax legislation established by the state. At the same time, it is necessary to highlight certain restrictions for the development of such a form of cooperation with taxpayers.

First of all, not all taxpayers can and are ready to ensure full transparency of their activities, as well as to disclose information about the tax base prior to the date of submission of the tax return. In addition, the tax authorities are unable to provide the implementation of the terms of such agreements with all interested parties. There is also a real threat that such information interaction will transform into a permanent control event that requires the involvement of significant labor resources on both sides (the taxpayer and the tax authorities). At the same time, the agreement itself does not eliminate an objective conflict of interests, the obviously fiscal position of the tax authorities in interpreting the provisions of the law, which is often not acceptable to the taxpayer. In our opinion, methodological support for horizontal monitoring is also a serious problem, since full access to the taxpayer’s databases and documents is not a guarantee of the accuracy and validity of the inspectors’ conclusions.

24.5 Conclusion

The development of electronic document management technologies, as well as the legal framework defining the rules for the preparation of electronic primary documents, expands the possibilities of information support for financial and tax management and increases the transparency of business processes. Innovative technologies in the field of tax control, aimed at achieving the effect of unshadowing of the economy, are developing in two main directions:

- (1) expansion of electronic interaction with taxpayers on the basis of voluntary compliance and increased transparency of financial and tax reporting, which reduces transaction costs for participants in tax relations;
- (2) intensification of controls in relation to problematic and closed areas of activity, involving the use of risk-oriented strategies based on the results of intellectual analysis, improvement of interdepartmental and interstate exchange of information relevant for the purposes of tax control.

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Chapter 25

Coordination of the Development of Financial and Intellectual Technologies in the Global and National Markets



Viktoriya V. Razletovskaia  and Igor M. Stepnov 

Abstract The main trend in the field of financial technologies (Fintech) is the increasing influence of artificial intelligence technologies and neurotechnologies on their development. The cornerstone of international policy is the development of such technologies and the adaptation of states to them. Geographical separation, economic and functional specialization and provision of resources, integration processes need to be clarified. The currently observed transformation of financial markets and the system of public administration of their development through the use of high-tech solutions is the object of research conducted in this article. To ensure the global competitiveness of states in the technological digital race, including in financial markets, the development of organizational and managerial solutions aimed at the development of such technologies will be crucial. The key mechanism is the coordination of this process at a cross-sectoral level. The study of the interaction of international coordination mechanisms and national coordination models in the field of financial and intellectual technologies, taking into account their interconnectedness, rather than isolation from each other, is becoming a new and promising area of research.

Keywords Financial technologies · Intelligent technologies · Intersectoral coordination · Public administration · Coordination at the international level · National development models

JEL Classification O16 · E42

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25.1 Introduction

With the increasing role and influence of neurotechnologies and artificial intelligence technologies on the development of Fintech at the national level, the transformation of these areas is regulated according to the sectoral principle. At the same time, intersectoral mechanisms are practically not used; in addition, foreign policy in international organizations on these issues requires coordination. At the international level, uneven and inconsistent mechanisms of intersectoral coordination of Fintech development, artificial intelligence, and neurotechnologies are noted. Thus, a number of countries are already developing and implementing standards, regulatory sandboxes for Fintech through international organizations. While only the first intergovernmental standard has been adopted in the field of artificial intelligence development, which is of a recommendatory nature, a transition from basic principles to the harmonization of the general structure and descriptive model of artificial intelligence systems is underway (Draft Recommendation on Ethical Aspects of Artificial Intelligence, 2021). At the same time, in the field of neurotechnology, international symposiums and conferences determine the directions of international cooperation and coordination and monitor development at the level of international organizations (Huang & Luo, 2015).

All this increases the differentiation in the international and sectoral development of these technologies, strengthens the inequality between countries in the field of fintech development. Taking into account that not all countries take an active part in this process, the establishment of international standards in Fintech will have an impact on the research and development of neurotechnologies and artificial intelligence, thus setting the vector and proportions of their development at national levels, exacerbating the problems of commercialization of these technologies, limiting their use and sales markets (Razletovskaya, 2020). IMF in its report notes the need to build an effective system of intersectoral coordination and regulation of the development of the crypto ecosystem at the global level (Baths et al., 2022).

In addition, it is necessary to take into account the impact of financial and intellectual technologies on macroeconomic parameters: the processes of redistribution of resources in the economy, investment, stability of the financial system, consumption, sustainability of business development. All these change the existing institutional mechanisms and rules, change the national development infrastructure, and complicate international relations (Kovalchuk, 2021). Ethical issues go to a new level and affect fundamental rights and almost all aspects of human life. At the international level, Fintech and blockchain technology issues are regulated by more than ten international organizations: five ISO, WTO, OECD standardization committees, United Nations and its specialized agencies, FATF, Commonwealth of Nations, GPFI, FinCoNet (the International Financial Consumer Protection Organization), GFIN, FSB Word Bank, IMF, BSCBS, Eurasian economic Union, UNESCO (Digital Economy Report, 2019). At the same time, there is no assessment of the use of these technologies for the economies of various countries, their impact on global macroeconomic processes. The key issue of the development of these technologies—increasing

energy consumption and energy supply, spatial placement—is a geopolitical issue of future international relations, which has not yet found a proper reflection on the platforms of these organizations. Certain tools and mechanisms are being actively launched in various international organizations in the areas of their specialization, without assessing complex and systemic miscalculations, forecasts for the global economy and national economic systems. Applying soft regulation methods such as advisory measures and assessment of their implementation, international organizations emphasize and justify the importance of three factors for the development of financial and intellectual technologies, which include a clear mandate, flexibility, and effective coordination (Taylor et al., 2019).

Therefore, the scientific problem that this study is aimed at solving is the absence of a coherent strategic vision of transformations in the field of financial and intellectual technologies and forms of their state regulation, not provided with a number of practical recommendations, measures, methods, and tools for achieving sustainable development. This scientific problem also requires the solution of issues related to the determination of forms and methods of coordination at the national and international levels. The purpose of this study is to review the current situation in the field of international and national models of coordination of financial and intellectual technologies and to consider the directions in which mechanisms of such coordination can develop in the future.

25.2 Methodology

Based on the analysis of the work of international organizations in the field of Fintech, artificial intelligence, and neurotechnologies, as well as the study of publicly available documents of national legislations, the article describes the trends in the development of national and international intersectoral mechanisms for coordinating the development of financial and intellectual technologies. The use of methods of schematization, modeling, complex and system analysis, forecasting and strategic planning, interdisciplinary research allowed the authors to formulate proposals for the conceptual basis of the model of national and international coordination of the development of financial technologies, artificial intelligence, and neurotechnologies in order to ensure the national interests of the Russian Federation.

25.3 Results

The analysis of the activities of international organizations (WTO, OECD, UN and its specialized agencies, FATF, Commonwealth of Nations, International Organization for Standardization (ISO), GPFI, FinCoNet (the International Financial Consumer Protection Organization), GFIN, FSB, Bank, IMF, BSCBS, Eurasian Economic

Union, UNESCO) allows us to state that international coordination in the development of financial and intellectual technologies is only in its infancy (Taylor et al., 2019) in the absence of a strategic approach, forecasts, and consequences of the development of their application at the global and national levels. Preparations are underway for the introduction and dissemination of blockchain technology in all industries (G20 Ministerial Statement on Trade & Digital Economy, 2019) The stage of standardization of financial and intellectual technologies at the international level is inconsistent, non-systemic, and disjointed, not all countries are involved or actively participated in this process, and mechanisms for intersectoral coordination of the development of Fintech, artificial intelligence, and neurotechnologies are not coordinated (Razletovskaya, 2020). International coordination mechanisms vary from bilateral agreements and initiatives (for example, memoranda of understanding in the field of Fintech) to multilateral, coordinated by international bodies, including the establishment of standards (Arner et al., 2016). Both a decentralized coordination model based on rules, criteria, and recommendations common to the participating countries for decision-making at the national level and a centralized collective coordination model are used, in which the participating countries delegate certain powers to a supranational body—an international organization (Wymeersch, Hopt, & Ferrarini, 2012). The beginning of the formation of coalitions of states and organizations, larger (GFIN, etc.) and smaller ones is also observed (Fintech: The Experience So Far, 2019). Global regulatory processes in these areas are complicated by the struggle for infrastructure and markets (Kamolov & Stepnov, 2020). At the same time, there are no forecasts, a strategic block, and a systematic approach at the level of international organizations—regulation is fragmented and distributed among more than eight organizations, and an intersectoral block and strategies at the national level are also absent. The need to harmonize legislation in the financial sphere exacerbates issues of national economic security. A special soft law mechanism has been formed in the international financial sphere (Lifshits, 2021). This mechanism has the following characteristics: formally optional recommendations; standard setters; checks and assessments of the implementation of standards carried out by these institutions, as well as mutual, horizontal checks; creation of incentives to encourage the implementation of international financial standards in national legal systems, as well as the establishment of adverse consequences of non-implementation (Lifshits, 2020). The rules contained in the recommendations of international intergovernmental and non-governmental organizations, without the force of an international legal norm, demonstrate a significant potential for influencing the legal systems of states and integration entities.

At the national level, the analysis of intersectoral forms of interaction in the field of financial and intellectual technologies, strategic and program documents of state authorities and the regulator (the Bank of Russia) allows to identify the following results and trends in their development.

At the level of the regulator (the Bank of Russia), a department of financial technologies has been created that provides analysis and development of financial technologies, coordinates the implementation of the “Main Directions of Financial Technology Development”, organizes the activities of the regulatory sandbox—a

mechanism for piloting innovative financial technologies, products, and services together with the Fintech Association. Thus, the Bank of Russia not only performs the role of a mega-regulator, but also acts as an initiator and a platform for the development of Fintech projects. Public councils under the State Duma Committee on Financial Markets and other advisory bodies under the Ministry of Finance of the Russian Federation and the Ministry of Economic Development of the Russian Federation take an active part in regulation. To date, the necessary regulatory and legal framework has been created to ensure the functioning of financial technologies: the conceptual apparatus has been defined (digital rights and digital assets and their types, the legal status of smart contracts, participants in the turnover, and digital infrastructure are legally fixed). Cross-cutting issues have been settled for various branches of legislation related to the identification of subjects of legal relations in the digital environment, electronic document management, data turnover, including personal data.

The issues of regulating the development of artificial intelligence and neurotechnologies are divided between sectoral federal ministries and authorities: the Ministry of Finance of the Russian Federation, the Ministry of Economic Development of the Russian Federation, the Ministry of Industry and Trade of the Russian Federation, Rospatent. Industry unions and associations play an active role (Dezhina et al., 2020).

Currently, separate traditional blocks of national legislation and regulation of the Bank of Russia regarding Fintech have been developed and adopted in accordance with the requirements of international organizations (prevention of the laundering of the proceeds from crime, terrorism (FAVT), G20 taxation, protection of user rights). There is a disparity in the stages of regulation and in the directions at different levels of government. Strategic planning at the level of federal authorities is not coordinated with the programs of the Bank of Russia on Fintech and lags behind the normative regulation of this sphere.

The directions of intersectoral coordination and regulation of Fintech are determined by the trends of technological development and the financial market as a whole (Stepnov, 2021), so, along with technological solutions in the field of artificial intelligence and blockchain, the priority areas of neurotechnologies in Fintech for 2021–2023 are: neuroassistants and neurocommunications, automated portfolio management systems using neural networks, speech recognition and biometrics, neural network forecasting, neurotesting, neuromarketing, and neuroeconomic research, recommendation systems, intelligent decision support systems, and others.

Today, competition and the main struggle are taking place in the field of financial service delivery methods (issues of development of new infrastructure: mobile applications, competition of payment systems, and the banking sector). Tomorrow, the stumbling block may be competition in the choice of a neuroconsultant and a neuroassistant. The next stage is determined by a qualitatively new level of service using neuroassistants and neurocommunications in Fintech. In this regard, there are questions of definition and development of the concept of digital financial service, changes in the field of investment consulting and asset management, the functionality of participants, the legal status of clients, protection of freedom of choice and consumer safety, etc.

With the development of digital platforms, the issues of their tariff policy and the new digital infrastructure, the increase and change in the role of non-bank credit institutions (the proportions of banks and the non-banking sector in the economy, the place of banks in the infrastructure of the digital ruble), and their impact on financial stability are becoming more acute. The development of regulatory algorithms requires a legal and ethical assessment, clarification of the mandate of the central counterparty in terms of granting him the function of lending and launching the digital ruble, his role as coordinator of the “new” digital market—e-commerce, his relationship with platform operators, consumer protection (both participants from the point of view of ensuring competition and end users). How will these processes affect the economic cross-sectoral proportions and the new architecture of the financial market?

The development of blockchain technology and its provision with energy makes the geopolitical problems of mining more and more urgent.

In view of these trends, it is possible to define targets and identify the following priority areas of intersectoral coordination in the field of Fintech, artificial intelligence, and neurotechnologies.

The goals of the next stage of the financial market and Fintech development 2021–2025 are to ensure the stable positions of the Russian segment of financial and intellectual technologies, taking into account national security through strategic planning and intersectoral coordination of development at the national and international levels. Priority areas of intersectoral coordination of financial and intellectual technologies are the following.

Firstly, ensuring the coordination of strategic priorities and program documents for the development of financial and intellectual technologies. Given the cross-border nature and macroeconomic impact of financial and intellectual technologies determines the use of classical systemic approaches to the formation of coordination mechanisms for their development, not limited to vertical-sectoral coordination. Taking into account their impact on macroeconomic processes: redistribution of resources in the economy, investments, stability of the financial system, public consumption, it is necessary to ensure coordination of strategic documents for the development of the financial market of the Government of the Russian Federation and program documents of the Bank of Russia in the field of financial technology development. For this purpose, the “Financial Market Development Strategy until 2030” developed by the Ministry of Finance of the Russian Federation on behalf of the Government of the Russian Federation and such program documents of the Bank of Russia as “Main directions of financial market development” and “Main directions of financial technology development” should include a targeted national model of financial technology development taking into account the development of blockchain technology, an intersectoral coordination block and the development of Fintech, artificial intelligence, and neurotechnologies, solving the problems of providing energy resources and the international section: models or concepts of integration of the Russian Fintech segment into the global market. Provision should be made for regular, annual reporting to the State Duma on the goals and indicators of Fintech development, which will require amendments to Federal Law No. 86–FZ

of 10.07.2002 “On the Central Bank of the Russian Federation”. In addition, it will ensure the sequence of stages of transformation of the financial market: by providing for the implementation of the Plan of regulatory regulation of the use of technological solutions in the financial market after the coordination of strategic, international, and intersectoral priorities of its development. In the conceptual block of international cooperation, in contrast to its traditional functional content, it is necessary to specify the goals, directions, coordination mechanisms, and forms of international cooperation for industry organizations, business, development institutions, public authorities, in the form of a sequence of activities by stages, areas of activity and projects, the expediency of participation in working groups of international organizations or initiating the creation of new ones, and the possibility of using financing tools for global development institutions. It is important to reflect the issues of regulation of transcontinental and extraterritorial services—which we stimulate (lack of analogues), which we restrain to protect the domestic market. It is essential to reflect the geopolitical issues of mining development and regulation.

It is necessary to shift the priorities of financial market development from risk management to competitiveness support and strategic planning.

Secondly, a qualitatively new level of development of intelligent technologies (artificial intelligence, blockchain, neurotechnology, biometrics, cloud technologies, etc.) used in the provision of financial services, including in the field of investment consulting, asset management and portfolio managers, regulating algorithm, mobile applications, sets the tasks of specifying and developing the concept of financial technologies and financial services in legislation, regulating liability and making decisions on the application of existing insurance institutions to relations involving financial technologies. It requires a description of the legal status of robot advisors, ensuring the protection of the rights of users of robot advisors; expanding opportunities for the use of robot advisors in making investment decisions; removing barriers, observing public interests and consumer rights and methods for measuring various parameters and characteristics of artificial intelligence systems, regulations on the rights and obligations of participants, market access, consumer rights, tariffication.

The third direction is conducting neurotesting of Fintech products. Mandatory IT expertise of Fintech products and neurotesting at the testing stage are provided for in the recommendations of the international organization FinCoNet in the framework of consumer protection. Neurotesting of services and financial technologies includes psychoemotional analysis, psycholinguistic assessment, verbal assessment, assessment of consciousness and unconsciousness of reaction, UX research, instrumental neuromarketing, and other methods. It should be possible to fix a number of requirements for disclosure of information about a financial product, excluding the practice of prompting the consumer to a certain choice (unconsciously), which is beneficial for a financial organization, requirements for the contrast of background colors and text, etc.

Fourth, in the case of using artificial intelligence technologies and neurotechnologies, it is necessary to ensure the harmonization of financial services’ standards in terms of requirements for developers, software with industry associations in the field of artificial intelligence and neurotechnologies, including approaches to their

formation at the international level, and not only with the Fintech Association. At the international level, it is necessary to harmonize international organizations, stages, priorities and ensure coordination of experts.

The next direction is to ensure coordinated positions in the domestic and foreign markets in the field of financial technologies, artificial intelligence, and neurotechnologies. The introduction of the digital ruble into circulation will change the landscape of the financial market—a monopoly on infrastructure and its regulation will be created. In this regard, the issues of intersectoral coordination and regulation of monopoly—mechanisms and institutions of public control and consumer protection—become relevant. To this end, it is necessary to create an institution of public control—a conciliation body based on an intersectoral coordination mechanism, which would include, along with representatives and associations in the field of Fintech, representatives of related industries—artificial intelligence and neurotechnologies, as well as energy in terms of mining issues and federal executive authorities. Possible options: the Consumer Protection Committee at the Bank of Russia, Working groups at the public councils of the executive bodies of state power of the Russian Federation and the State Duma of the Russian Federation, Expert support at the Government Commission.

At the international level, it is necessary to ensure the protection of national interests through the coordinated work of experts at a cross-sectoral level, participation in the priority pool of international organizations WTO, OECD, United Nations and its specialized agencies, FATF, Commonwealth of nations, ISO, GPFI, FinCoNet (the International Financial Consumer Protection Organization), GFIN, FSB World Bank, IMF, BSCBS, Eurasian economic union, UNESCO. The IMF has released a report on digital assets (Baths et al., 2022), in which it is called for the FSB to be recognized as a coordinator for the development of crypto ecosystems at the global cross-sectoral level, including for setting standards to support national regulation of crypto assets. In this regard, it is advisable for national regulatory authorities to intensify work on the harmonization of such standards, taking into account their national interests, both at the FSB platforms and in other coalitions. It is reasonable to participate in the development of ISO standards on blockchain and artificial intelligence in terms of requirements for developers and access to markets. In the OECD to cooperate with the Financial Markets Committee, the Global Finance Forum, the Symposium on the Promotion of Financial Literacy, with the Joint Task Force on Institutional Investors and Long-term Financing, on Mixed Financing, the Task Force on Consumer Protection of Financial Services. It is important to prepare proposals for the implementation of the project “Towards Digitalization for Growth and Well-being” and to ensure the participation of Russian experts in the development of tools and its meaningful content: OECD Issues in neurotechnology governance, as well as Working Party on Biotechnology, Nanotechnology, and Converging Technologies (BNCT), in working groups—International Brain Initiative: Global Neuroethics, Global List of Brain Initiatives, Education and training, to participate in further work on global standards and data exchange tools and technologies, communication, and advocacy. It is necessary to join the work of Brain/MINDS Beyond, UNESCO, the

development of an international normative document on the ethics of artificial intelligence, as well as work on the structure of the agreement on the Eurasian Economic Union in section XVI “Regulation of financial markets from 2025”.

The share of high-tech services in the sectoral structure of Russian exports of services is 29%, financial services—3%. The Russian export support system lacks a product line for financial service providers, which creates unequal conditions in international markets. The functions of the Bank of Russia by law do not include the promotion of Fintech and financial services to foreign markets. For the development of integration associations (Eurasian economic Union, etc.) and the positions of the Russian Fintech segment in foreign markets, it is advisable to provide for the functionality of promoting financial services to foreign markets either at the level of the Bank of Russia or at the level of self-regulatory organizations with the coordinating role of the Bank of Russia. In order to develop the export of financial services, it is necessary to implement the concept of introducing open APIs and increasing the export competitiveness of Russian platforms (crowdfunding) at the level of integration associations, as well as stimulating the creation of national strategic consortia in Fintech, including intersectoral ones using artificial intelligence and neurotechnologies, as well as their promotion on the international level.

25.4 Conclusion

The analysis of international mechanisms and the national model of coordination of the development of financial and intellectual technologies, as well as the study of trends in the development of technologies and the financial market, makes it possible to identify the following priority areas of intersectoral coordination of their development: ensuring coordination of strategic and programmatic priorities for the development of these areas, ensuring coordinated positions in the domestic and foreign markets in the field of financial technologies, artificial intelligence, and neurotechnologies, specification and development of the concept of financial service in the legislation, conducting neurotesting of Fintech products, and ensuring the harmonization of financial services standards using artificial intelligence technologies and neurotechnologies in terms of requirements for developers, software with industry associations in the field of intelligent technologies, including approaches to their formation at the international level.

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Chapter 26

The Influence of the Controlling System on the Economic Security of Industrial Enterprises in the Digital Economy



Victor P. Kuznetsov , Anatoly A. Permovsky , Evgeny A. Semakhin ,
Elena V. Romanovskaya , and Yulia V. Ozhiganova

Abstract *Purpose:* The purpose of this article is to interpret the updating of the controlling system as an element of the economic security of industrial enterprises. *Design/methodology/approach:* In this article, the authors formulate the definition of controlling the economic security of an enterprise as a tool for optimizing management decisions. The introduction of the controlling system into the organizational and managerial structures of the organization is being updated. *Findings:* According to the authors, this system significantly reduces the risks associated with the negative impact of the external and internal business environment. The development of flexible and effective methods of influencing various situations and factors, planning a strategy, formulating goals and ways to achieve them contributes to the adaptation of an enterprise to constantly changing economic conditions, as well as further development and prosperity. *Originality/value:* Modern approaches to management activities related to the organization of the economic security of an enterprise are achieved through planning, the formation of financing strategies, reporting on profit and loss, analysis of deviations from the plan, monitoring and processing information, as well as predictive work. According to the authors, economic security is an integral part of the effective operation of both an individual enterprise and the industrial sectors of Russia as a whole.

Keywords Controlling · Economic security · Management · Economic threats · External and internal environment

JEL Classification M11 · D23 · G32 · D29 · L23

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26.1 Introduction

In modern stochastic conditions of the economy, the successful functioning of industrial enterprises largely depends on the adaptability and efficiency of management decisions. Protecting an enterprise from economic threats comes down to the safety of its production, scientific, technical, technological, and human potential from direct and indirect threats. Against the backdrop of globalization and the economic interconnection of many industries, it is important for each market entity to have its own technological and financial independence. Understanding and assessing the level of economic security of an industrial enterprise, as a function, are possible within the framework of an integrated controlling system (Garina et al., 2020a, 2020b; Permovsky & Kuznetsov, 2022).

Controlling the economic security of an enterprise consists in the formation of a flexible system of information and methodological support for management decisions on ensuring the efficient use of resources, preventing threats at the present time, and ensuring the stable development of the enterprise in the future (Kozlova et al., 2020). Controlling can become a link between the security service of an enterprise, as a separate structural unit, and management. The use of planning, analysis, control, information data integration techniques are only tools and mechanisms for implementing the controlling function (Garina et al., 2020). The controlling system is designed to maintain profitability and ensure the liquidity of the enterprise, by developing and optimizing management decisions. «The controlling function is very important in large enterprises. One of the main tasks of controlling is to create a comfortable management system, where management receives information in the right amount and at the right time to make error-free decisions» (Permovsky et al., 2020; Pervova & Polubelova, 2021; Solomatova, 2019).

26.2 Materials and Methods

The economic security of industrial enterprises is the flagship of sustainable growth in the real sector of the Russian economy (Kozlova et al., 2021). It should be considered within the framework of possible risks and threats for an economic entity, which can be both internal and external (Yashin et al., 2019) (Table 26.1).

The internal economic threats at the enterprise include the modern specifics of the information environment of the subject. Modern digital technologies and computer programs combine information from different production units into one system for more efficient and effective management control. Such a digital enterprise management system influences strategic planning and allows you to increase efficiency and maximize benefits by improving the quality and volume of products. Only a clear and well-coordinated functioning of the information system at the enterprise will allow you to effectively manage and make optimal decisions.

Table 26.1 Main economic threats

Internal threats	External threats
Financial	Political
Personnel	Environmental
Informational	Legal
Technological	Social
Production	Macroeconomic
Resource	Market
Logistics	Scientific and technological
Organizational	Epidemiological

Source Compiled by the author

Modern enterprises use robotic systems and various sensors to improve monitoring of equipment performance and timely notification of possible failures and breakdowns, thereby ensuring uninterrupted operation (Mizikovskiy et al., 2018).

The trend of transition to digital information systems, on the one hand, generalizes and simplifies the work with current information and, on the other hand, complicates the task of protecting this information from intruders. Moreover, the loss of information can occur not only as a result of industrial espionage, but also due to the negligence of employees of the enterprise. The purpose of the controlling system in the framework of information security is the creation of organizational and managerial measures with information flows and the combination of reasonable access to confidential information with strict regulation of work with it.

Another possible threat to the economic security of the enterprise is the efficiency of the management, which is expressed in the final results of production. It is also necessary to organize protection against economic crimes, which can be expressed in industrial espionage, theft, and falsification. The controlling system should develop and provide criteria for assessing management, as well as regulate actions to overcome the current unfavorable situation. Efficient organization of production and management processes, optimization of budget management systems, financial planning ensure the firmness and independence of the enterprise, as well as financial stability. An important factor is the number and qualifications of staff, their satisfaction with wages, and working conditions. Potentially, every employee of the company, and in fact it is every legal user of the information system of the enterprise, admitted in accordance with their official duties to information resources, is a potential insider. Therefore, the fight against insider threats is an important task of strategic planning in identifying and minimizing risks. Only relying on the ideology and tools of the concept of controlling, the problem of economic security of the enterprise can be solved.

Digital transformations should take into account that significant investments in competent human resources will be required, so such changes should be economically justified. «Innovations often require significant financial investments aimed at significant transformations in the production process, the development of new

technologies, promising types of products. These kinds of improvements are usually made when a positive return on investment is possible» (Modenov et al., 2019). The introduction of a digital controlling system loses its meaning if the management cannot analyze the incoming information and draw the appropriate conclusions, does not want to rebuild, changing the business model.

Internal economic threats should also include a decrease in the stability and financial efficiency of production, problems of a technological and technical nature, and others (Necheukhina et al., 2017).

External economic threats include crisis phenomena in the economy and politics of the state, sanctions restrictions and prohibitions, actions of competing enterprises, breaking economic associative ties, the state of the target market, environmental problems, etc.

26.3 Results

To effectively prevent the emergence of external threats and minimize their consequences, a holistic view of the enterprise's activities and an integrated approach are required, developed taking into account the necessary management actions and specific measures, the development of forecasting methods, mechanisms for identifying and assessing threats, the development of strategies and tactics of action. Also, one of the important goals of controlling is the development of mechanisms for the reorganization of an enterprise in order to counteract threats to economic security.

Timely awareness and reliability of information to the management about the adverse effects of the external environment on the structures of the enterprise should ensure the avoidance of risks, as well as the correctness and immediacy of management decisions. Given the instability and unpredictability of the economic situation in the world, the activities of the enterprise may undergo qualitative changes and alternative ways of development. There are many methods for analyzing various types of risks and methods for managing them. The enterprise chooses the most optimal strategy after analyzing the totality of risks: financial, industrial, social, environmental, etc. To improve the economic activity of the enterprise and to strengthen its financial condition and management, financial analysis of performance indicators plays a significant role. Identification of unused reserves and an increase in production capacity is possible after assessing the work on the implementation of business plans and assessing the financial and property condition. The most important conditions for ensuring economic security at the enterprise are the minimization of production costs, adaptation to transformations and innovations, and the development of promising areas for the development of the enterprise infrastructure (transport, communications, logistics, energy supply, i.e., activities serving the main production).

26.4 Discussion

The level of economic security of an enterprise depends on management mechanisms and requires more and more new and improved approaches to prevent external and internal threats and eliminate negative consequences (Kulueva et al., 2019).

The main objects of protection against economic threats are shown in Fig. 26.1

The main tasks of the controlling system for the economic security of an enterprise are:

- participation in the development of methods for forecasting and modeling threats to the economic security of the enterprise, both in the internal and external directions;
- development of recommendations, internal standards, incentives and motives, means and methods for implementing a set of measures aimed at countering threats to economic security;
- timely identification of adverse trends and scenarios in the event of threats to economic security in accordance with accepted standards and methods, in order to make optimal management decisions;
- evaluation of the effectiveness of management decisions and their implementation to counter threats to the economic security of the enterprise.

Based on the results of the implementation of the conditions that ensure the economic security of the enterprise, the following indicators are evaluated:

- development of fixed production assets and technical resources of the enterprise;
- the pace of production and the stability of the production process, resource supply;
- stability of product sales on the market and its competitiveness;
- cost, profitability, capital productivity, as well as the balance of assets and liabilities;
- personnel potential.

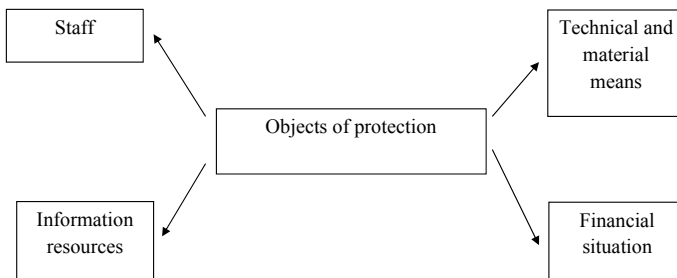


Fig. 26.1 Main objects of protection against economic threats. *Source* Compiled by the author

26.5 Conclusion

Despite the above general tasks of economic security, an individual concept of approaches should be developed for each enterprise, taking into account the specifics and direction of activity, the legislative and legal framework of the state, the material and technical resources and financial capabilities of the enterprise, territorial location, environmental features, socio-political tasks, and many other factors. It is the individual approach implemented by the controlling system that should lead to independence and security and also allows optimizing the management of the enterprise, adapting it to various changes in the external and internal environment, planning and coordinating the future development of the enterprise, making it profitable and competitive. «The economic security of an enterprise that has implemented controlling is at a higher level than its competitors».

Thus, in conditions of fierce competition and unpredictability of the external environment, the formation of a controlling system, as an element of economic security in an enterprise, significantly reduces financial risks and prevents crisis situations.

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Chapter 27

The Impact of Digitalization on the Economic Security of the Territory in the Solution of Socially Significant Issues



Elena V. Lobkova 

Abstract The author considers the impact of digital technology on the level of economic security of the territory in terms of highly important social tasks. The author presents the main author's approaches to studying the relationship between the digitalization of the socio-economic sector and the economic security of the territory. The paper aims to quantify the strength of the impact of digitalization on security and risk management. The research develops and describes an algorithm for the assessment that proposes methods for finding the optimal value by the criterion of similarity with the ideal solution, fuzzy logic tools, and assessing the relationship of indicators through correlation coefficients. To interpret the results, the transition to clear quantitative values of the indicators was made by applying the method of the center of gravity and aggregation of the final indicators based on the additive–multiplicative model. The author assesses the impact of information and communication technology on security indicators with a probabilistic assessment of their belonging to a certain level of risk. The research identifies indicators of the introduction of digital technologies in the economy, which have the most significant impact on economic security indicators. The author concludes about the ambiguous influence of digitalization of the social sector and industries on the parameters of economic security of territories. According to the research results, the conclusion about the prevailing trend of growth of risks and threats to the economic security of regions under the influence of digital transformation processes is made.

Keywords Information technology · Risk · Accessory function · Digital transformation · Economic security

JEL Classification C43 · O11 · P51 · R13 · R58

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27.1 Introduction

The ESG investment agenda has become a hot topic in many countries. It receives much attention at the level of big business, government agencies, and small- and medium-sized businesses. Components of ESG initiatives are implemented in business programs and strategies. They are supported by the government and are integrated into other relevant concepts and strategic directions, particularly in the concepts of sustainable development and economic security.

The emphasis on environmental problems and the active introduction of the “E” (the environmental component) component into business programs and government projects, in a sense, leaves the “S” component (the social component) in the shadows. The social aspect does not lose its relevance and even demonstrates an increase in importance while its interpretation changes. The traditional interpretation of the social factor or its neglect is a serious limitation in the development of business, territory, and country; it increases the risks of systems.

Nowadays, the model of interaction between the government and business, in which social problems postulated by the state are solved by attracting private investment with the payment of a grant to a business entity—the investor in the case of achieving the required social effect for the project area, is widely used. A joint solution to social problems has a synergistic effect. It ensures more efficient use of budgetary resources and encourages businesses to develop their projects in new planes. Thus, in today’s environment, businesses must provide quality products and financial stability and contribute to solving social issues. The result of the activities of government agencies in the sphere of economic security depends on the success of solving the entire set of tasks related to the labor market (job creation, quality of employment, wage conditions, and labor safety) and the development of the territory in terms of providing quality social infrastructure facilities and their accessibility.

The main role in ensuring the economic security of the country belongs to the government. Its active position and openness in dialogue with business are necessary to achieve the strategic objectives of sustainable development and economic security of the territory.

27.2 Materials and Methods

The study of the impact of digitalization of the economy and social sector on economic security is mainly reduced to the identification and systematization of problems arising against the background of the increasing use of digital technology and the insecurity of certain aspects of business and social life.

Spivakovskyy et al., (2021) highlight the advantages and disadvantages of business and society in the digital economy, focusing on systemic, structural, and sectoral problems of this process. According to the authors, the most acute problems include the “digital divide,” the lack of a minimum base of skills and opportunities to use

digital technology among the population and individual business representatives, changes in the labor market due to the loss of need and importance of certain professions of workers, industrial espionage, and the manipulation of personal data. The authors propose a network readiness index as a tool for monitoring the development of a digital society. The authors reduce the practical significance of their study to developing a mechanism to smooth the impact of digital transformation on the country's economic security.

In their study on the systematization of challenges and threats to economic security, Popov and Semyachkov (2018) identified the prediction of the risks of universal digitalization as a priority task. The authors refer to the features of the digital economy as intellectual assets, increased relevance of data, network management, widespread Internet penetration, and global data exchange. Based on their research, the authors formulated priorities for addressing economic security in a digitalized environment: rational use of resources, continuous learning, a unified approach to systems management at different levels, and the involvement of stakeholders in digitalization.

Mamatelashvili and Kulagina (2021) highlighted the advantages of the digital economy (reduced costs, increased productivity, new jobs, reduced corruption, transparency of transactions, and reduced human error) and the threats of digitalization, which included the risk of information leakage, increased frequency of fraud, reduction and disappearance of some unclaimed professions, staff reduction due to the introduction of robotics in organizations, lack of staff experience, and skills in working with new technologies, and unwillingness and inability of some categories of citizens to use new technologies in practice. Thus, there is a set of features of the digital economy. On the one hand, these features positively affect socio-economic conditions. On the other hand, they pose new threats and increase the existing risks of reducing the level of economic security of territories and the country.

The ambiguous impact of the digital transformation of the economy on security has been studied and proved by many authors; there are also quantitative estimates of this impact (Dzobelova et al., 2019; Kirishchieva et al., 2021; Korotkova, 2020; Plotnikov et al., 2020; Vlasov, 2020).

Current trends in the digitalization of public administration, the system of relationships between business entities and consumers, the social sphere, and the entire economic space entail several important changes, from the qualitative transformation of interaction systems to the growth of threats to the economic security of participants in the process and entire territories. With the increasing level of optimization and speed of various communication, operational, functional, and managerial tasks, the frequency and likelihood of threats and risks occurring in traditional conditions, as well as new threats and risks arising against the background of extensive digitalization of society, are also increasing.

This research proposes an approach to assessing the impact of the digitalization of society and management systems on the indicators of economic security of the territory. The proposed approach can be applied to any level of the socio-economic system—state, region, industry, or enterprise (macro-, meso-, and micro-levels). When adapting the approach, it is necessary to vary the indicators for assessing the level of economic security and digital maturity of the subjects of relations.

The assessment of economic security and related risks is a challenging task. It requires a continued search for solutions due to the lack of normatively established methodological approaches and comprehensive recommendations on this issue. State authorities in different countries have established lists of indicators to assess economic security within the framework of national security priorities, explanations for assessing these indicators are given, and systematic monitoring of their values is carried out. However, a comprehensive approach to the diagnosis of the array of these indicators, as a rule, is not applied, which makes it difficult to assess the relationships with other areas of socio-economic development. The state of economic security of the territory in the context of addressing issues of social importance (considering the “S” factor) considers the indicators of development of key sectors of the economy, indicators of product manufacturing, the level of social security of the population, the effectiveness of solving social problems, accessibility and quality of social infrastructure, ensuring the necessary and sufficient level of income and their security, protection against the system and specific risks, labor market and investment parameters, etc.

Current conditions of doing business and implementing government programs and activities require the inclusion of the block for diagnosing the activity and success of the introduction and use of digital technology in assessing economic security. One of the options for considering this aspect is creating membership functions to a given level of risk and safety. Methods of fuzzy logic, which include the method of constructing membership functions, allow us to adequately assess several socio-economic processes that have a probabilistic nature and an ambiguous influence of various hidden and complexly conditioned factors. This includes the process of economic security, the labor intensity of implementation of which is increasing due to the increasing concentration of digitalization in the business environment and society.

The approach proposed by the author is a combination of methods of multicriteria evaluation of alternatives (TOPSIS method) and fuzzy logic (construction of membership functions). An illustration of the proposed algorithm is carried out on the example of the regions of Yenisei Siberia (the Krasnoyarsk Territory, the Republic of Khakassia, and the Republic of Tuva).

The largest companies that implement their activities and business projects in the regions of Yenisei Siberia are included in the ESG agenda. They implement their ideas in the field of sustainable development and current trends of doing business on the principles of environmental, social, and corporate responsibility. The economic security of the territories and the prospects for their development largely depend on the success of these business representatives.

The author assessed the level of economic security of territories by statistical indicators and considered the processes of digitalization of the socio-economic sector. The connection of digitalization processes in the social and economic sphere with the level of economic security of systems is expected to be present. Nevertheless, it requires proof and, most importantly, an assessment of the strength of the impact and clarification of the direction of this influence. The developed evaluation algorithm includes several procedures, the sequence of which is shown in Fig. 27.1.

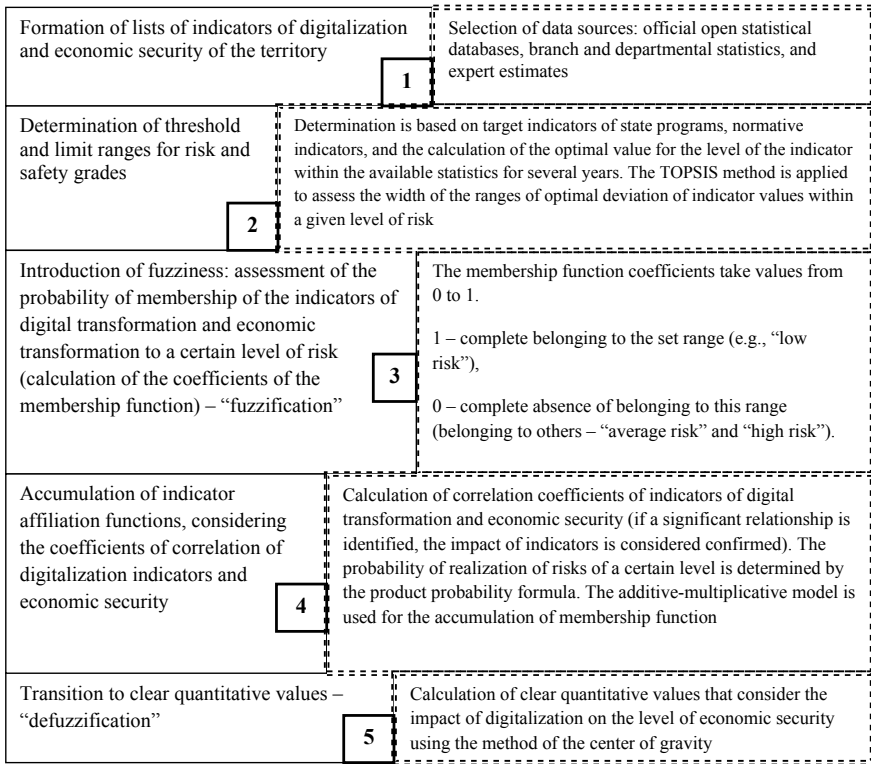


Fig. 27.1 Sequence of implementation of procedures of the method of assessing the impact of digitalization on the level of economic security of the territory. *Source* Compiled by the author

The first stage of the proposed method is to form a set of indicators used to diagnose the level of risk and economic security, the extent of implementation of information and communication technologies, and the development of the information society. For these purposes, official statistical data and information from departmental and industry reports are used. In the absence of indicators necessary to assess certain aspects of economic security and digital transformation, expert assessments can be used, considering the factor of their subjectivity.

The second step implements a procedure for determining the thresholds and limits of the ranges for the risk and safety gradations. The basis of this procedure is target indicators of state strategies and programs, normative indicators or benchmarks for best practices of states and territories, and the “best” indicators on the available sample of statistical indicators for several years. After calculating the limit values, the width of the ranges of acceptable deviations of the indicators from the threshold value is evaluated. The optimal deviation is calculated using the TOPSIS method, the application of which has been described in detail by several authors (Ding et al., 2016; Lobkova, 2020; Rahim et al., 2018). Within the framework of this method, the

perfect solution is considered to be a limit value (maximum or minimum), which is a threshold for the selected indicators. The measure of the optimal deviation of the indicator calculated by the TOPSIS method becomes the base value for determining the width of the ranges of values formed for the distribution of indicators according to the criteria: “low risk and high safety level,” “medium risk and medium safety level,” and “high risk and low safety level.”

The third stage is the direct application of the method of constructing membership functions of indicators to a certain level of risk and safety (“fuzzification”—the transition to a fuzzy set based on probabilistic estimates). Calculation of the coefficients of the affiliation function for each safety or digitization indicator is performed according to the results of the evaluation of the frequency of the statistical indicator in the interval for a given risk level. The probability of the indicator falling within a limited safety range is assessed. The result of such an assessment is a square matrix of coefficients of distribution of the indicator by the level of risk. The resulting matrix elements serve the purpose of calculating the degree of belonging of the input parameter to the designated safety interval. Finding the eigenvalue of the coefficient matrix of frequencies of an indicator falling in a given interval provides an eigenvector of values, the components of which are the coefficients of the membership function. The obtained results allow us to construct a membership function for each input parameter of economic security, which, through the coefficients, characterizes the degree of belonging of the selected indicator to one of the gradations of risk and security.

The fourth stage of the method assesses the relationship between indicators of economic security and digital transformation. For this purpose, correlation coefficients are calculated between the resulting indicators (indicators of economic security) and factor attributes (indicators of digitalization of the economy and social sphere). When significant correlation coefficients are obtained, the correlation of the indicators is considered to be confirmed. In this case, the probability of occurrence of events related to each other is determined by the product probability formula. The general aggregation of the coefficients of membership functions, considering the digitization of sectors, is carried out based on the additive–multiplicative model. In the case of incompatible events (there is no significant relationship between the indicators), the probability of the implementation of the economic security risk of a certain level is considered to be independent of the processes of digital transformation of the socio-economic sector of the territory.

The transition to clear quantitative values, understandable for interpretation of the evaluation result—the fifth stage of the procedure (“defuzzification”), is carried out based on the method of the center of gravity.

27.3 Results

To test the developed approach, the authors selected seven indicators of economic security of the territory used to assess the following:

- The dynamics of the volume of investment in fixed capital in the region (y_1);
- The unemployment rate among the working-age population (y_2);
- The price level on the consumer market (y_3);
- The physical volume of gross regional product (y_4);
- The real money income of the population (y_5);
- The poverty level (the share of the population with incomes below the subsistence minimum) (y_6);
- The degree of depreciation of fixed assets (y_7).

The listed indicators are used to diagnose the state of the territory's economic block and social sector, which is especially important in the conditions of growing attention to ESG principles on the part of businesses and authorities.

The results of the assessment of the impact of the processes of digital transformation of the economy and social sector on the economic security of territories (on the example of the regions of Yenisei Siberia) demonstrate different impacts on the studied phenomenon (Fig. 27.2).

Ten indicators were selected to assess the implementation of information and communication technologies in the social sphere and sectors of the economy (the level of digitalization of the regions): the number of Internet users; the share of citizens using the mechanism for obtaining state and municipal services in electronic form; the share of business organizations and government agencies that use Internet access to place orders for goods (works, services) and have a website on the Internet; the share of spending on the implementation of information and communication technologies, etc.

27.4 Discussion

The change in the coefficients for individual indicators reaches 130% of the original level; the minimum deviation is 12%. Comparing the values of the coefficients of affiliation functions before and after considering the impact of the implementation of information and communication technology on the level of risk and economic security of the territory allowed the author to formulate a conclusion about the ambiguous impact of the digitalization process on socio-economic development. The difficulty of formulating accurate estimates and clear conclusions regarding the direction of the impact of digital transformation processes on the economic security of territories is due to the factors described above, associated with the optimization of several critical processes in the economic and social sphere, on the one hand, and the growing risks of taking advantage of digital technologies, on the other. The general trend for

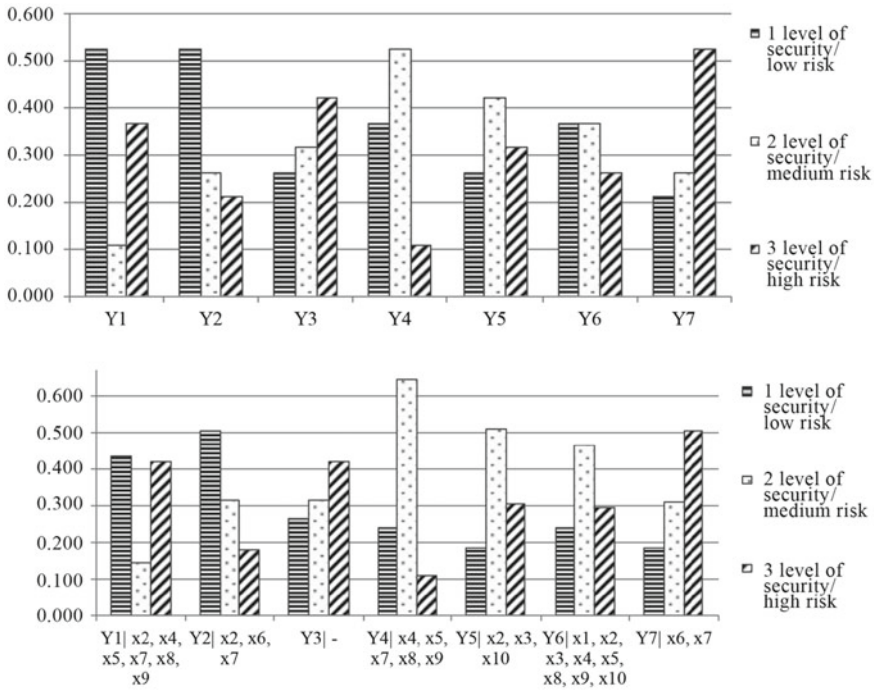


Fig. 27.2 Distribution of the coefficients of the membership functions of economic security indicators of the Krasnoyarsk Territory without regard to (upper histogram) and with regard to (lower histogram) the impact of indicators of digital transformation. *Source* Compiled by the author

the studied territories (the Krasnoyarsk Territory, the Republic of Khakassia, and the Republic of Tuva) is a predominant increase in the risks of economic security indicators when considering the impact of digitalization indicators.

The greatest sensitivity of risk factors to digitalization indicators is characteristic of regions that have less “safety margin” in terms of parameters and safety indicators (e.g., the Republic of Tuva). Simultaneously, some statistical indicators show a lack of sensitivity to these phenomena, as well as the dynamics of the coefficients out of the general trend (e.g., the reduction of system risks when considering the impact of ICT implementation indicators).

27.5 Conclusion

Thus, the processes of digital transformation, along with their positive impact on the efficiency of regional socio-economic systems, entail increasing risks and threats to economic security. Managing the digitalization processes of the social sphere and

sectors of the economy requires systemic monitoring of the “response” indicators of socio-economic security due to their probabilistic deviation from the required level.

The application of the algorithm described by the author to assess the impact of digitalization on the level of economic security of territories makes it possible to diagnose the propensity of indicators to the growth of risks and the negative implementation of threats to the system.

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Chapter 28

Cybersecurity for the Stimulation of Entrepreneurship Development in the Digital Economy Markets



Dmitriy N. Panteleev

Abstract This research is aimed at determining the essence of cybersecurity, identifying the factors of cyber threats and the tools for their elimination, discovering the influence of information risks on the digital economy development and substantiating the directions for the strengthening of cybersecurity of entrepreneurship in the digital economy markets from the position of an increase in resilience to threats. The methodology of this research is based on the systems' approach, which treats the digital economy as a whole. The processes that ensure its development and hinder it because of a range of cyber threats are described. In this context, cybersecurity is a factor that stimulates development. This research uses the approaches of risk management to identify cyber threats and their possible influence on the development of the digital economy, structural analysis to discover the impact of digital culture on the state of cybersecurity, the graphical method to demonstrate the connection between cyber threats and tools of cybersecurity and methods of economic analysis to substantiate the volume of losses due to cybercrimes and expenditures for cybersecurity within the determination of economic expedience of the given measures. Cybersecurity is treated as a process connected with the protection of information, data, communication channels and networks and their owners and consumers from damage or unsanctioned access. The list of cyber threats and cybersecurity tools is structured. The volume of economic losses from cybercrimes is given, and the volume of expenditures for cybersecurity, which are used for ensuring the functioning of the digital economy, is listed. The direct connection between the size of the digital economy and the volume of cyber threats is determined. According to this, there exists a need to prevent such threats through the formation of a corresponding level of digital culture of employees, population, public authorities, etc. Such actions allow raising the level of adaptability and flexibility of cyberspace and ensuring a better level of resilience against cyber threats. This research allowed discovering a close direct connection between the size of the digital economy and scales of digital threats. According to this, the directions for ensuring resilience against cyber threats

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through the development of digital culture are formulated. These suggestions are the objective factors on the stimulation of entrepreneurship development in the digital economy markets.

Keywords Cybersecurity · Cyber threats · Cybercrimes · Digital economy · Digital entrepreneurship · Digital culture

JEL Classification L86 · M13 · O10 · O15 · O30 · O32 · O38

28.1 Introduction

The basis of digital economy development is data. Data are treated as a modern phenomenon, a new natural resource and the basis of competitive advantage, which transforms each profession and branch. Risks on the change of data, their loss, or theft under the conditions of the digital economy are much higher. Each fact of cybercrimes may have a large influence on the state of development of digital entrepreneurship and conditions of functioning of state services or private interests. Therefore, cybercrimes are among the largest threats to each profession, sector and enterprise in the world (Morgan, 2015).

The development of digital entrepreneurship is closely connected with the increase in the volume of information, Internet connections and the growth of the number of Internet users. The same tendencies define the development of the digital economy and ensure its stimulation. About 3.5 billion people have Internet access, while the volume of information on the Internet is 44 zettabytes (ITU, 2022). Dissemination of information technologies influences national ecosystems more and more. They form new organisational and business opportunities, implement online services in the environment of public authorities and promote new economic and product paradigms, e.g. Industry 4.0 or wide digital economy.

Under such conditions, the volume of information and information products grows constantly. Not only companies and organisations but also consumers participate in the generation of data. More and more people use information technologies for the receipt or purchase of products, services and information (UNCDF, 2022).

According to Cybersecurity Ventures, by 2025, 200 zettabytes of data will be stored in the world, due to the development of the digital economy. This volume will include data stored in private, public and municipal IT infrastructures, private and public cloud centres of data processing, on private PCs, laptops, tablets and smartphones and on IoT devices (Morgan, 2020). Thus, the risks and scales of cybercrimes will be constantly growing.

As for global losses from cybercrimes, their volume could be compared to the volume of a national economy. Six trillion dollars of losses from cybercrimes in 2021 are the world's third-largest national GDP (after the USA and China) (Morgan, 2020). With this in mind, initiatives on cybersecurity and its development and institutionalisation grow annually. Expenditures for this are expected to reach USD 10.5

trillion by 2025. This might be treated as the largest movement of capital in the history of the world economy, which exceeds losses from natural disasters and forms a separate sector in the structure of the digital economy. Thus, the stimulation of the development of digital entrepreneurship cannot be separated from the development of cybersecurity.

28.2 Materials and Methods

This research is based on the systems' approach, which treats the digital economy as a whole, with its specific features and parameters. Cybersecurity is an important factor that influences the general state of the system, raises its stability and facilitates its development. The methodological approaches of risk management, economic analysis and comparison are used. The structural analysis allowed determining the influence of digital culture on the formation of a favourable environment for the strengthening of cybersecurity, protection of digital data and secure development of digital entrepreneurship. The use of graphical method allowed structuring the list of cyber threats and tools in their management. Economic analysis was the basis for evaluating the volume of economic losses from cybercrimes and the volume of expenditures for protection from such threats.

The study of the issues of cybersecurity in the context of the development of the digital economy and entrepreneurship is an important direction in world economic thought. In the context of this research, attention should be paid to works connected with the determination of a connection between the growth of digital capital and development of cybersecurity (Comite, 2022); regulation of the issues of cybersecurity management at the international level (ITU, 2022); analytical studies of the state and specifics of cybersecurity in the digital economy (Council, 2019; Guardian, 2020; Kaspersky Laboratory, 2018); assessment of scale and trends of cybercrimes and cybersecurity (Morgan, 2015); substantiation of the directions for cybersecurity management (Stedman, 2022), influence of digital culture on the assertion of provisions of cybersecurity (Georgiadou et al., 2020; Ghernaouti & Wanner, 2018; Huzaiz et al., 2021; Veiga et al., 2020); perspectives of cybersecurity under the conditions of an increase in the influence of the digital economy (Katsantonis et al., 2019); substantiation of the role of cybersecurity as a decisive tool in the development of the digital economy (Leahovcenco, 2021; UNCDF, 2022).

While acknowledging a high level of scholarly and expert works that are devoted to the issues of cybersecurity in the context of its influence on the development of digital entrepreneurship, it is necessary to state the need for further research on the generalisation of approaches to the development of cybersecurity. According to this, the main goal of this study is to substantiate the direction for the improvement of cybersecurity from the position of stimulation of the development of entrepreneurship in the digital economy markets.

28.3 Results

A digital economy is a system in which formation and development are predetermined by the active use of modern processes of information and communication technologies. The development of the digital economy is inextricably connected to an increase in the volume of information, its dissemination via information channels and infrastructure and, accordingly, the growth of its role and value. Information protection is a factor in the development of an economic system and cyberspace on the whole (Veiga et al., 2020). The notion of “cybersecurity” has acquired a comprehensive meaning on the protection of any data or information processes, including their everyday use only recently. For a long time, this notion was used only in narrow professional circles (Georgiadou et al., 2020). However, an increase in the level and volume of cyber threats and the establishment of dependencies between all information processes, which cover everything (Ghernaoui & Wanner, 2018), predetermined the wide use of the notion of “cybersecurity” with the entire spectre of risks connected with IT.

The key definitions of the notion of “cybersecurity” are presented in Table 28.1.

As is seen, the presented definitions treat cybersecurity differently, but they are peculiar for its common treatment as a process connected with the protection of information, data, communication channels and networks, as well as their owners and consumers from damages or unsanctioned access. The elements of cybersecurity are, as a rule, policies, procedures and tools, including the measures of protection of

Table 28.1 Approaches to the definition of “cybersecurity”

Author	Definition
EU Regulation 2019/881 (2019)	Activity necessary for the protection of network and information systems, consumers and other persons who suffered from cyber threats
Kaspersky Laboratory (2018)	Strategic actions aimed at the protection of information and communications with the help of a range of leading tools, policies and processes
Guardian (2020)	The process that covers all technologies, operations and methods designed for the protection of networks, devices, programmes and data from attacks, damages or unsanctioned access; security of information technologies
Leahovcenco (2021)	Set of policies, procedures and tools, including measures of protection of different information systems and their devices from threats, as well as the concept of security and risk management and measures against cyberattacks
Stedman (2022)	Protection of systems with an Internet connection from cyber threats. This practice is used by individuals and enterprises for the protection against unsanctioned access to data processing centres and other computerised systems

Source Created by the author based on (Guardian, 2020; Kaspersky Laboratory, 2018; Leahovcenco, 2021; Stedman, 2022; Veiga et al., 2020)

different information systems and devices; methodology of cyber risk management; measures to repel cyberattacks.

An increase in the number of users, devices and programmes and the growth of the data flows, a large part of which is confidential, leads to the growth of the importance of cybersecurity. The increasing number of cybercriminals and methods of cyberattacks further complicate the problem. The scale and frequency of cyberattacks grow, and they influence all spheres of economic activities, creating threats and dangers for industry and enterprises. Besides, digital technologies help to create new enterprises and open market opportunities for digital entrepreneurship, making them more vulnerable to cyberattacks at the same time.

In view of this, the danger to cyberspace is a factor of a hindrance to the development of digital entrepreneurship, for it raises the risks of its functioning and increases the level of expenditures due to the necessity to redirect a part of investments or profits to data protection. Based on this, a necessary condition of the development of digital companies is a deep understanding of cybersecurity for the creation of reliable business practices. This requires a clearer identification of processes and devices that need protection (Huzaiz et al., 2021).

Thus, the quick development of the digital economy, the creation of new digital products and active innovations in the information environment are a source of the emergence and development of new cyber threats. Each new technology contains new risks that might remain without a response from the environment for a long time. In their turn, the tools to fight against cyber threats are a reaction to risks created by them. From this point of view, cybersecurity is an integrator between cyber threats and security tools (Fig. 28.1).

Within the proposed model, cyber threats are the primary factors. In certain cases, they are identified in advance for the creation of a system of effective protection; in other cases, they are formed post-factum, after the damage is dealt to data, devices, networks or systems.

The most widespread threats to corporate cybersecurity are unauthorised access to the network, social engineering tools, distributed denial of service (DDoS) and malware (UNCDF, 2022).

Cyber protection is most often used in the following directions:

- Security of software—constant update and testing of software, to make sure they are effective against attacks;
- Security of network—protection of network from attacks;
- Security of endpoint—protection of remote access to company network;
- Data security—protection of confidential information about the company and customers;
- Identity management—management of every person's access to the company network;
- Database and infrastructure security—protection of devices;
- Cloud security—control of access and integrity of data in cloud storage;
- Mobile security—protection of smartphones and tablets.

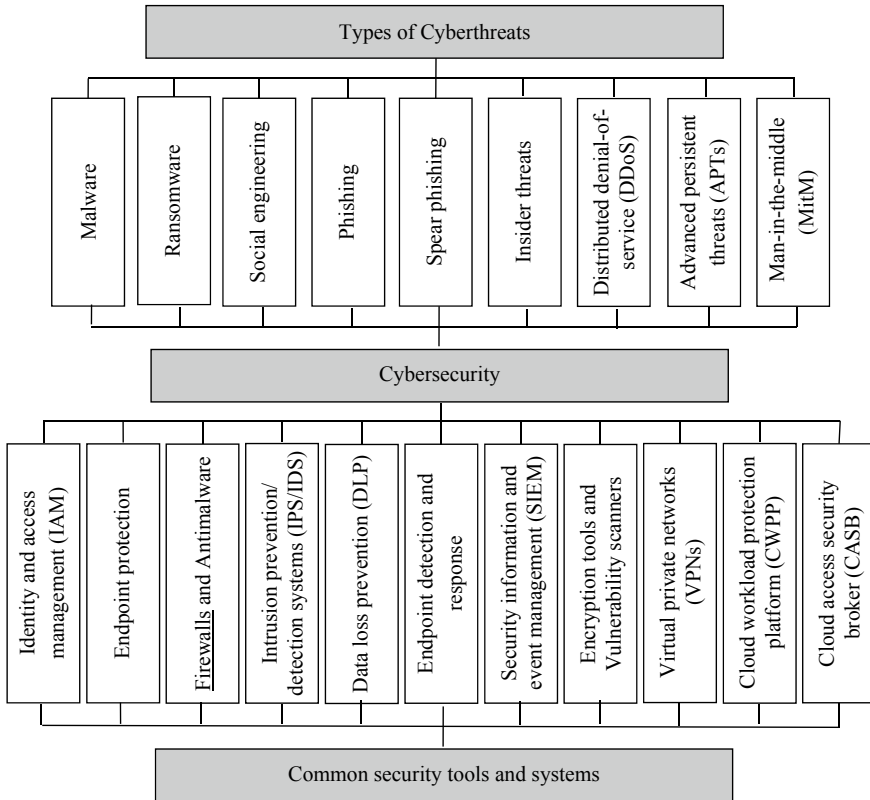


Fig. 28.1 Key cybersecurity threats and tools. *Source* Created by the author based on (Stedman, 2022; UNCDF, 2022)

In general, modern cybersecurity is an infinite cycle of an increase in security and training of humans, aimed at the prevention of harmful attacks, while criminals are seeking new methods to deal damage. Thus, cyberattacks require not only one-time measures that are aimed at the resolution of certain problems of cybersecurity but the formation of a sustainable culture for the deep understanding and constant management of the risk environment. Since the level of the use of data and the Internet continues growing, cyber awareness becomes more relevant (Katsantonis et al., 2019).

Thus, a high level of cybersecurity, which can be reached by a digital company at a certain stage of development, does not usually have a stable character and requires constant support for relevance and correspondence to the changing environment. The culture of cybersecurity, which was implemented in enterprises, might be a factor of adaptation and flexibility. A company’s employees could be the subjects of increasing the level of cybersecurity and initiators of changes if a need arises.

On the other hand, the development of digital entrepreneurship is inextricably connected with an increase in the volume of information, the expansion of networks and infrastructure. In such conditions, each next step of a digital company must have a stable culture basis, which can quickly adapt the system of cybersecurity of the company, environment or society to new risks that are connected with the growth of cyberspace. According to this, the stimulation of entrepreneurship development in the digital economy is closely connected to an increase in the list and volume of risks of the loss of data and damage to networks and devices. To assuage the negative consequences of such processes or to avoid them, it is necessary to create a stable culture of cybersecurity through the training of employees and the promotion of relevant values and skills.

Resource support for high-tech productions is important for ensuring cybersecurity. One of the aspects of cybersecurity is reliability (continuous work, absence of faults) and high performance of digital equipment that is manufactured with the help of furfural. Table 28.2 presents analytics of the market of furfural with the help of SWOT analysis.

As shown in Table 28.2, the strengths (S) and drivers of the development of the market of furfural are favourable business climate, developed infrastructure and highly effective state regulation of the market of furfural. The weaknesses (W) and barriers to the development of the market of furfural are strong fluctuations of prices for raw materials for the production of furfural and the instability of international flows of raw materials for the production of furfural. The threat (T) to the development of the market of furfural is posed by an increase in instability of world prices for raw materials for the production of furfural and larger violations of the natural course of the international flows of raw materials for the production of furfural under the influence of international sanctions.

Table 28.2 Analytics of the market of furfural with the help of SWOT analysis

Strengths (S) and drivers of the development of the market of furfural	Weaknesses (W) and barriers to the development of the market of furfural
Favourable business climate, developed infrastructure and highly effective state regulation of the market of furfural	Strong fluctuations of raw materials' prices for the production of furfural, as well as unstable international flows of raw materials for furfural production
Opportunities (O) of the development of the market of furfural	Threats (T) to the development of the market of furfural
Growth of productivity in production of resources for furfural, receiving "scale effect" and technological progress in the sphere of biofuel	Growth of instability of world prices for raw materials for the production of furfural and larger violations of the natural course of international flows of raw materials for the production of furfural under the influence of international sanctions

Source Compiled by the authors based on the materials of Marketresearch (2023)

Thus, as a result of the furfural market analytics, it is possible to conclude that to ensure cybersecurity in the interests of stimulating the development of entrepreneurship in digital economy markets, it is necessary to realise the opportunities (O) of the development of the market of furfural through the growth of performance in the production of raw materials for furfural, achievement of “scale effect” and technological progress in the sphere of biofuel for the production of furfural (Marketresearch, 2023).

28.4 Conclusions

The development of entrepreneurship in the digital economy takes place due to and simultaneously with the increase in the volume of information, its carriers, users and objects of infrastructure. At the same time, more and more valuable information is transferred to the digital space, and new opportunities for its monetization appear. These processes predetermine the growth of digital information’s value and the increase in risks of its theft, damage or destruction. Moreover, the process of improvement of cybersecurity at all levels is constantly accompanied by the growth of risks and scale of cyber threats. The volume of potential profit from cybercrimes plays a key motivating role in such a situation.

In view of this, all actions of companies in the digital economy markets must be based on cybersecurity measures. To ensure better flexibility of security systems, it is expedient to form a culture of digital awareness and sustainability among company employees and users of digital products. Such actions will allow for earlier detection of threats, reduction of their possible negative influence and stimulation of the improvement of cybersecurity tools. Improvement of cybersecurity measures, combined with the development of the corresponding digital culture, is an important factor in the stimulation of entrepreneurship development in the digital economy markets. The main factors of growth here are the increase in the level of resilience to threats and the reduction of the size of expected losses from cybercrimes. Thus, cybersecurity in the digital economy is an inseparable and objective element of development. Improvement of its tools is an important task, which must be implemented at all levels, including regular users, businesses, public authorities and global institutions.

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Chapter 29

Artificial Intelligence in the Fashion Industry—Reality and Prospects



Natalia Yu. Konina 

Abstract Research aims to determine the AI impact on fashion companies. The author uses systemic and comparative analysis with an integrated approach for determining the nature of change in AI usage and new trends in consumer behavior. The research objects are AI applications used by fashion companies structured by application. The research tasks suggest a detailed comparative analysis of what companies have applied the most interesting AI solutions for the fashion industry and how new technologies based on AI can change the business operations of fashion companies. The author identifies the main areas of utilization of AI by large fashion companies and AI applications factors: big advances in data collection, further high-tech research, growing competition, and deep changes in consumer behavior. The author concludes that the main trend is in the combination of different technologies of AI by a growing number of fashion companies. Based on the analysis of the usage of AI applications by fashion companies, the author concludes that new segments of the fashion market are influenced by a growing number of AI applications that have become essential tools of fashion firms.

Keywords Artificial intelligence · Fashion industry · Fashion TNC · Big data analytics · Machine learning · Expert systems · Globalization · Consumer behavior · Fourth industrial revolution · Fashion forecasting · Computer vision · Machine learning · AI

JEL Classification L67 · Q53 · Q55

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29.1 Introduction

With the emergence of globalization and the digital revolution, the markets have undergone a deep transformation, largely determined by the operations of the biggest multinational companies, which have organized and structured global value networks far beyond the boundaries of the firms (Vladimirova et al., 2020). As one of the biggest global industries, the global fashion industry is dominated by transnational corporations from developed countries, mainly from the USA and Europe (Konina, 2018). The author understands the global fashion industry as a complex segment of the global economy comprising the textile, apparel industry, specialized retail, and e-commerce, with estimated revenues of around \$3 trillion in 2019, roughly equivalent to 2% of the global GDP. The formation of global markets employs a wide range of digital tools, including artificial intelligence (AI), which has been increasingly used lately (Konina, 2021b).

AI is an attempt to make intelligent machines based on machine learning and deep learning, used in various applications, from robotics to voice recognition and every mapping from the translation and natural language processing to intelligence and expert systems (Barro & Davenport, 2019; Guo et al., 2011; Nayak & Padhye, 2018). Fashion companies utilize AI to improve global value chain operations, including styling, apparel production, fabric control, ready-made garments storage, distribution, logistics, and customer interactions (Giri et al., 2018). AI application is connected with the creation of digital platforms, big data analytical tools, and other advanced technologies (Acharya et al., 2018). For handling complicated global value chains, decision support is researched through the lenses of AI algorithms (Ngai et al., 2014).

29.2 Methodology

The methodology is an integral part of the research, which examines the correct way to conduct the analysis. The author used a systemic approach and analysis of the most important qualitative characteristics, considering previous studies.

The authors reflect different approaches to AI implementation in the fashion industry, being, in many cases, combinations of different AI technologies. An integrated approach is applied to analyzing applications of AI by fashion brands. The leading research method is systemic and comparative analysis. The author applied the systemic approach, making it possible to consider comprehensively several diverse elements that were previously studied separately. The author collected and prepared data for analysis from scientific databases, Web of Science, and Russian e-library.ru. Additionally, the study used news articles, annual reports of transnational fashion corporations (TNCs), press releases, and regional economic publications.

29.3 Results

Despite the active development of AI research in recent years, a unified approach to AI has not yet been achieved. The author understands AI as a set of algorithms, software and artificial systems to perform activity similar to the activity of the human brain and with typical human abilities to autonomously pursue a specific goal, making decisions that up to this point were usually entrusted to humans and their integration, trying to mimic a set of human mental processes that provide an adequate reflection of the surrounding reality.

There are two leaders in the global AI market—the USA and China (Chui et al., 2018). These countries have managed to establish leading centers of excellence in this area. In the USA, the corresponding R&D has been carried out since the mid-1960s. In China, a breakthrough in this direction has been made over the past decade.

World leaders in the development of solutions and implementation of AI technologies have already proven the effectiveness of long-term investments in AI, overcoming in capitalization dynamics other companies not so active in AI.

The factors that contribute to the active growth AI use industry include:

- Abundance of data available;
- Growing availability of the Internet and smart devices;
- Growth of computing power;
- Development of the relevant areas: high-tech R&D, mathematics, biology, psychology, economics, etc.;
- Reduction of the cost of solutions based on AI technologies.

Being simulation of human by machines that make it possible to quickly and easily complete tasks, AI has led to significant changes in retailing of fashion apparel (Shankar, 2018). On the one hand, AI is driving change in the fashion industry by improving customer experience and the overall manufacturing process. On the other hand, AI can improve the understanding and processing of data to optimize business processes in the global fashion industry. This leads to resource optimization, previewing, and finding the best approach for problem-solving, automation, forecasting, and real-time management of major production, distribution, and process and operations quantification and optimization problems (Konina et al., 2020).

Artificial intelligence as a technology has existed since the mid-1950s, but only in the last 7–8 years has it been dynamically developed in relation to the fashion industry in order to reduce costs, automate repetitive routine operations and more successfully cope with an ever-increasing amount of data.

The most prominent fashion companies deploy AI, including Dior, Macy's, Alibaba, H&M, Levi's, Nike, Zalando, Nordstrom, etc. There are several ways these brands incorporate AI into their marketing and management practices. The use of AI technology, such as augmented reality (AR) applications, virtual assistants, and AI-powered chatbots, considerably influences competition in the fashion industry, turning fashion retailers who have not adopted AI on the verge of bankruptcy.

From a technology perspective, AI in the fashion industry can be classified into several groups: machine learning, decision support systems, rule-based expert systems, optimization algorithms, image recognition and vision, neural networks, and robotics. By type of deployment, AI systems are on-premises and cloud, with growing importance of cloud deployments due to minimum installation and maintaining problems at affordable prices.

Virtual Assistants and AI chatbots based on NLP technology serve for improved direct communication with customers. The AI-powered Macy Shopping Assistant, an on-call chatbot tool based on NLP, was first launched in July 2016, aimed to improve the in-store shopping experience, helping to navigate offline retail stores. Chatbots used by fashion brands (e.g., Burberry, Tommy Hilfiger, and Levi's) are useful for collecting information about customers' desires and prospective purchases.

Amazon is actively developing Alexa, moving much of the functionality of Echo Look to the Amazon Shopping app, including Style by Alexa, which includes AI that offers fashion pointers. Echo Look first appeared in 2017 and has gained new features over the years, including a collection tool, curated content from Vogue and GQ, and support for voice profiles.

Several brands have launched personalized apps to help users make online purchases similar to in-store purchases. For example, VF Corporation's The North Face launched the Expert Personal Shopper program in 2015 in partnership with IBM Watson. PTTNRS.ai has launched an AI-powered trading tool designed to interact with shoppers intelligently.

AI can potentially be applied to significant cost savings in fashion companies by reducing errors in the selection of clothes, increasing personalization, in particular, improving brand recommendations for fitting products on a real figure, since all companies sew clothes on some abstract average figure, which really very different from the real bodies of consumers, improving quality control in the production process and optimizing the supply chain, and marketing. The importance of AI for different segments of the fashion industry naturally varies. For manufacturing companies that are part of the global value chains of the world's leading brands and have production facilities in Asia, the use of AI in manufacturing is of greatest importance, for example, for sorting fabrics and linens, controlling the production process through computer vision, and then controlling the quality of finished products, which estimates can give savings of 5–15% of the cost of manufacturing products. AI helps fashion companies to streamline their supply chains and 3–29 words unconditionally maintain a more personalized relationship with their customers by keeping as much information as possible about customer preferences based on previous purchases or browsing history and offer more personalized clothing online with better results than traditional methods (Konina, 2021a).

One of the most problematic and controversial areas of AI is the creation of new clothing models. Fashion is founded on the anticipation of trends, based on the effort to process billions of pieces of information. Companies such as Heuritech use fashion AI in combination with all the data available for trend forecasts (e.g., colors, styles, textures).

Important progress in AI was achieved by research of Carnegie Mellon University based on the processing of tens of millions of images from Instagram. Another interesting project is of MIT, when application took into account the characteristics of already existing clothes, such as sleeve length or waist width. Despite the developments that have already appeared, the hybrid work of AI and people will probably be the most desirable. The use of AI will speed up the process of creating new garments, however the participation of human designers with their intuition and talent to select and adjust designs seems essential.

AI can improve product discovery in online shops across the customer journey through personalized recommendations. AI smart mirror permits to try on clothes without undressing. Visual search AI as LykDat uses reverse image tool method to help buyers find fashion goods using photographs.

Product recommendation systems that can predict and match products according to customer likes and dislikes, such as deep learning AI offered by the Indian startup Stylumia or the Japanese company Neural Pocket, are gaining popularity in the mass fashion market.

Expectations for the success of AI applications are often overstated and more focused on capturing customer attention than commercial success. That remark is applicable to Alibaba's highly publicized launch in July 2018 of the first Fashion AI store on the campus of Hong Kong Polytechnic University. Utilizing an AI neural network trained on 500,000 fashion images selected by Taobao designers and Tmall partners, customers could use the AI to select products from the Guess collection for them.

One of the companies that are very active in the AI fashion field is Amazon. Amazon's first fashion AI project was launched by Israeli researchers in 2017 to apply machine learning for determining how fashionable the product is. The next AI project came from Amazon Lab126's "AI designer" in 2017 and later Amazon patented manufacturing system to make clothes on demand. The last Amazon AI initiative is connected with the first Amazon Style store opened in Los Angeles in 2022 using a wide range of new technologies including AI and Amazon Style.

Swedish global fashion retailer H&M also seeks and tries to use AI and advanced analytics, new technologies, and supply chain management to make profit and freely do business in the entire network, totaling 4288 stores worldwide. In 2018, H&M applied big data technology with AI (Self-Learning Algorithm) to optimize supplies to one trial store in Stockholm instead of the same set of standard products, thus reducing 40% of stock-keeping units without dropping sales. According to H&M, the self-learning AI system already knows how to use the information from the internal data of the company and the "outside world" through analysis and blogs, inquiries in search engines, and social networks (Chaudhuri, 2018).

An important area of AI application in the fashion industry is the decision-making aimed at optimizing clothing production based on the use of robotics and computer machine technology, which reduces the amount of labor and improves quality (Duan et al., 2019).

Zara, Top Shop, and H&M utilize AI to optimize their supply chains and reduce delivery times and shipping costs while providing up-to-date inventory information

basing on analysis of big complex structured and unstructured data. AI has big potential to improve operational efficiency, anyhow, it is still in its infancy. Among the first prototypes is software in combination with supporting hardware called the Juki Advanced Network System (JaNet), which collects production activity data. This software makes it possible to use AI in automated apparel production and total quality control of mass-produced items. Fashion companies have started using AI in their manufacturing. For example, a computerized system for detecting fabric defects and fabric color Cognex ViDi can guarantee the quality, thereby saving time. Cognex ViDi is an AI platform based on the visual detection of fabric intended for graphics, such as weaving, knitting, printing, bead embroidery, and textile finishes, using predefined images.

Companies like ASOS and Nordstrom are experimenting with AI to visualize customers' ideas.

Discussion

In a highly dynamic, volatile, and competitive market, the accessibility of big data coming from RFID tags and Bluetooth data create big potential for the use of AI.

Enthusiasts for using predictive AI models in fashion say that AI models based on big data should help online merchants better understand consumer preferences and minimize inventory.

However, analysis of the market condition of some highly publicized companies that have applied AI suggests otherwise. Current AI models are still far from perfect and do not yet bring the necessary impact in predictive analytics. US company Stitch Fix uses an online application for the simulation based on machine learning to personalize garments depending on the client's size, budget, and style preferences. Stitch Fix widely uses AI to create garments in "hybrid design" (Wilson et al., 2016). In 2022, according to the report, it faced a drop in its customer base from 4.18 million people in October 2021 to 3.7 million people in October 2022, with the average purchase per consumer stagnating from \$524 to \$525, with nearly 10% inflation. These facts indicate that consumers are moderately satisfied with the level of personalization offered by Stitch Fix AI. This conclusion is based on the fact that while company sales grew to \$1.95 billion in 2022, the growth of operating costs led to Stitch Fix's net loss for the year of \$261 million.

Manufacturing fashion companies have started to use AI to get feedback on the feasibility of development and estimate costs and production times, potentially saving months of talks with suppliers and gaining necessary agility (Babu et al., 2022).

Applying AI in the fashion industry will lead to a change in information search and ranking in the search engine for fashion sites. AI remembers the characteristics of a person when searching. Under AI scrutiny, clients will automatically be classified under their desires and preferences.

AI personalization and product information help reduce the percentage of products returned and improve customer satisfaction.

Deep learning technologies combined with big data and business analytics help fashion companies to better understand new fashion trends and prevailing customer intentions regarding styles. Germany-based online fashion retail platform

Zalando participated in an experiment launched in 2016 with Google in Project Muze, using AI to improve clothing designs based on the customer's preferred colors, textures, aesthetic parameters. The Muze project neural network algorithm was trained on the Google Fashion Trends Report and design and trend data from Zalando. In 2021, Zalando implemented AI based on NLP model on its website.

AI styling service start-up Intelistyle provides styling tips such as overall look recommendations based on previous purchases and the best possible available alternative fashion products. The use of AI helps online shoppers to understand what clothes look like and how they will look on them, in particular by projecting clothes onto their real body, taking into account color, texture, and accessories.

AI tools can help fashion businesses identify their most popular (and worst) products and plan their inventory accurately. In October 2022, Levi Strauss launched the use of AI technology patented under the name BOOST to optimize order fulfillment in online sales.

Artificial intelligence has significant potential in the field of textile and clothing production, quality control and inventory management, optimization of logistics, improvement of communication with consumers and marketing, including multi-channel sales.

29.4 Conclusion

The fashion AI market can grow at an average annual growth rate of + 40% over the nearest years (2020–2027). Through product personalization or better design, AI and machine learning technologies impact the operations of fashion companies, enabling them to understand rapidly changing customer needs and expectations. The influence of tools and technologies based on AI will increase on the activities of the biggest fashion firms, dealing with numerous clients in highly competitive markets.

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Chapter 30

Advanced Technologies for Finance and Business Performance and Agility



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and Valeria D. Dmitrieva 

Abstract In the context of new uncertainty, post-pandemic effects, and economic and political sanctions and restrictions, the issue of technological sovereignty becomes relevant for different countries. Technological sovereignty is relevant not only to Russia. Technological sovereignty does not mean complete isolation from foreign innovations; it is about independence from imports of products and technologies, advanced developments, and ownership of exclusive rights to key technology components. Moreover, advanced technology for finance, business, and manufacturing ensures that products and services are customized and personalized. That is why more people-centric, data-driven, and techno-centric approaches are the basis of Business 4.0. This research aims to reveal the specific role and advantages of advanced technology for business processes. The main focus is primarily on existing theoretical findings and expert reviews. The novelty of the phenomenon of AI does not make it possible to give accurate estimates in the study, which is why this study can be characterized rather as an essay or discussion about the value of AI for business performance. Analytical sources are presented by official open reports and articles. The authors conclude that AI and other advanced technology change consumer expectations and experience and manufacturing and organizational processes. Moreover, AI and other advanced technology blur the border between IT and financial companies. Using AI for finance and business performance is still a new study field. AI has become more influential and hyped. It brings together a human-oriented approach, data, and technology. The authors try to illustrate the changes AI brings to business to make it more people-centric.

Keywords Industry 4.0 · Banking 4.0 · Technological sovereignty · Advanced technology · Digitalization · Innovation

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JEL Classification F63 · O33

30.1 Introduction

The COVID-19 pandemic has become one of the most serious stress tests for the global economy. The lives of people and the activities of organizations were practically paralyzed. The COVID-19 pandemic has highlighted all systemic problems of the economies of countries striving for globalization.

The reduction in production, the ban on movement and the disruption of supply chains, and massive unemployment have primarily affected those industries that are characterized by a lower level of digitalization. In a situation of new uncertainty, high-tech companies and those manufacturers who switched to closer coordination with the public sector gained an advantage (Accounts Chamber of the Russian Federation, 2021).

Subsequent international events caused by the Russian-Ukrainian conflict, as a result of an active sanctions policy, led to an energy crisis in Europe, a political split in society, and a blurring of the vision of the future. Company strategies are supported only by those companies and institutions that follow key trends, have significant resources and alternatives, and are confident in their business partners. In this case, the company's technological development level becomes important: the availability of adequate digital tools, the availability and proper condition of computer equipment, the company's ability to independently create innovations in production and management, etc.

In the new economic history, economic crises appear increasingly often. Their influence is becoming ever larger. For the past three decades, the post-Cold War world has been characterized by the acronym Volatility, Uncertainty, Complexity, and Ambiguity (VUCA). Since 2016, more and more clearly now, its state is described by the acronym Brittle, Anxious, Nonlinear, and Incomprehensible (BANI). BANI does not cancel VUCA but complements or even reformats it. However, BANI describes our world better and better: unpredictable, chaotic, sometimes passive, and disproportionate. As the author of this concept notes, "small decisions lead to massive consequences"; therefore, it is sometimes better not to make any decisions at all (Cascio, 2020).

Fragility becomes a characteristic not only for countries with significant internal development problems and a significant proportion of vulnerable populations (the World Bank lists Burundi, the Republic of Congo, Eritrea, Nigeria, Lebanon, Sudan, Venezuela, and some other countries with a history of complex political and religious conflicts). Nowadays, against the backdrop of energy and food security problems, rising unemployment, and increasing inflation, some EU countries see an increase in the number of vulnerable populations, increasing socio-economic inequality, and a political crisis.

In the context of new uncertainty and economic and political sanctions and restrictions, the issue of technological sovereignty becomes relevant for different

countries. Technological sovereignty is not only about Russia. Globalization and a unipolar world fail, and countries must find their own identities again. Technological sovereignty does not mean complete isolation from foreign innovations; it is about independence from imports of products and technologies, advanced developments, and ownership of exclusive rights to key technology components.

No one can be single in this world; innovations cannot be created and do not work alone. Only the joint efforts of scientists, social and business-community, and governments worldwide can provide a proper level of development. It is time for every country to be special, unique, and technologically advanced.

30.2 Methodology

This research aims to reveal the specific role and advantages of advanced technology for business processes. The adoption of AI for finance and commercial is the core trend now. It is an interdisciplinary problem in which economists usually see only one side.

The main focus is mostly on existing theoretical findings rather than on empirical research. The novelty of the phenomenon does not make it possible to give accurate estimates in the study. Thus, the authors of this research rely on expert reviews.

For this reason, this study is an essay, a discussion about the value of AI for business performance. Analytical sources are presented by official open reports of McKinsey (2020, 2021), Harvard Business School (Davenport & Ronanki, 2018), NBER (Acemoglu, 2021), and others.

30.3 Results

30.3.1 *The Business 4.0 Paradigm: Techno-Data-People-Centrism*

Advanced digitalization and adoption of augmented reality and virtual reality technologies, emerging markets of high-tech production, integration of manufacturing and logistic processes, client-oriented approach and priority of customer needs, and Internet dependence (not psychological but industrial) are all about a new economic model in the digital era. The most common term to describe this condition is the Fourth Industrial Revolution, or Industry 4.0 (or, simply, I4.0). The term was popularized by Klaus Schwab, the founder of the World Economic Forum and the author of the book with the same title. According to him, the Fourth Industrial Revolution is characterized “by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres” (Schwab, 2016).

The economists see the key trends of new economic transformation in massive technological changes, improvement in telecommunications, organizational innovation (including practice and management), etc. Transformation of financial institutes to IT companies, the replacement of live relations with chats and people with AI, data-driven business, and focus on creating value are becoming common practices. Intellectual networking of machines and focus on the supply chains are the main aspects of a new paradigm (Acemoglu, 2021; Dalmarco et al., 2019; Xu et al., 2021).

Industry 4.0 is a multidimensional system of value creation based on management, organizational, business-related, technological, and manufacturing-related variables (Cascio, 2020; Lavrinenko & Shmatko, 2019; Nosalska et al., 2020). Lasi and Kemper point out that Industry 4.0 concept has two directions: changes in the operating framework and technological push (Lasi et al., 2014).

Khan and Turowski define Industry 4.0 as “a revolution enabled by application of advanced technologies (like IT) at production level to bring new values and services for customers and organization itself” (Alam & Khan, 2016; Khan & Turowski, 2016).

From mechanization, electrification, and computerization to digitalization and socialization—the new focus of economic development shifts to social fairness, sustainability, and quality of life. The economy is becoming more people-centric. A worker is putting at the center of the production process (Xu et al., 2021). A customers’ needs are on focus.

Smart systems (AI and automation) release workers from routines and increase the speed of decision-making and the production process. Thus, workers can add value to the company; they are not only human resources, they create products, innovation, profit, and leadership.

On the other side of the production process, customers want to have personalized and affordable products. Years ago, economists talked about mass customization that replaced mass market strategy. Nowadays, we talk about mass personalization as a significant element of competitive strategies for e-business. Reiß and Koser suggest that “standardization and ‘mass concepts’ (such as mass production, mass communication, mass marketing) are replaced by hybrid concepts that combine ‘mass and class’” (Reiß & Koser, 2004). It is not only about design customization but about the personalization of a product or a service, a way that makes it more efficient for the customer.

For this reason, customization and personalization lie on the basis of the Business 4.0 paradigm (Fig. 30.1). It is the start and the final point of the business process.

According to Umachandran et al., the main drivers of Industry 4.0 are as follows:

- Cyber-physical systems (CPS) are defined as systems “conceived to manage big data through algorithms and technologies that allow each system layer to cooperate with a unified structure and get an appropriate overall functionality in terms of efficiency, reliability, and product quality” (Umachandran et al., 2019). CPS is the instrumental basis of all production and managerial processes;
- Virtualization and decentralization are considered as the basis for customization: production becomes more personalized and flexible, business becomes more

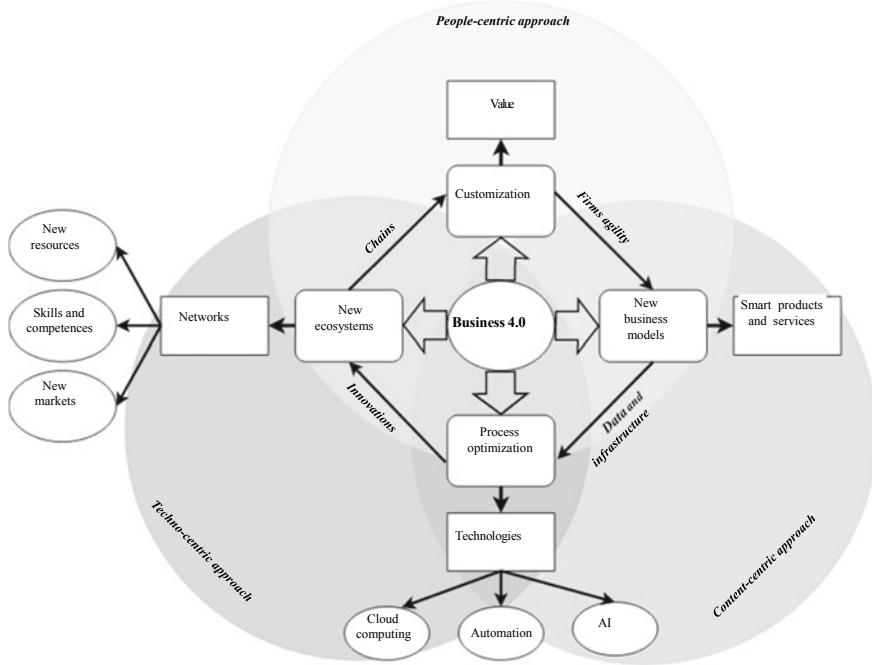


Fig. 30.1 The main drivers of the Business 4.0 paradigm. *Source* Developed by the authors

client-oriented, and management becomes more knowledge- and competence-oriented;

- Open networks’ building for decision-making means the optimization of processes through the implementation of AI, IoT, cloud computing, and automation;
- Servitization “blurs the boundaries between manufacturing and services” (Umachandran et al., 2019).

The Business 4.0 concept is based on Industry 4.0 and can be described as the “leadership framework, which will help end users and customers leverage digital technologies like computers and handheld devices to address their growth and transformation agendas” (Alam & Khan, 2016). More people-centric, data-driven, and techno-centric approaches are the basis of Business 4.0 (Fig. 30.1).

30.3.2 Banking 4.0—More Than Bank

Anyone who has ever shopped in the marketplace or searched for something online understands how referral systems work. Nowadays, AI algorithms decide what we want to watch, read, eat, or wear. They predict the weather, the passage of the bills,

election results, and court verdicts. There are many different directions in which AI can be developed and become useful.

Nowadays, financial organizations more often transform into IT companies and build ecosystems around themselves. Such ecosystems usually include banking, B2B services, eCommerce and marketplaces, eHealth, food-tech, leisure activities, voice assistants, etc. Becoming autonomous technological ecosystems, banks optimize the number of employees and departments and reduce offices and units (Lavrinenko & Shmatko, 2019). Banks are now more than a place for cash-deposit operations and more than mobile banking; in fact, they are no more places to go.

Vice versa, large technology companies (e.g., Google, Amazon, or Yandex) develop financial services. Therefore, the border between finance and IT is blurring.

Many banks provide experiments with AI technologies (Fig. 30.2). The main reasons AI is not used broadly in finance include the lack of investments and a clear strategy for AI, as well as fragmented data assets (McKinsey, 2020).

However, even AI experiments need more resources to invest. To understand the scale and perspectives of this phenomena, for global banking only, McKinsey estimates the future contribution of AI technologies as up to \$1 trillion of additional value annually (Cascio, 2020; McKinsey, 2020).

Neural nets, IT services, and software (especially mobile versions) are the core trends, which means that IT spending will continue to grow. Gartner Inc. predicts

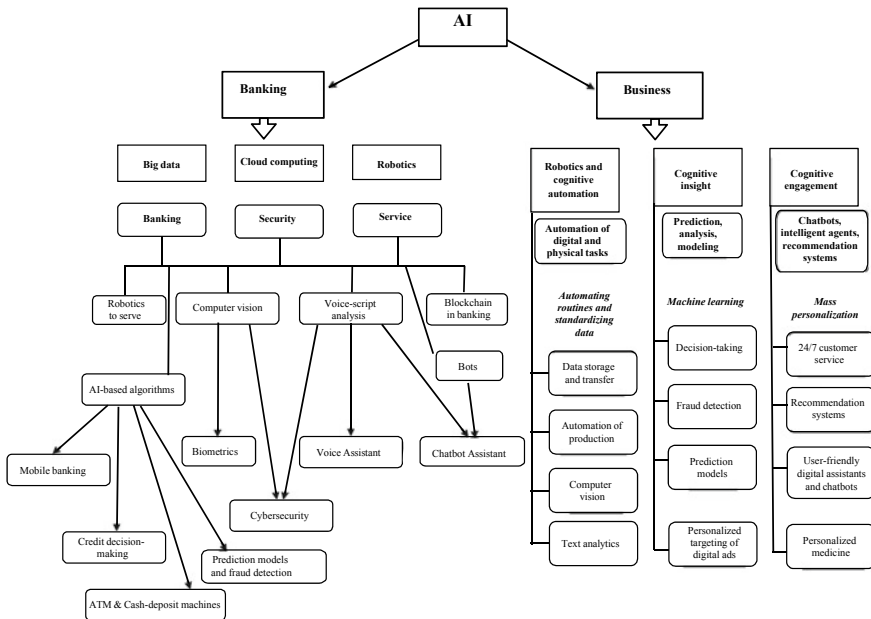


Fig. 30.2 AI in banking and business. 2018 Source Developed by the authors based on (Davenport & Ronanki,)

the massive growth of tech investments: about \$623 billion worldwide this year and much more in the next 2–3 years (OrboGraph, 2022).

30.3.3 AI Instruments for Business

Banks and non-financial organizations have become more digital and intelligent to come closer to their customers. Sophisticated consumers demand unique services and expect organizations to fit into their lives. In turn, businesses need to reach thousands or even millions of consumers in a competitive environment. Even a short-life company has a chance to make a significant profit at once. Companies compete with each other and people's dreams and working hours.

As bank services should be more people-centric, any non-financial product of any company turns out to be personalized as well. People want to have luxuries and be unique no matter what social class they belong to.

The data-driven approach helps to have a singular view of the clients' needs: algorithms trace and analyze customers' behavior based on AI and machine learning. After all, they automate digital and even physical tasks inside the organization, predict human wants and future trends and problems, and engage people to use products or services (Fig. 30.2).

For such transformations, any business organization has to be open-minded, learning, agile, and communicative to have partnership and collaboration.

30.4 Conclusion

Artificial intelligence is not only for tech giants and global corporations. No matter what size, a company can succeed if it is ready to invest in infrastructure, have a strong financial plan, assess supply chains, learn itself, and evolve for its customers.

AI transforms business in many ways. It changes consumers' experience and expectations. That is why the core of new business models is the value that a company can create for its consumers and itself. This value can change from time to time. Thus, a company has to be agile, open-minded, and flexible to adapt to a new environment and changing needs.

Speed adoption of advanced technologies, R&D, and prototyping are the main features of a company in a nonlinear world. The real practice shows that leaders are those companies that apply AI for organizational management and production.

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Part IV
Corporate Finance and Government Crisis
Management (Governance) in Support
of Sustainable Development
of the Economy

Chapter 31

Revealing the Correspondence Between the Level of Development of Production Potential and the Quality of Life in the Regions Based on Cluster Analysis



Elena V. Tinkova, Olga V. Konina, and Sergey A. Tinkov

Abstract It can be assumed that there is a certain relationship between the level of development of the production potential of a certain territory and the level of quality of life. To identify and confirm such a relationship, it is necessary, first of all, to have an array of comparable data and primary statistical indicators that can characterize the production potential and the quality of life. The research presents these indicators. Further, the question arises about the use of methods and techniques for processing these indicators to identify such a relationship. This process has a multi-stage character. In the first stage, to confirm the hypothesis about the relationship between production potential and quality of life, we use cluster analysis, although it was not originally intended for this. That is why the statistical indicators are taken for several heterogeneous regions of Russia within the Central Federal District. The use of cluster analysis on indicators of heterogeneous regions confirmed the hypothesis.

Keywords Region · Production potential · Quality of life · Cluster analysis · Statistical indicators

JEL Classification C38 · E23 · P46 · R13

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31.1 Introduction

In today's life, including economic phenomena, we often want to understand the interrelationships of different objects, systems, and indicators and identify cause-and-effect relationships. This allows us to look in a new way at the nature of phenomena and develop more effective levers to control or adjust the behavior of systems. The hypothesis about the existence of a connection between the social side of the economy and the production system is no longer new to anyone and does not require proof. In a narrower case, such as the quality of life and production potential, research is still underway because the concepts of "quality of life" and "production potential" are being transformed, refined, and supplemented. There is certainly a relationship between these concepts. In this research, we will show whether it remains at the level of individual regions of Russia. The research uses cluster analysis to prove that regional differences do not disprove the relationship between quality of life and production potential. Simultaneously, we assume that the quality of life is a dependent factor, but we do not set the task of proving this logic in this research.

31.2 Materials and Method

The level and quality of life of the population in the economy are becoming a factor that determines the satisfaction of the population with state policy. The differentiation of the standard of living is an integral characteristic of society in any country. It is also the object of research by economists worldwide. The differentiation of the standard of living is associated with several factors, including economic and demographic variables. However, the views of researchers regarding the components of these variables do not always coincide.

Based on the above study, we can distinguish the following main components: the rate of economic growth, the competitiveness of the region, the economic policy of the region, and the production potential. The emphasis of this research is made on the production potential.

Thus, the relationship between the standard of living and the demographic and economic component was studied in detail in the works of Steckel (1995), Scholliers (1996), Allen and co-authors (2011), Millward and Baten (2010), Stephens (2016), and Piketty (2015). The authors singled out an economic policy as a priority factor in the differentiation of living standards of the population, emphasizing that it makes an important contribution to the evolution of economic inequality. A similar position was presented in the works of Durand and Exton (2019). Based on empirical calculations, Madzík et al. (2015), as well as Okrepilov and Makarov (2015), substantiated the impact of the region's competitiveness on the standard of living of the population. The study of the degree of influence of economic growth rates on indicators of the quality and standard of living is presented in the works of Howarth (2012), Bramston et al. (2005), and Easterlin et al. (2011). Of particular interest to this research are

the works on the study of indicators of the quality and standard of living of the population. There is also no consensus among the authors regarding the composition of indicators.

Diener, Such, and co-authors (Diener & Suh, 1997; Diener et al., 2003) considered three philosophical approaches to well-being in the context of measuring the quality of life, highlighting social, economic, and subjective indicators of well-being, as well as factors influencing subjective well-being. The importance of social indicators based on monitoring changes in social conditions is substantiated by Noll (2004). Dowrick et al. (2003) singled out social indicators and the volume of economic activity among indicators of the level and quality of life of the population.

Simple indicators have also been used to measure living standards. For example, Bérenger & Verdier-Chouchane (2007) and Angeles (2008) suggested using GDP per capita as a general indicator of the population's standard of living. Mârza et al. (2015), based on a study of the well-being of the population of Romania during the economic crisis, singled out GDP per capita, incomes of the population, and the volume of expenditures of the population as priority indicators. As a priority indicator of the population's level and quality of life, Kakwani (1993) singled out the total per capita income. He substantiated his conclusions with empirical studies based on data from 80 developing countries. This position was later followed by Allen et al. (2011) and Arroyo Abad et al. (2012).

Shin and Johnson (1978) used the category "happiness" as a general measure of the quality of life, having analyzed it in detail from the point of view of various life situations. Of interest is the work of Greenhaus et al. (2003), who studied the influence of time balance between families and worked on the quality of life of individuals. Finally, individual, narrow aspects of our lives have been explored as components of the quality of life. For example, Andereck and Nyaupane (2011) assessed the role of tourism on the quality of life.

Hagerty et al. (2001) generalized methods for measuring life quality indices. They revealed the generalizing shortcomings of these indices (when assessed by 14 criteria) and showed the possibility, after some indices were finalized, of their use for public policy purposes.

As we can see, almost no research has been carried out from the point of view of the impact of production potential on the quality of life, except for the consideration of individual indicators studied in assessing the overall dynamics of the quality of life. Evidence on the role of productive capacity in improving quality of life is potentially useful because we can improve the population's quality of life by developing productive capacity. Now let us talk about cluster analysis in economic studies of the quality of life from the point of view of the regional aspect.

The use of cluster analysis for the indicators of quality of life is already a traditional approach used in the works of scientists worldwide. Successful cases of using cluster analysis to identify regional differences and relationships are known. For example, Brauksa (2013) used cluster analysis to identify regional differences in Latvia. Bergman and Feser () identified industrial and regional clusters using cluster analysis.

Cluster analysis is quite often used at the regional level. In Russia, this aspect is sufficiently disclosed in the works of Kurkudinova (2010), Kolesnichenko and Savinova (2014), and other authors. Simultaneously, the tool of cluster analysis is aimed at different regional aspects: investment potential (Merkushev, 2004; Raiskaya et al., 2007), savings behavior of the population of regions (Sevryukova, 2012), regional competitiveness (Kolesnichenko & Savinova, 2014), social aspects and demography (Orlova & Filonova, 2015; Filipova et al., 2017), internal labor migration (Kovanova, 2013), agricultural and food sectors (Stovba et al., 2017), and other areas. Donichev and co-authors (Donichev et al., 2011) carried out the clustering of regions in terms of socioeconomic and reproductive-innovation potential. Several authors add regression or factor analysis to cluster analysis (Nizhegorodtsev & Arkhipova, 2009; Piskun & Khokhlov, 2019). Regional aspects using cluster analysis are also investigated in the works of scientists from Europe. Žmuk (2015) carried out a cluster analysis for the regions of Europe and identified the relationship between the quality of life and the level of economic development of the region (country).

Thus, the method has been sufficiently developed for various objects and phenomena. The cluster analysis can be carried out in different ways. The cluster analysis algorithms were presented in sufficient detail in the works of Rodriguez and co-authors (Rodriguez et al., 2019). Halkidi et al. (2001) conducted a comparative review of well-known clustering algorithms. Davies and Bouldin (1979) investigated the use of the measure of data division into clusters. Kinnunen et al. (2011) consider the parametric Gaussian mixture model and nonparametric vector quantization model using the best-known clustering algorithms, including iterative. Fraley and Raftery (1998) considered the problem of determining the structure of clustered data without prior knowledge of the number of clusters or any other information about their composition. Maulik and Bandyopadhyay (2002) evaluated the performance of three clustering algorithms: hard K-means, single linkage, and simulated annealing.

31.3 Results

Our research includes two main stages. In the first stage, we carry out a multidimensional classification of the main initial selected indicators characterizing the quality of life and production potential. A subset of regions is formed by the regions of the Central Federal District of Russia. We also conduct a qualitative analysis of the preliminary relationship between the quality of life and production potential in cluster groups. In the second stage, the dependence between the ranking places of the regions is determined (this stage is not considered in the research).

As a method for studying this dependence, we will use a well-known tool—cluster analysis. As is known, a statistical array of indicators must be collected, in our case, reflecting the quality of life and production potential. Since we are examining several regions (and this is necessary for grouping them into groups), statistical indicators must be collected in each of these regions.

In total, we had four iterations of cluster analysis for the array of indicators. In the first stage, we used cluster analysis for the selected indicators to assess the production potential. As a result of the cluster analysis, we identified three clusters formed according to the indicators included in the assessment of production potential (17 indicators) (Table 31.1).

The third cluster consists of one Moscow Region (in terms of production potential). This is the expected result because this region is quite large compared to other regions of the Central Federal District. Moreover, this region is traditionally more developed due to its proximity to Moscow, forming the Moscow agglomeration with it. We did not give centroid values for clusters (still defining them), but the next cluster in terms of development level—the first in terms of centroid values of the level of the development of production potential is inferior to the third (Moscow Region). The first cluster includes only three areas with a good development of production potential. These regions (Voronezh, Belgorod, and Lipetsk Regions) have several large

Table 31.1 Results of cluster analysis

Cluster number	The number of objects in the cluster	Region name
<i>By production potential</i>		
1	3	Voronezh, Belgorod, and Lipetsk Regions
2	13	Bryansk, Vladimir, Ivanovo, Kaluga, Kostroma, Kursk, Oryol, Ryazan, Smolensk, Tambov, Tula, Tver, and Yaroslavl Regions
3	1	Moscow Region
<i>Indicators of demography and employment</i>		
1	10	Belgorod, Bryansk, Kaluga, Kostroma, Kursk, Lipetsk, Oryol, Ryazan, Tambov, and Yaroslavl Regions
2	6	Vladimirskaya, Voronezhskaya, Ivanovskaya, Smolensk, Tver, and Tula Regions
3	1	Moscow Region
<i>By living standards</i>		
1	6	Belgorod, Voronezh, Kursk, Lipetsk, Tambov, and Tver Regions
2	10	Bryansk, Vladimir, Ivanovsk, Kaluga, Kostroma, Oryol, Ryazan Smolensk, Tula, and Yaroslavl Regions
3	1	Moscow Region
<i>Indicators of health care, education, and criminalization</i>		
1	3	Moscow, Belgorod, Voronezh Regions
2	8	Bryansk, Vladimir, Kaluga, Kostroma, Lipetsk, Oryol, Tambov, and Tula regions
3	6	Ivanovo, Kursk, Ryazan, Smolensk, Tver, and Yaroslavl Regions

Source Developed by the authors based on the results of cluster analysis

enterprises on their territory that are part of natural energy and metallurgical monopolies. The second cluster, formed by most regions (13 regions), is characterized by the lowest centroid values of the indicators of production potential.

Further analysis was carried out for three identified groups of quality-of-life indicators: demography and employment; standard of living; health care, education, and criminalization. Seven primary statistical indicators were included in the demographic and employment indicators group: X16–X22. The results of cluster analysis of the regions of the Central Federal District according to these indicators are presented in Table 31.1.

Also, as in the cluster analysis of production potential, the third cluster consists of a single region—the Moscow Region. That is, in terms of demography and employment, it differs from the entire sample of regions of the Central Federal District by the highest centroid values. This time, the first cluster (the most numerous) was formed from ten regions. The centroid values of the primary indicators in the demography and employment group are average. The second cluster is formed by six regions. The centroid values of indicators in the demography and employment group for these regions are the lowest.

Now let us conduct a cluster analysis of the studied regions according to the second group of indicators of the quality of life—the standard of living. There are nine indicators. The results of clustering regions by living standards are presented in Table 31.1.

Just as in the cluster analysis of regions in terms of the indicators of the “demography and employment” group, in terms of the quality of life, we also see three clusters with an uneven number of regions in each of them. The third cluster is also formed by one region—the Moscow Region, which differs from other regions in terms of the indicators included in the “quality of life” group. The first cluster, formed by six regions, is distinguished by the average centroid values of the indicators. The second cluster, the most numerous in the regions represented, includes ten regions with low centroid values of the quality-of-life indicators.

Let us conduct a cluster analysis for the third group of quality-of-life indicators—“health care, education, and criminalization.” There are seven statistical indicators in this group. The cluster analysis results are presented in Table 31.1.

As can be seen, for the third group of quality-of-life indicators, the first cluster with the highest centroid values is formed by three regions. The Moscow Region was not left alone in the cluster for the first time. This is primarily due to the presence of fairly large and effective health care and educational institutions in the Voronezh and Belgorod Regions, which are sufficiently developed in socioeconomic terms. The third cluster is the average centroid indicators of health care, education, and criminalization. It is formed by six regions. The second cluster includes regions with low centroid values of indicators (eight regions).

In this way, for the first stage of testing the hypothesis, the use of cluster analysis is quite justified. Thus, we can present our hypothesis graphically, confirmed by the results of cluster analysis (Fig. 31.1).

This hypothesis, confirmed by cluster analysis, is very important in the chain of evidence of the relationship between production potential (we consider it as a cause,

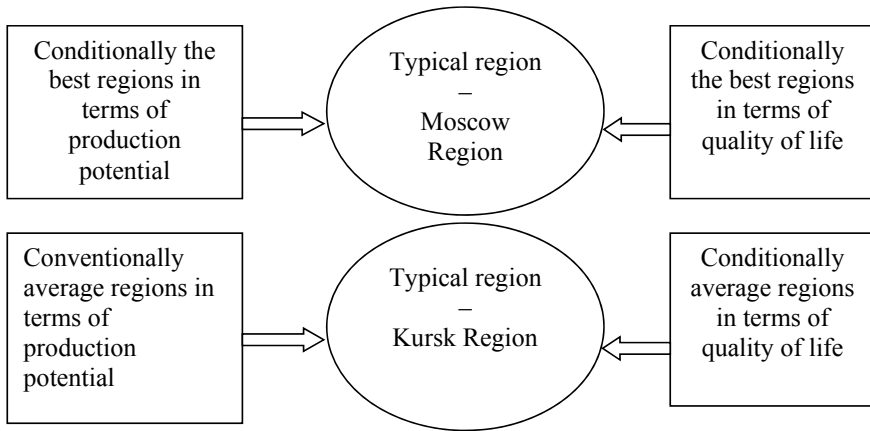


Fig. 31.1 Correspondence diagram of typical regions in terms of production potential and quality of life. *Source* Developed by the authors based on the results of cluster analysis

as a factor variable) and quality of life (we consider it as a resultant factor). As a rule, this correspondence in the group of typical regions is much clearer than in the group of “atypical” ones. Therefore, there are still factors (possibly latent) that we have not considered when forming the initial base, either due to the limited choice of data for comparison or due to the fact that these factors in the form of statistical indicators are not measured and are not given in official statistics but exist for “backstage” of economic processes and phenomena in these regions and can be revealed in whole or in part only when using multivariate factor analysis.

31.4 Conclusion

The results of the conducted cluster analysis give us reason to at least not reject the hypothesis that there is no direct dependence of the quality of life on the level of development of production potential. We considered the regions of one district—the Central Federal District. Nevertheless, the regions included in this district have significant deviations in terms of area, population, and other main indicators. However, there is a link between the clusters. If the region has average values in terms of production potential, then in terms of many indicators of the quality of life (three groups), it occupies an “average” value. A striking example is the Moscow Region, which forms a separate cluster in terms of production potential and quality of life. Visually, some areas (Table 31.1) fell into a cluster with average values in terms of production potential and, for some of the three groups of quality-of-life indicators, for example, into a cluster with low centroid values. However, this is a cluster. If we look at the centroid values, there is a connection. Additionally, the tool of cluster

analysis and the approach that we used do not pretend to establish clear quantitative relationships between production potential and quality of life. For this, at least, correlation and regression dependences and the use of factor analysis are needed or modeling the relationship between integral indicators obtained both from the array of primary data on production potential and according to indicators of quality of life.

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Chapter 32

Platform Solution in the Development of Financial Literacy as a Key Tool for Personal Finance Management: Case Study



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Abstract Financial literacy is a comprehensive field that includes mainly an understanding of key financial concepts and the use of this information to make smart decisions that contribute to the economic security and well-being of society. The intensive development of the economy and the rapid spread of mobile payment technologies and alternative financial services require an economically literate and active population. Financial education is the most important basis for improving financial literacy and informing the next generations of consumers, employees, and citizens. In connection with the progressive introduction of e-education at all levels and the development of remote learning, there is a growing demand for the development of educational platforms for online learning. The research describes the decision to create an online educational platform to resolve the problem of improving financial literacy.

Keywords Financial literacy · Financial education · Personal finance management · Online educational platform · Online education · Digital transformation

JEL codes A20 · D14 · P46

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32.1 Introduction

Financial education allows people to develop their financial skills and changes their viewpoint on money management, guiding them in making informed and sustainable financial decisions (Government of the Russian Federation, 2017).

Digital transformation has changed society and the economy. It is increasingly affecting everyday life. However, prior to the COVID-19 pandemic, its impact on education and training was much more limited (Eremina, 2021).

The pandemic has demonstrated that it is essential to have an education and training system fit for the digital age. This shift has opened up new and innovative ways for students and teachers to organize their teaching and learning activities and interact online in a more mobile and flexible way (Kaptsova, 2021).

For the research, it was important to analyze the required market segment, volume, and dynamics. To understand how promising the EdTech industry is, one could refer to statistics on the dynamics of the financial volume of the market. By the end of 2020, the market had grown to \$222 billion, while it was \$205 billion just a year before. The Russian market share is quite small—only 30 billion (Gimranova, 2021). The distribution of global financial capital is as follows: North America 40%, Asia 30%, China 40%, and Russia 1–2%. In the figure below, we can evaluate the dynamics of the market volume in the recent past and in the coming years.

Speaking about the dynamics of growth in the e-learning market, we should mention the subject of the COVID-19 crisis. Since the beginning of the pandemic, the demand for online education services from private companies and the use of EdTech practices in schools, universities, and other educational institutions have grown sharply. There is only one objective reason for this process—the need to implement measures for social isolation in the context of ongoing training, learning, and work. This has caused a significant inflow of capital, investment, and personnel into the online education market due to the growth in demand.

As part of the research, it seems necessary to create a qualitatively new educational online platform that considers the imperfections of existing platforms and is aimed at improving financial literacy among the youth.

Educational platforms are educational services provided in an automated or semi-automated form using various simulators, course designers, and interactive and gamified tasks. An example of an educational platform on the Russian market is “Uchi.ru” or “Skyeng” (Adzhikova et al., 2018).

32.2 Methods

The research implements an analysis of Russian and foreign scientific and pedagogical literature on the problem of financial education of students, uses methods for comparing Russian and foreign pedagogical practices in the use of online educational

platforms, and tests and questionnaires developed by the authors to assess the level of financial literacy of the youth.

32.3 Results

To determine the preferred format of training on financial literacy in the youth category, a survey was conducted among students of the Rostov State University of Economics (RSUE). The results of the survey are shown in Fig. 32.1.

The survey results show that the most attractive and convenient for students is the opportunity to take special courses at the place of study or training webinars and courses on the Internet, with 50% and 42% of those interested, respectively. This once again proves the need to use platform solutions in the field of education.

Competitors in this area are as follows:

- Offline schools of financial literacy;
- Financial literacy courses (Umnaziya, Finznaika, and Finam);
- Online learning platforms (Skillbox, Netology, and GeekBrains) (Povetkina & Kudryashov, 2020).

However, even such big market players have many drawbacks, ranging from the fact that the application is not adapted to different smartphone platforms, ending with the fact that there is no information necessary to gain knowledge in this area and complete the game.

An analysis of user feedback on the problems of educational courses of these companies allows us to draw conclusions on the reasons for the high or low ratings

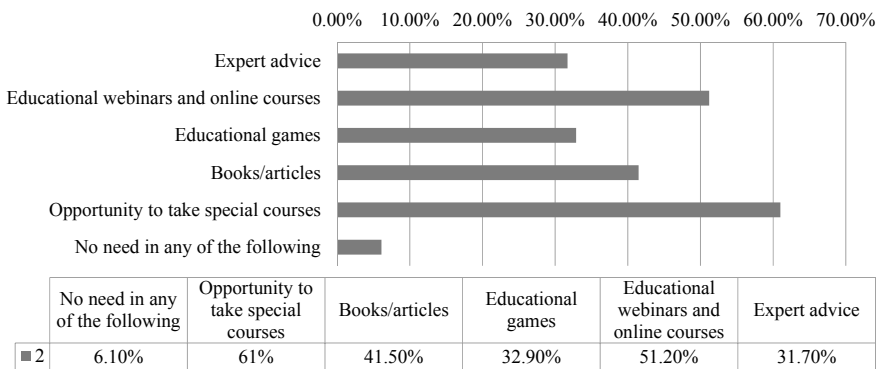


Fig. 32.1 Sources of information on financial literacy that RSUE students would like to have. *Source* Developed by the authors

of certain players. Thus, users often note several types of problems due to which they give a low rating to online education schools. These problems are as follows:

- The low structure of the material and the quality of the presentation of information do not allow for properly mastering the online course and using the skills and competencies embedded in its educational plan;
- The lack of proper feedback and constant communication between teachers and students leads to low motivation of students, more mistakes, an increased level of stress in mastering the course, and, consequently, less effective use of the course;
- The lack of a program and practices for supporting or mentoring students after graduation is one of the reasons for the low conversion of one-time course participants into regular students of online schools;
- Periodic independent tasks of high complexity, which are not explained in the process of preparation and basic training. In view of this factor, students experience inconvenience in the assimilation of educational material;
- Long duration or, conversely, a compressed course in a narrow timeframe leads to a lower involvement of students in work due to their limited ability to focus their attention.

Based on these reviews, it is necessary to introduce such a system for organizing the educational process and delivering educational content that will satisfy the needs indicated by the students.

After analyzing the market for services in this area, we identified the following competitive advantages:

1. Cost: Competitors have a much higher cost of services;
2. Advanced technologies and interactive process (gamification): Services use contemporary models and techniques that support all available educational programs;
3. Individual approach to each generation;
4. Social significance: This direction is currently very important for society (since the financial literacy of Russia is at a low level); one of the key tasks is the prosperity of society in this area rather than making a profit.

Platforms based on game mechanics attract children and adults who want to gain new knowledge but are not diligent enough to take a “severe” online course (Lavrenova, 2020). People do not feel the difference between studying and playing: They are equally interested in both of them; in games, they are not afraid to make mistakes. This is the secret of better assimilation of knowledge—in the absence of fear of making mistakes.

Based on the survey and analysis of the summarized data, Table 32.1 presents the metrics by which the key users of the online platform are identified.

To make sure that the definition of the target audience is correct, we built hypotheses and analyzed them to understand whether the proposed model is viable.

To confirm or refute the hypotheses, we conducted a survey:

1. Hypothesis: “We believe that the ideal clients of an educational institution are women aged 18 to 25 who live in small towns and have a need to learn the

Table 32.1 Defining the target audience by various criteria

Criteria	Consumer profile	Rationale
Demographical (gender, age, marital status)	<ol style="list-style-type: none"> 1. Woman 2. 18–25 years old 3. Single 	<p>Studies show that women are more likely to experience financial difficulties than men. Currently, women tend to be more independent than men. They strive to realize themselves in various fields</p>
Geographical (country and city)	<ol style="list-style-type: none"> 1. Russia 2. Rostov-on-Don 	<p>Rostov-on-Don is a developing city, and the standard of living is not high compared to Moscow and St. Petersburg. People who strive to improve their well-being tend to leave the city for the capital that attracts them with wages and a completely different standard of living</p>
Economical (occupation, income level, employment)	<ol style="list-style-type: none"> 1. Student 2. From 20,000 rubles 3. Parallel working (freelance) 	<p>Economics students are more likely than others to believe that they have a high level of financial literacy. Thus, they will be less attractive to studying it than students of technical specialties and medicine. Training and learning expenditures are from 2000 rubles monthly</p>
Social (hobbies, lifestyle, and interests)	<ol style="list-style-type: none"> 1. Hobbies: art, music, learning languages, etc. 2. Takes care of health 3. Interested in self-development 	<p>Anyone who follows the physical component of his or her life wants to improve the financial one</p>
Psychological (temperament, values, life position)	<ol style="list-style-type: none"> 1. Choleric or sanguine 2. Values: independence and material support 3. The desire to make life better 	<p>Cholerics are active and love leadership; it is important for them that they do not look stupid in the eyes of others. Sanguine people are very proactive and sociable; they are interested in constantly learning something new. Life values indicate the desire to improve one's financial situation. Independence speaks of a desire to achieve everything on one's own, including in terms of money</p>
Behavioral (model of behavior during the purchase, characteristic features)	<ol style="list-style-type: none"> 1. Recognizes a financial problem and decides to resolve it 2. Ambitious leader and innovator 	<p>Only on condition that a person is aware of the problem in the financial sector, he or she will be trained. Also, if they are ambitious, it will indicate that the platform user will be interested in such an unusual form of learning</p>

Source Developed by the authors

basics of finance and financial literacy.” The survey revealed that 76.6% of those interested in financial literacy questions are women, and 84.1% are aged from 18 to 25 years old. Thus, we confirm our hypothesis.

2. Hypothesis: “We assume that the most compelling value proposition for users of an educational platform will be the opportunity to receive material through an online course in theoretical and practical (gamified) forms.” According to the survey results, it turned out that the most significant number of respondents (72%) considers it interesting when various games are involved in the learning process using various points and awards. Thus, the hypothesis was confirmed: On average, about 50 people out of 82 respondents want to learn financial literacy using educational games.
3. Hypothesis: “We believe that the platform’s target audience is ready to pay a base price of 6000 rubles for training.” According to the survey results, about 56% or 46 people out of 82 are ready to pay for education from 5000 to 10,000 rubles. The hypothesis is confirmed.

Thus, the core of the target audience is a female careerist, a part-time student of 22 years old with an income of 20,000 rubles, engaged in self-development, spending 2000 rubles or more on education every month, aware of her problems in the financial sector and wishing to eliminate it.

For a deeper understanding of the audience, we analyzed the problems of the user of the online platform and ways to solve them. The selected target audience has the following problems:

1. Inability to manage finances;
2. Fear of unforeseen expenses (the risk of getting into debt and loans);
3. High anxiety due to lack of money or their loss;
4. Self-doubt and desire to become successful in the future;
5. Lack of a financial literacy course at the place of study;
6. Fear of stumbling upon the wrong platform when searching for information;
7. Distrust of courses (fear of being deceived);
8. Low self-esteem due to feeling of being stupid in the financial sector.

Utilizing the platform for teaching financial literacy in the field of personal finance management, users will receive the following:

- High-quality information (information will be correctly selected from reliable sources and presented in accordance with life circumstances);
- An exciting interactive process (the format of the game entertains and provides a good practical experience);
- Stable increase in capital (by competently managing their finances, the funds will constantly increase, and the customer will not fall for scammers and will know how to manage their funds properly);
- Knowledge in the field of long-term planning of a personal budget (satisfy one’s needs with the help of well-distributed funds);
- A clear and interesting explanation of such a complicated but important aspect of financial life;

- Increased self-esteem (when people understand all aspects of financial life, they will feel confident);
- No fatigue from training;
- Financial independence and a conscious style of financial behavior (it will help analyze fears and take steps that were previously avoided due to ignorance).

The key values of the online educational platform are as follows:

- Assimilation—the course program is built in such a way that users can easily acquire the necessary knowledge and skills through an accessible presentation of the material;
- Practice—users will gain skills and knowledge that are applicable in practice. The maximum result will be provided by 80% of practice and 20% of lectures. The mandatory development of practical skills will lead to the successful assimilation of the program and its further implementation;
- Maintenance—motivation of users to learn and accompany in the course of it to master the program in full;
- Feedback—users will receive valuable feedback from industry experts;
- Convenience—the online format allows studying financial literacy not only at the university but also in any place suitable for the user and at any convenient time;
- Self-understanding—the study of emotional intelligence, which will be a bonus at the end of the training, will help one to understand one's thoughts and not make rash decisions, referring to emotions;
- Confidence in the future—well-distributed funds will help create a safety cushion, save up for a dream, and even start saving for retirement.

Carrying out analytical work to identify the key characteristics of the potential target audience and its needs, we were convinced that the idea of creating a new online educational platform fits the current trends in the digital education market in Russia. Having found the consumer segment, one needs to build the right relationship with them.

After analyzing the possible categories of relationships, we could identify those with which we can achieve the maximum result:

1. Automated service. At the initial stage, people get acquainted with the proposed course options (their components, training time, prices, etc.) and independently choose the appropriate one.
2. Personal support. If questions arise during self-study of courses, the consumer could ask them in a chat with support or by e-mail.
3. Special personal support. The curators are always in touch with the users of the platform. They are assigned groups of listeners who can count on support in resolving any issues related to.

Thus, using this block, we will be able to form the right relationship with users for their successful learning on the online platform.

The proposed structure of the online educational platform and the duration of the course are as follows:

- The duration of the course will depend on the tariff chosen by the student;
- Each training module will consist of 5–10 video lessons, duration from 5 to 15 min, with a mandatory practical task on the lesson material in the form of a game;
- All students receive knowledge within their set time, i.e., be able to study when and where it is convenient;
- Each practical task is checked immediately after completion; students receive individual and detailed feedback in the format of a video analysis of their work;
- At the end of the module, all students are invited to a lesson on an online video communication platform where the teacher answers the remaining questions on the module's topic, organizes group tasks to work out the material, and summarizes what has been learned;
- The next module is open only to students who have completed and passed the required tasks of the previous module;
- Students will have a general chat where they can ask questions to classmates and the teacher and get a quick response;
- At the end of the training, a bonus for everyone will be a lesson on emotional intelligence, where students will learn how to control their emotions so as not to commit rash actions.

32.4 Discussion

Having assessed the strengths and weaknesses of the online platform, its opportunities and threats in the external environment, we will formulate an action plan and use it to compile a matrix of possible SWOT analysis strategies (Table 32.2).

It should be noted that the developed educational platform primarily has a social orientation, and after that, it is already making a profit; that is, the priority is to increase the level of financial knowledge of young people in Russia.

32.5 Conclusion

Financial education in Russia is gaining momentum. There are many different government programs to improve financial literacy. Thus, each region develops regional projects for its population that will help achieve its goals. The central authorities are developing concepts, national projects, and various online trainings and seminars to develop this area. Business entities for which a special level of financial literacy is being formed are not left without attention. It is not only the state that participates in such a socially significant task as financial education; for many commercial projects, this area is becoming more and more attractive every year. Currently, about 80 free and paid programs are being implemented from the

Table 32.2 Online platform confrontation matrix

Factors	Strengths	Weaknesses
Opportunities	Breakthrough strategy Expanding the target audience and capturing new niches for the full-fledged work of the center	Transition strategy #2 A large-scale marketing campaign and modern teaching technologies will create a certain image of the school, attracting additional consumers
Threats	Transition strategy #1 Thanks to reasonable prices and the threat of an economic crisis, the information that users of the platform receive will help them avoid losing money in difficult times The online format will allow one to continue learning even during a pandemic	Survival strategy By increasing the visibility and quality of education, we increase the client base, which will increase our market share and maintain our competitive advantage

Source Developed by the authors

country’s leading training sites and private personal finance coaches (Alikperova, 2020).

Many citizens of Russia face various financial problems in their lives. Unfortunately, not everyone is eager to seek help in making the right financial decisions in a timely manner. To eliminate these problems, it is necessary to create a product that will make it possible to provide accessible and high-quality knowledge in the field of finance to the extent necessary so that people can apply it in practice and not just know it in theory (Zhutaev, 2019). Therefore, the general idea of creating an online educational platform to improve financial literacy in the format of a game is quite demanded.

We should offer simplistic (but no less important), timely, and contextually relevant information and use technology, gamification, practice, and incentives where possible to make financial education more attractive.

Before launching a well-developed online platform, it is necessary to determine all components for its successful implementation.

For this stage, we carried out the necessary actions: determined the target audience, identified the needs and specific requests in the field of financial education from potential consumers, created a project model of the course and determined its duration and communication format, and justified the key benefits for potential users. For the target audience, unique components of the product were formulated and presented to attract their purchasing interest in the product. Simultaneously, the concept of a minimum viable product (MVP) was chosen to test the hypothesis about the demand for this service among the target audience.

Thus, the set tasks were fully resolved. The research goal was achieved—an online platform for teaching financial literacy was developed, considering the imperfections of existing platforms and aimed at improving financial literacy among the youth.



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Chapter 33

Tax Administration in Today's Digital Environment: A Model and Prospects for a Proactive Approach



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Abstract The research studies the implementation and state of the proactive model of tax administration in terms of property taxes (transport tax and property tax of organizations) paid by organizations as a promising component of the modern digital environment of tax authorities. The authors revealed the stages of the concept implementation in practical activity and showed key indicators of success. To improve and increase the efficiency of proactive (non-declaration) tax administration, it becomes necessary to carry out digital changes in taxpayers' personal accounts, making it possible to increase the availability and openness of information. Moreover, it is necessary to transfer the vector of calculating tax liabilities to tax authorities, thereby ensuring the fulfilment of the service function.

Keywords Taxation · Digitalization · Proactive tax administration · Transport tax · Corporate property tax · Property taxes · Modernization of tax authorities · Customer-centric model

JEL Classification H250 · H30

33.1 Introduction

For several years, the tax authorities have been developing and implementing successful projects of proactive administration based on digitalization: online cash desks, the legalization of the activities of self-employed citizens, and the automated taxation system “Automated simplified taxation system online.” Simultaneously, reforms of tax administration based on the digitalization of activities require constant changes in the legislative framework in terms of tax control. Tax legislation is no

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exception, which is aimed at improving the mechanism of calculation and payment in various areas, including property taxation.

The ongoing modernization, namely the implementation of the project of proactive (non-declaration) administration, allowed the Federal Tax Service to move to a customer-centric model of interaction with taxpayers (Egorov, 2022), which, according to the authors, expresses the essence of a service approach to interaction with taxpayers.

33.2 Methodology

During the conducted research, the authors applied various general scientific methods: observation, measurement, comparison, analysis, synthesis, induction, deduction, etc. Solving specific problems was accompanied by the use of graphic imaging methods and quantitative analysis of tax indicators.

The information base of the research includes information data on the accrual and receipt of taxes, fees, and other mandatory payments to the budget system of the Russian Federation.

33.3 Results

In the context of the digital transformation of tax administration, the growth of trust in the interaction of the Federal Tax Service of Russia with tax entities, the development of tax monitoring, and the simplification of interaction on tax issues, the function is transferred from taxpayers to tax authorities as a fairly professional player in the tax sector (Vazarkhanov et al., 2022).

One of the directions of proactive administration is changes in the part of property taxation of legal entities. In the current tax system of Russia, property taxation is located at the regional and local levels and is represented by some tax obligations of legal entities: regional taxes (transport tax from organizations and tax on property of organizations) and local taxes (land tax).

Analyzing the data on the receipt of tax payments (Federal Tax Service of Russia, 2020, 2021, 2022), we can say that the revenues of the consolidated budget of Russia for 2021 increased by 4973.4 billion rubles (22.1%), amounting to 27,476.7 billion rubles. The main source of replenishment of the revenue part is federal taxes and fees: 20,331.3 billion rubles in 2019 and 18,551.9 billion rubles in 2020. Drawing a parallel between 2021 and 2019, an increase in the value of 4890.0 billion rubles can be observed (24.1%).

Not least in the structure of revenues are regional taxes, budget revenues for which increased by 67.6 billion rubles in 2021 (6.2%) compared with 2019, gaining a foothold at the level of 1163.4 billion rubles. In 2019, revenues reached the level of

1095.8 billion rubles, and in 2020—425.9 billion rubles. In 2021, local taxes amounted to 289.7 billion rubles, while income in 2019 amounted to 263.0 billion rubles.

If we consider income on taxes related to special tax regimes operating in Russia, we can note a downward trend over the analyzed period. Thus, in 2021 compared to 2019, revenues decreased by 10.9 billion rubles (1.3%); in 2019, they amounted to 813.2 billion rubles.

The analysis of the structure of tax revenues to the consolidated budget of the constituent entities of the Russian Federation for 2019–2022 is shown in Table 33.1.

In 2019, the maximum part (share) in the structure of income revenues to the consolidated budget of the Russian Federation was occupied by federal taxes and fees; they accounted for 90.35% of income, and regional taxes amounted to only 5% of the total. Taxes related to special tax regimes were 4%; the share of local taxes was only 1%.

There have been small shifts in 2020. Still, the maximum part of the income was federal taxes and fees: they occupied 96.22%. Regional taxes amounted to only 2.21% of the total, which indicates a decrease in their specific gravity compared to 2019. Taxes related to special tax regimes are 0.14%. The share of local taxes was 1.41%.

The share occupied by regional taxes, as the main group of property taxes, in budget revenues for 2021 shows positive changes in the overall structure of tax revenues.

Taxes related to special tax regimes occupy 2.93%. The share of local taxes was 1.05%. Thus, it is possible to note that regional taxes in the budget occupy the second place and do not exceed 5%.

The analysis of revenues by types of regional taxes in the consolidated budget of the Russian Federation (Federal Tax Service of Russia, 2020, 2021, 2022) allows us to say that in 2021, in comparison with 2019, there is an increase in the number of revenues on property tax of organizations by 5.1% and by 11.8% on transport tax. The growth is due to the improvement of the tax administration model and the development of its digital component.

Table 33.1 Structure of tax revenues to the consolidated budget of the constituent entities of the Russian Federation for 2019–2022

Indicator	2019, %	2020, %	2021, %	Absolute change 2021 by 2019 (+/–)
Federal taxes and fees	90.35	96.22	91.79	1.44
Regional taxes	4.87	2.21	4.23	–0.64
Local taxes	1.17	1.41	1.05	–0.12
Taxes related to special tax regimes	3.61	0.16	2.93	–0.68
Total	100.00	100.00	100.00	–

Source Compiled by the authors

The assessment of the structure of regional taxes received in the consolidated budget of the Russian Federation for 2019–2021 (Table 33.2) made it possible to draw the following conclusions regarding property taxes: for property tax of organizations, there is a decrease in the share by 0.82% in 2021 compared to 2019. Transport tax, on the contrary, has a positive trend of 0.85% for the analyzed period.

The largest share for the analyzed period belongs to the property tax of organizations; at the end of 2021, it amounted to 83.01%. The second place belongs to the transport tax, the value of which was fixed at the level of 16.83%.

Earlier, it was noted that the ongoing digital reform of the tax system of the Russian Federation affects not only aspects of changes in the role of tax authorities but also the existing system of calculating, paying, controlling, and administering tax liabilities. One of the directions is the project of the Federal Tax Service for proactive (non-declaration) administration of taxation of taxpayers' property, which has been actively developed since 2019.

Nowadays, the tax service has practically left office tax audits for regional taxes. Until then, attempts were made to simplify and change the forms of declarations and simplify advance payments, which required large costs from the tax administration and the taxpayer. These procedures did not bring big effects in the end. Unfortunately, the tax control measures carried out did not have much effect either.

Taxpayers were invited by the control body to minimize the costs of forming annually submitted documents and refused, in principle, tax returns. This is primarily due to the fact that everyone has the same sources of information. For example, we will start with each transport tax. This source is information obtained from the resources of the Unified State Register of Vehicles and others. With the unity of sources, the question arises for granted "Why do we need office checks if the period of ownership, the base, and the characteristics of the objects are initially unified?" There were other costs, such as the storage and processing of approximately one million tax returns, of which about 550,000 were transport tax returns.

There was also a departure of the tax authorities from low-performing office tax audits because they were not carried out. Prior to this, most of the detected violations of regional taxes were minimal, and the cost of processing tax returns was quite high.

In terms of taxpayers, it was supposed to exclude the costs of the formation and annual submission of tax reports (if there are uniform sources of data on vehicles, land plots, and capital construction projects) and implement a non-declaration procedure

Table 33.2 Structure of regional taxes for 2019–2021

Indicator	2019, %	2020, %	2021, %	Absolute change 2021 to 2019 (+/–)
Corporate property tax	83.83	82.83	83.01	–0.82
Transport tax	15.98	17.03	16.83	0.85
Gambling tax	0.19	0.14	0.16	–0.03
Total	100.00	100.00	100.00	–

Source Compiled by the authors

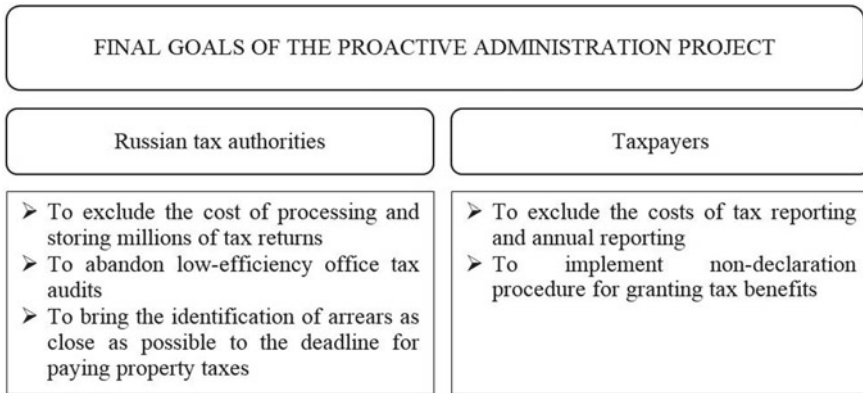


Fig. 33.1 Objectives of the project of proactive administration of regional taxes. *Source* Compiled by the authors based on (Laschenov, 2021)

for the provision of tax benefits. Regarding the tax authorities, the implementation of this project pursues to eliminate the costs of processing and storing 1.1 million tax returns, abandon low-efficiency office tax audits, and bring the detection of arrears as close as possible to the deadline for paying property taxes (Fig. 33.1).

The project of proactive tax administration in terms of regional taxes as a continuation of the development of digitalization of the activities of tax authorities involved the implementation in several stages (Fig. 33.2).

The tax legislation of the Russian Federation has been constantly amended. On the property tax of organizations, starting from the tax period of 2020, quarterly advance calculations were accordingly canceled. In terms of the effectiveness of transport tax audits, the conditions regarding the submission of tax returns have been canceled. Traditionally, the synchronization of the tax payment period was accordingly established in regional laws and municipal regulations. In this case, it was very difficult to navigate the changes in legislation; it was necessary to track official information from directories on rates and benefits annually. Taxpayers still preferred, along with the official information of the Federal Tax Service, to look for published regulatory documents to prevent inconsistency of information when paying, and also preferred to look at authentic sources. To synchronize the terms of payment in the Tax Code of the Russian Federation, a single framework was introduced on March 1 of the year following the expired tax period.

To solve the indicated problem, a system for sending messages on the payment of regional taxes was developed (this has so far affected only the transport tax). An important point remained, accordingly, ensuring the timely reconciliation of information about taxation objects. This reconciliation today can be carried out at the initiative of the taxpayer in case of inconsistency of data with databases. According to Article 85 of the Tax Code of the Russian Federation, the tax authorities are obliged to respond to this message and contact the relevant departments.

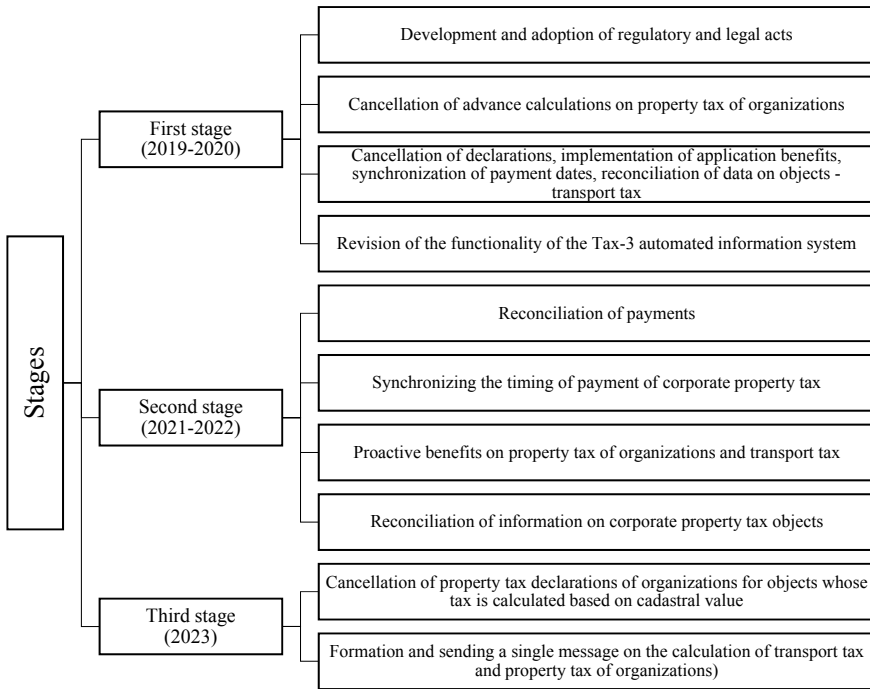


Fig. 33.2 Main stages of the project of proactive administration of regional taxes. *Source* Compiled by the authors according to the data (Laschenov, 2021)

Starting from 2021 and during the past months of 2022, the tasks of the second stage of the project have already been implemented:

- Payment reconciliation—(via reporting of tax amounts)
- Synchronization of the terms of payment of property tax from organizations;
- A mechanism for proactive (unapproved) benefits of property taxes;
- Reconciliation of data on objects on property tax paid by organizations.

There are also quantitative results of the implementation of the concept of proactive tax administration for 2021 and 2022 expressed in the form of feedback from taxpayers—67891 explanations for messages about the calculated amount of transport tax, which amounted to 10.6% of the sent messages. Agreeing with the taxpayer’s arguments, the tax authorities recalculated 43,754 messages. The consequence of this is the departure from the fiscal component and the transition to a client-centric administration model, which includes the provision of services in terms of life situations and the development of digitalization of activities based on receiving regular feedback from taxpayers.

Proactive benefits mean that there is no need to submit an appropriate application (the use of benefits of an unapproved regime), and the tax authorities, having information about such taxpayers, independently determine the benefits and calculate them on their basis.

The survey showed a positive attitude of taxpayers towards the introduction of a proactive administration model into the tax authorities' system while noting the positive effect on business conditions.

Analyzing the data, we can say that 97% of respondents rated the introduction of a proactive administration mechanism as positive, and only 2% considered the effect neutral, not beneficial to either taxpayers or tax authorities.

The next iteration of the development of the project is planned for 2023. At this stage, it is envisaged to completely switch to determining the tax base based on the cadastral value and abolish the declaration of property tax on organizations (maximum simplification for the taxpayer of document management). The second component of this stage is the sending of a single message containing the calculation of transport tax and property tax of organizations, which once again confirms the readiness of the tax authorities to take full responsibility for calculating the taxpayer's obligations. This decision will require a concentration of efforts on the part of the Federal Tax Service to digitally modernize internal systems and the representation that taxpayers will see in their personal accounts.

33.4 Conclusion

Summing up, we can say that the project of proactive tax administration in terms of property taxation of legal entities had several key indicators of success:

- KPI-1—in 2020, three advance calculations on property tax of organizations were abolished;
- KPI-2—in 2021, the transport tax return was canceled.

As part of the development of the project, the Federal Tax Service plans to form a consolidated tax notice (including the calculation of tax obligations on transport tax and property tax of organizations), which will need to be paid no later than thirty calendar days from the date of receipt; the tax payment period is postponed to September 1.

The transformation of the project in 2023–2026 should take place as part of the expansion of the application of cadastral value as a tax base for property tax on organizations in terms of the transition to cadastral value for all objects registered in the USRN (except for individual structures), cancellation of the annual list of objects, and the abolition of tax for small and medium-sized businesses applying special tax regimes.

To further improve the effectiveness of proactive tax administration, it is necessary to make digital changes in personal accounts. It is necessary that the taxpayer

see the number of obligations payable and have access to information detailing the calculation of these obligations.

This will require a certain amount of time to modernize existing resources. Nevertheless, it will make the digital platform more open to subjects; interaction with taxpayers will become fast, comfortable, and trusting.

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Chapter 34

Tax Control in the Russian Federation Performance: Assessment, Digital Instruments, and Development Prospects



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Abstract The research studies the effectiveness of tax control in the Russian Federation. An analysis of the indicators of control work carried out by the tax authorities for the nine months of 2021 is given compared with the same period in 2019 and 2020. The factors that had an impact on the growth of tax revenues are presented. The authors disclosed digital tools that have made it possible to achieve positive results that affect the receipt of tax liabilities in the consolidated budget. It is noted that further improvement of the control block of tax authorities should take place within the framework of strengthening work in the areas of a risk-oriented approach, preventing violations of mandatory requirements, and integrating the Tax-3 automated information system with systems used by taxpayers.

Keywords Digitalization · Tax control · Digital tools · Debt · Tax risks · Tax audits · Control and analytical work · Pretest analysis

JEL Classification H250 · H30

34.1 Introduction

In recent months, a new strategy for the work of the Federal Tax Service, the so-called manifesto of the Federal Tax Service of Russia, has been actively discussed. The essence of the new strategy is mutual trust between tax authorities and taxpayers. Along this path, the mechanism of control work of the tax authorities is being reorganized at the level of the state as a whole and at the level of each territorial unit.

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As part of tax audits by the tax authorities, it is possible to resolve a very wide range of tasks in practice: identifying and preventing the commission of tax offenses, including non-payment of tax payments, ensuring the receipt of tax payments into the Russian tax system, and preventing tax offenses (Korotkova et al., 2022).

Among the most important tasks implemented during the tax control measures are the suppression and prevention of violations of tax legislation and the incentive of taxpayers to voluntarily avoid the use of illegal tax schemes. The key trend in the development of control work is the transition from total control to point checks based on a risk-oriented analysis of the economic activities of taxpayers. The use of such a control model ensures a consistent reduction in the number of on-site tax audits while improving their quality and efficiency. Moreover, it helps reduce the share of low-efficiency and ineffective on-site inspections.

34.2 Methodology

During the research, the authors applied various general scientific methods, including comparison, analysis, synthesis, induction, deduction, etc. Solving specific problems was accompanied by the use of graphic imaging methods and quantitative analysis of tax indicators.

The information base of this research includes information data on the results of the control work of tax authorities and the receipt of taxes, fees, and other mandatory payments to the budget system of the Russian Federation.

34.3 Results

For quite a long period, Russia has been reviewing models and instruments of tax control. The technology of control work of tax authorities undergoes continuous improvement and rejection of total control of taxpayers; the development of digital tools plays a key role in this process.

Since 2006, employees of the tax service have been systematically working on digitalizing all processes in the tax authorities. In 2018, the concept of import substitution of software in the Federal Tax Service was approved (Muravleva, 2022). This has led to certain positive results.

Let us move on to the assessment of control work for nine months of 2021 compared to similar periods (Federal Tax Service of Russia, 2019, 2020, 2021).

Revenues to the consolidated budget of the Russian Federation in January–October 2021 increased by 6272 billion rubles (+37%) compared to October–November 2020 and by 4288 billion rubles compared with 2019 (+23%). During the analyzed period, receipts were fixed at the following levels: 18,946 billion rubles in 2019, 16,962 billion rubles in 2020, and 23,224 billion rubles in 2021 (Fig. 34.1).

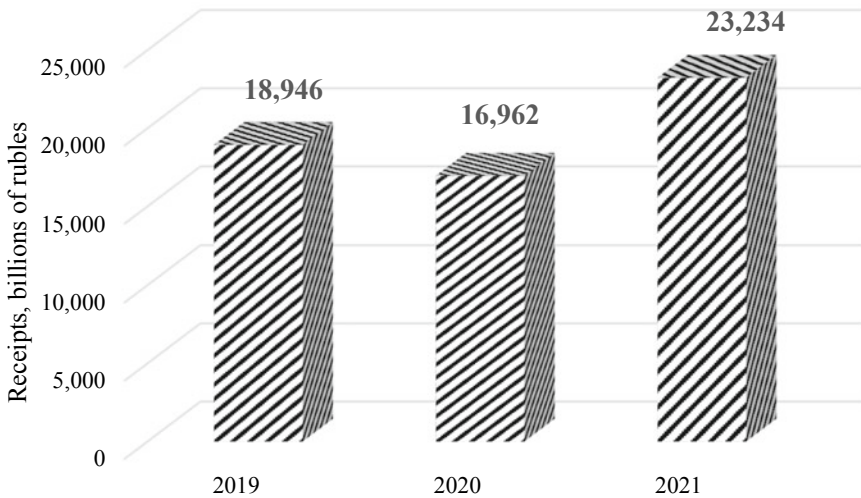


Fig. 34.1 Real terms tax revenue growth for January–October 2019, 2020, and 2021. *Source* Compiled by the authors

The economic factors that affected the growth of revenues to the consolidated budget of Russia in 2021 include price growth (45%), recovery of gross domestic product (32%), legislative factors (12%), and the effect of tax administration (11%).

The results of the control and analytical work of the tax service make it possible to say that 241 billion rubles were received in nine months of 2021 (including 125 billion rubles based on the results of the analytical work). Revenues as a result of working out scheme deductions for value-added tax amounted to 25 billion rubles.

The tax authorities for the year 2021 excluded from the register and made records on the unreliability of information in the Unified State Register of Legal Entities in relation to 7000 “one-day” firms and technical companies; 151 beneficiaries clarified tax liabilities in the amount of 1.7 billion rubles; 459 field tax audits were scheduled for beneficiaries in the amount of 8.3 billion rubles; two criminal cases were initiated against the organizers of the “sites” under Article 210 of the Criminal Code of the Russian Federation; 23 criminal cases have been initiated against beneficiaries using circuit deductions formed by “sites” in the amount of 3 billion rubles.

Not a small contribution to increasing the effectiveness of tax control was made by the technology of automatic information exchange, the use of which in January–October 2021 allowed the tax authorities to add 4.3 billion rubles. Work on the automatic calculation of tax risks in this view was carried out in the following directions:

- Non-payment of 3-NDFL and failure to report;
- Formation of user assignments of the territorial tax authority for risk development;
- Territorial tax authorities see only the accounts of those taxpayers who are registered with them and for which risks have been formed.

The strengthening of the work on the collection of the evidence base was constantly carried out, considering the provisions of Article 54.1 of the Tax Code of the Russian Federation. In total, for nine months of 2021, 496 materials of office inspections were received (an increase of two times); 433 (90.6%) materials of inspections were considered to assess evidence on the abuse by taxpayers of their rights in violation of the provisions of Articles 54.1 of the Tax Code of the Russian Federation, of which 367 cases were found to be justified. Consideration of 12 draft acts of office tax audits submitted by the territorial tax authorities made it possible to add more than 300 million rubles.

For nine months of 2021, 290 thousand companies with inaccurate information and inactive legal entities and 257 thousand of inactive individual entrepreneurs were excluded from the Unified State Register of Legal Entities and the Unified State Register of Legal Entities.

The increase in the number of taxpayers applying the special tax regime “Tax on professional income” for nine months of 2021 amounted to 1.8 million and fixed at the level of 3.5 million participants. The total income of payers for 2019–2021 amounted to 729 billion rubles, of which 473 billion rubles in 2021. Budget revenues for January–October 2019–2021 totaled 20 billion rubles, of which 16 billion rubles were received from taxpayers in January–October 2021. This circumstance suggests that the tax on professional income is effective and in demand. It also gives positive results in control work.

The markets project implemented by the Federal Tax Service in 2021 leads us to the following values:

- Number of registered persons operating in the market who are obliged to have the status of individual entrepreneurs (or be registered as a legal entity)—147.3 thousand;
- The number of cash registers to be used in the markets in the performance of registration duties—160.7 thousand;
- Revenue of taxpayers, which should be reflected subject to full reflection on cash registers—35.3 billion rubles.

The pre-trial and judicial work of the tax authorities, as part of the control work, at the end of 9 months of 2021, gave the following results: the number of cases considered by the courts amounted to 4826 units, which is 2.8% less than in the same period last year. The share of claims considered in favor of the tax authorities amounted to 70 billion rubles out of 90 billion rubles, which make up the total amount of claims considered.

As of October 1, 2021, total debt amounted to 19,081 billion rubles (Fig. 34.2).

Thus, on October 1, 2021, there was a historical minimum of the ratio of debt on tax obligations to receipts.

The increase in the effectiveness of tax control is associated with the introduction of various digital tools into the activities of tax authorities, which form a digital ecosystem of control work. An important role in the development of digital instruments of tax authorities was played by the project “Reform of control and supervisory activities.”

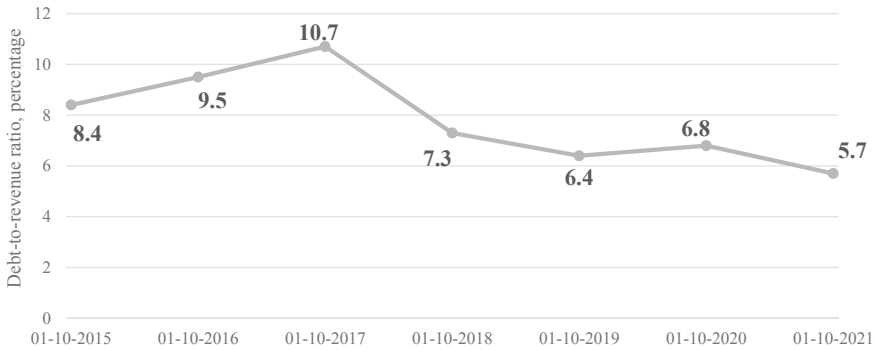


Fig. 34.2 Tax liability to revenue ratios. *Source* Compiled by the authors

The tasks of the reform of control and supervisory activities were as follows (“Presidium of the Council under the President of the Russian Federation...”, 2016):

- Reducing the level of material damage by controlled types of risks;
- Reducing the administrative burden on organizations and citizens engaged in business activities;
- Improving the efficiency of the organization of control and supervisory activities;
- Growth of the quality index of administration of control and supervisory functions.

Within the framework of this program, a remote-control system is actively developing, and infrastructures and mechanisms for managing and protecting information are being worked out during remote control and during remote interaction between state authorities and organizations.

This concept was based on the concept of “risk” as a tool and indicator in this work area. During this period and to date, the goals and objectives facing the tax authorities in the risk management framework were determined. The promotion of voluntary compliance with the legislation on taxes and fees today is based on the following principles of the tax service:

- Ensuring correct calculation and timely transfer of taxes and fees to the budget;
- Increased accuracy of detection, earlier detection, and prevention of factors of possible violations of the Tax Code of the Russian Federation;
- Development of strategies and methods for identifying risks for various groups of taxpayers;
- Implementation of a system for identifying and minimizing (eliminating) tax risks;
- Development of a strategy for effective communication with taxpayers and disclosure of information about the identified risks of potential violators.

The use of a risk-oriented approach when conducting tax audits is manifested in the following: “Pre-review analysis–Selection” and categorization of taxpayers by risk.

Assessment of tax risks is carried out in the following areas:

- Degree of coverage by types of taxes;
- Identification of risk as early as possible;
- Optimum use of the selected process plan;
- Level of automation of detection and elimination;
- Prioritization.

The priority task is to ensure the correct calculation and timeliness of the transfer of taxes, fees, and insurance premiums to the budget. To do this, it is necessary to improve the accuracy of detecting violations and identify these violations as early as possible.

Thus, two groups of fundamental tasks were identified:

- Development of a strategy and methods for identifying risks for various groups of taxpayers to ensure the accuracy and prevention of tax control measures;
- Implementation of a system for the identification and elimination of tax risks based on the strategy.

The tax authorities clearly understand that without a strategy of effective communication with taxpayers and disclosure of the identified risks of potential violations, it is impossible to promote voluntary compliance with tax and collection legislation.

Nowadays, the target structure of the tax risk management system has already been formed, which is used by tax authorities in their activities, and which has been giving positive trends for several years.

The direction of development of digitalization of control work activities is the constant improvement of the system units—“Diagram typology module” and “Communication analysis module.” The advantages of system units are as follows:

- “Diagram typology module”—automated circuit typing, operation prioritization; define views based on participant role and schema type; a single platform for the exchange of documents, a system of user tasks, the exchange of experience—a repository of acts;
- “Communication analysis module”—visualization tool according to the principle “Minimum information—maximum conclusions”; formation of comprehensive knowledge about taxpayers and their environment; formalized description of taxpayer interdependencies with the application of supporting primary data.

Thus, the risk-oriented approach in the activities of tax authorities combines the following:

- Office check (93.1 of the Tax Code of the Russian Federation, benefit, reimbursement);
- Control and analytical work (effective elimination of “complex” discrepancies by the correct establishment by “ASK VAT-2” PC; preventing the use of “transit” and “technical” organizations in formal document management to ensure deductions and ensuring the “cleanliness of the environment” of the region);

- Pre-inspection analysis and on-site tax audit.

The development of digital instruments allowed the tax authorities to achieve certain results and revise the mechanisms of tax control. Currently, it makes it possible to introduce almost proven standards based on trust relations between the tax inspectorate and taxpayers.

34.4 Conclusion

The research makes it possible to argue that the concept of a risk-oriented approach in the activities of tax authorities and the developed digital tools make it possible to reduce attempts at fraudulent reimbursement by at least six times, reduce the number of one-day firms, and reduce tax evasion schemes.

From 2023, the tax administration will have an innovation called the Unified Tax Account, which will allow taxpayers to transfer all obligations to one budget classification code for their subsequent redistribution by the tax authority. In part, it will also act as a digital tax control tool that combines the rules for settling accounting for all obligations, a single dynamic collection document, and recovery and refund of overpayment from a single tax payment, bringing to a single payment date. The implementation of this mechanism for calculating, paying, and controlling tax payments will make it possible to introduce and develop the institution of a unified calculation of calculated liabilities.

According to the authors, further improvement of the control work of the tax authorities should be based on the following areas:

- Formation of an industry risk map, which describes typical and characteristics of the type of activity and the most common risks. The preparation of such maps should be based primarily on the analysis of statistical data on violations that have been identified over the past three years;
- Prevention of violations of mandatory requirements should include public events, placement of current lists of mandatory requirements on the site, guidelines for compliance with mandatory requirements on the site, information campaigns, round tables, and seminars with taxpayers;
- Integration of AIS “Tax 3” with information systems of organizations. This will ensure that information is sent directly through the organization’s information systems.

The actions taken today in terms of improving the control work of tax authorities based on digital instruments, should ultimately lead to the solution of such problems as expanding the use of a risk-oriented approach when conducting control measures, prevention of violations, “smart” claim of documents, and promotion of electronic document management. It is the solution of these tasks that will increase the effectiveness of control measures carried out by the tax service and make them “transparent” for taxpayers.






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Chapter 35

International Labor Migration as a Factor in the Socio-Economic Development of the National Economy (Based on the Materials of the Republic of Tajikistan)



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Abstract Issues of regulation of migration processes and suppression of illegal immigration are also relevant for local government bodies. We have made an attempt to show negative and positive aspects of this phenomenon and substantiate migration as one of the factors in the development of the territory. The research aims to study the most attractive centers for attracting labor from Tajikistan, the importance of migrant remittances, employment of migrants by sector, and factors influencing the choice of migration direction. To achieve the set goals, the authors used theoretical analysis, generalization of statistical data, and comparison of indicators in dynamics.

Keywords International labor migration · Money transfers · Employment · Scale of migration · Labor force emigration · Economic development

JEL Classification F2 · F5 · J2 · J6

35.1 Introduction

This study is devoted to the problem of international migration and migration policy, as well as the issues of their interaction in theoretical and practical terms. Scale of international migration is growing from year to year. Thus, according to the estimates of IOM, there were about 101.9 million migrants in the world in 1980, which at that

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time accounted for 2.3%. These are people of different age groups with different professional backgrounds and motivations.

A significant proportion of them is labor and educational migrants. The IOM estimates the number of labor migrants at 164 million people (60.3%). In general, it is necessary to note a very important trend of contemporary migration—the feminization of migration. Compared to 2000, the share of migrant children has slightly decreased: from 16.0% to 13.9%. Migrant workers majority (approximately 111 million (68%)) worked in high-income countries (Amonova, 2014).

35.2 Materials and Method

International migrants are distributed unevenly across the countries of the world. A whole range of factors (demographic, socio-economic, political, natural, and climatic) predetermines the direction and scale of migration flows. As a result of these factors, stable migration corridors have now formed. This model of migration corridors is likely to prevail in most African and some Asian countries. Do not forget about intrastate migration, which is also a global phenomenon (Bankovskaya, 2016).

The world remains in demand for low-skilled and skilled labor of migrants. There is also increasing competition for highly skilled resources and talent. Personnel shortage in mechanical engineering, information technology, pharmaceuticals, healthcare, and education forces countries to make their migration policies more flexible to attract personnel necessary for the national economy. Labor migration is increasingly turning into circular labor migration. Migrant workers are also characterized by return migration, which becomes widespread due to financial and economic crises (Berdyklycheva, 2014). As of 2019:

- 31% (83.6 million people) of all migrants lived in Asia;
- 30% (82.3 million) of all migrants lived in Europe;
- 26% (70.3 million)—USA;
- 10% (26.5 million) of all migrants lived in Africa;
- 3% (8.9 million) of all migrants lived in Oceania.

International remittances from migrants are an important source of financing for developing countries. Migrant remittances reached \$689 billion in 2019, with about three-fourths of this amount going to developing countries (Makhmadbekov, 2010). Simultaneously, on the one hand, migrants' remittances serve as a tool to cover the deficit in the trade and balance of payments of beneficiary countries and significantly affect the exchange rate of national currencies. On the other hand, they are not a source of taxes for national budgets. Thus, the high dependence of donor countries of labor migrants on the volume of remittances leads to increased risks of socio-economic crises in the event of a decrease in remittances due to various factors (President of the Republic of Tajikistan, 2010).

35.3 Results

Over the past few years, Tajikistan has made notable progress in reducing or entrenching poverty. Significant progress has been made in this direction through international migration. For the population of the Republic of Tajikistan, going abroad is another important way to earn money, which contributes to a decrease in unemployment and a noticeable increase in foreign exchange reserves in the country. Other migrants sent \$2.7 billion to Tajikistan in 2019, which is 33.4% in relation to the country's GDP. According to statistics, due to the lack of jobs in the country, about 500 thousand people go abroad annually to find work and better wages (Vorobieva et al., 2018; UN DESA, 2020).

Given this trend, over the past five years, about 2.5 million people have left Tajikistan searching for work (Table 35.1). Additionally, in Tajikistan, men are traditionally considered the breadwinners of the family. The exact number of Tajik migrants in Russia remains unclear. The report estimates that 780,829 people work and live abroad as international migrants, which would make up about 14% of the workforce (Babadzhanov, 2009, 2017).

The main host country for Tajik migrants is the Russian Federation (97.6%). Additionally, Tajik labor migrants travel to Kazakhstan, the Kyrgyz Republic, Uzbekistan, Turkey, the USA, the UAE, Korea, and Germany. Russia is the main destination (Babadzhanov, 2012; Babadzhanov et al., 2017). Moreover, Russia has networks of migrants, and some migrants already have experience in the country. This factor encouraged migrants to choose Russia as their country of residence and work—their number increased from 24.4% in 2000–2004 to 33.5% in 2005–2009 and 40.4% in 2010–2013 (Babaev & Jurazoda, 2016).

The geography of labor migrants is located in large metropolitan areas such as Moscow, St. Petersburg, and the Moscow region. Most of the migrants do not have the proper specialty and education. About 65% of all males work in construction industry,

Table 35.1 Labor migrants

Indicator	2017	2018	2019
Total number of migrants	487,757 (−5, 7%)	484,176 (−0, 73%)	530,883 (+9, 64%)
Number of male migrants	419,721 (−3, 6%)	419,664 (−0, 01%)	453,870 (+8, 15%)
Male, %	86.1 (+2, 25%)	86.7 (+0,69%)	85.5 (−1, 38%)
Number of female migrants	68,036 (−16, 87%)	64,512 (−5, 18%)	77,013 (+19, 37%)
Female, %	13.9 (−12%)	13.3 (−4, 3%)	14.5 (+9%)

Source Compiled by the authors

mainly as unskilled workers (team leaders are rare), as well as in the service sector (waitresses, cooks, dishwashers, salespeople in the markets, etc.) (Kiseleva, 2018). As a rule, they are all low-paid professions.

Remittances from migrants to families in Tajikistan are used for basic needs such as buying food and clothing and paying utility bills. Members of migrant families use the vast majority of remittances (94%) for personal consumption. As everyone knows, consumption is one of the most important components of a country's GDP. Thus, remittances are rarely saved or invested. In the focus group discussion (FGD), respondents noted that the amount of funds invested in opening a bank account is too small (Asian Development Bank, 2020; IOM, 2019). The participants noted that a small salary also does not allow one to have savings. Most (80% to 90%) of them indicated that they are investing in building houses or buying small apartments.

35.4 Conclusion

In the last decade, Tajikistan has made steady progress in many economic indicators, such as reducing poverty, reducing unemployment, and increasing the country's foreign exchange reserve. The main driving element of these economic achievements is international migration, which provides alternative options for developing the national economy at the present stage. External labor migration is a vital indicator of economic growth for developing countries like Tajikistan.

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Chapter 36

Transformation of Priorities of Sustainable Development of Cities Under Conditions of Foreign Economic Limitations



Natalia N. Kosinova , Elena N. Kukina , Irina V. Dneprovskaya ,
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Abstract The paper aims to rethink the existing assessments of the sustainable development of cities (on the example of Moscow) as part of identifying the reasons for changing the priorities during external economic restrictions. Authors consider tools for assessing the sustainable development of cities in five aspects of their sustainable growth. The assessment tools were developed by the McKinsey & Company Global Institute in collaboration with the China Urban Research Center. The research contains examples of supporting the economy of Moscow, making it possible to reduce the economic damage from the imposed restrictions associated with sanctions. The crisis phenomena revealed many new risks for sustainable development, helped to identify “bottlenecks” in the economy and the social sphere, and gave impetus to developing new industries within the framework of import substitution. There is a need for a radical revision of program documents.

Keywords Sustainable development · Anti-crisis measures · Foreign economic restrictions · Import substitution · Offset contract

JEL Classification O10 · O20 · O50 · R50 · R13 · R11

36.1 Introduction

From its inception in the late 1980s to the present, sustainable development has been defined as the leading trend of our time.

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In 2015, “The 2030 Agenda” has been developed. It provides for 17 interrelated global goals based on three pillars of sustainability: economic, social, and environmental. The global goals include the goal of ensuring the openness, security, resilience, and sustainability of cities and towns. The implementation of this goal was determined by several tasks that have criteria of safety, accessibility, environmental friendliness, and complexity. These tasks relate to housing, transport systems and traffic, urbanization processes, global GDP losses due to natural disasters (UN Sustainable Development Goals, n.d.).

The paper aims to rethink the existing methods for assessing the sustainable development of cities (on the example of Moscow) in the framework of identifying the reasons for changing the priorities during external economic restrictions.

36.2 Materials and Method

In a book published in 1991, its author Saskia Sassen substantiated the theory of the “global city”. Based on the analysis of large-scale qualitative changes that occurred in large cities in the 80–90 s of the XX century, the author focuses on the need to study the phenomenon of transformation of metropolis. During this period, the world’s largest metropolises become a place of concentration of the global economy in its various manifestations associated with scale, new architectural solutions, new forms of spending free time, new ways of communication, new forms of economic relations. According to S. Sassen, the metropolis simultaneously includes clearly observed trends of “spatial dispersion” and “global integration” (Sassen, 1991, p. 3).

The most important methodological message of the author is that globalization is not an abstract force standardizing human relations and political perspectives, but a complex process of reshaping space. For this process is characterized not by the replacement of old institutions and structures on new ones, but by the emergence of complex configurations of their interaction within national territories. Thus, the global becomes local in such a way that megacities themselves produce global processes, which makes them a unique object of study as a microenvironment of globalization.

In 2010, the McKinsey & Company Global Institute partnered with the China Urban Research Center to develop the Indicators of Urban Sustainability, a new tool covering five dimensions of sustainable urban growth. These indicators quantify the dynamics of urban growth against criteria of sustainable development: (e.g., degree of satisfaction of basic needs of the population).

In turn, these criteria cover 18 specific factors, which are assessment tools. The authors concluded that the identified directions for 112 dynamically developing cities in China are relevant to the world as a whole (Urban China Initiative, 2010, p. 10).

36.3 Results

Moscow is the only city in the Russian Federation and Eastern Europe that is aimed at creating a comprehensive system for assessing the long-term development of the city that complies SDGs. Currently, cities from eight countries of the world are participating in this project. Moscow became a participant in the project in 2019 (“InvestMoscow”, n.d.-a).

The presentation of the OECD report “Territorial Approach to Sustainable Development Goals in Moscow” took place on December 1, 2021. The report contained seven key recommendations for a territorial approach to the SDGs in Moscow (OECD, 2021, p. 78). In this report, the Sustainable Development Goals are considered as a basis for the improvement and effectiveness of local development programs.

To achieve the SDGs by 2030 on a nationwide basis, the most important task is the need for strategic alignment of goals and priorities through a multi-level dialogue between federal, regional, and local branches of government.

Regarding sustainability criteria, the said document contains a recommendation on the need to coordinate investment priorities and allocate budgets at all levels. Improvement and expansion of public procurement, the use of risk mitigation schemes, and the development of financial market infrastructure can catalyze the necessary investments in sustainable development.

As a tool for implementing sustainable development at the state level, the document provided for the need to define relevant SDG objectives and key performance indicators for 13 Moscow state programs and three comprehensive urban development plans.

To achieve the SDGs, the document outlines the goal of strengthening cooperation. As stated in the report, a universal condition for the implementation of the SDGs is to raise awareness of citizens and change behavior toward sustainable consumption and mobility.

Given the challenges of the last eight years, long-term planning is losing its relevance. The forecast of trends, even for the medium term, has a high error. Global crises, external economic instability, sanctions restrictions, and the epidemiological situation makes significant adjustments to the plans for the sustainable development of territories at any level.

The priorities of Moscow’s social and economic policy have shifted their vector from development goals to the goals of reducing the economic damage from the imposed restrictions. It is planned:

- To save jobs;
- To save enterprises and businesses;
- To help people in difficult situations;
- To create conditions for import substitution (“InvestMoscow”, n.d.-b).

The Moscow city hall has created working headquarters in all areas of life, including trade, economics, construction, and others. Headquarters promptly offer new support measures for Muscovites and businesses, including the following:

- Subsidies for vocational training. Capital companies and individual entrepreneurs can reimburse part of the cost of training their staff;
- The interest rate on concessional loans for enterprises in construction industry has been reduced to 9%. They can get an online loan for any purpose in 1–3 days in 8 key banks.

Moreover, a new service for business has been opened—automatic selection of support measures. The new service combines all support measures in Moscow, both city and federal. With a step-by-step algorithm, one can easily learn about the available measures.

Import substitution requires special attention. Currently, the State Program launched on April 15, 2014, continues to operate successfully in Russia (Government of the Russian Federation, 2014) to develop import substitution for each type of industry until 2024. Billions of rubles are allocated annually for the implementation of the project (e.g., more than 330 billion rubles in 2021).

Moscow enterprises have experience in import substitution of products in such industries as aircraft construction, mechanical engineering, radio electronics, building materials, etc. Additionally, Moscow manufacturers are working to meet the demand for medicines, baby food, light industry goods, etc.

Nowadays, a system of support for the industry is functioning in Moscow, including the assignment of the status of an industrial complex to enterprises, the creation of special economic zones, and the provision of land plots for a ruble per year. Additionally, purchases of equipment and technologies are subsidized, and preferential loans are issued.

The program of offset transactions guarantees the business to purchase its products for state budgetary institutions. Five offset contracts have been signed in the capital with a total volume of private investments of about 13 billion rubles. Offset transactions primarily aim to finance factories to produce medicines, medical devices, and baby food (“Portal of Economic Policy and Property and Land Relations”, n.d.).

In the near future, this practice will spread to the conclusion of offset contracts for all complexes of the municipal economy, which, in turn, will allow them to be signed for the widest possible range of products necessary for state needs. From July 2022, Moscow enterprises will be able to sign offset contracts for services.

A positive example of the implementation of offset contracts in Moscow is the company “Biocad”, with which an agreement was signed in 2017. According to this agreement, starting in 2021, medicines for oncological diseases, including Western analogs, will be supplied to patients in the capital.

In 2019, the city signed an offset contract with the company “Gemamed” to localize the import-substituting production of medical devices for stoma patients. Currently, the construction of the production complex has already been completed, and industrial equipment for producing products has been put into operation. Medical

products manufactured at this enterprise by the company “Gemamed” have been tested in an authorized medical institution and are supplied to residents of the capital.

Two other offset contracts are also being implemented to develop pharmaceutical production of drugs used in the treatment and prevention of endocrine, oncological, and cardiological diseases.

Additionally, antiglaucoma, antibacterial, and analgesic drugs, antidepressants, and neuroleptics will be produced in Moscow. As part of another offset contract, Moscow is already supplying baby food for dairy kitchens.

Another effective measure to support industrial production in the city is subsidizing preferential rates of loans for backbone enterprises.

Thanks to comprehensive support, the industrial production of Moscow is growing every year, outpacing the national level. Thus, in January–March 2022, the volume of the manufacturing industry increased by 27.3% compared to the same period in 2021. Mechanical engineering demonstrates the maximum pace, which increased by 85.1% in January–March compared to last year’s period. Positive dynamics are also observed in furniture production (51.1%). High rates are also observed in the production of drugs—an increase of 24.8% for the first three months (“Portal of Economic Policy and Property and Land Relations”, n.d.).

For example, the products of the pharmaceutical company “Amedart” are available to the consumer while not yielding to foreign analogs. The company has pharmaceuticals for the treatment of cancer, which are supplied to the domestic market at a price ten times lower than the cost of foreign analogs.

The metropolitan enterprise “Trayana” produces conveyors made entirely of domestic materials, including Russian sheet metal. Currently, more than 500 productions in Russia are supplied with them.

Since 2017, the Group of Companies “Moskabelmet” has been producing power cables with heat-resistant insulation, also consisting of domestic materials. The power cables of this manufacturer were used in the construction of new lines of the Moscow and St. Petersburg metros, the reconstruction of roads, and the repair and launch of cable power lines throughout the country.

Nowadays, large-scale production on 3D printers has been launched in Moscow, which is carried out by about 30 companies. For more than five years NPO “CNIIT-MASH” has been developing and manufacturing 3D printers for working with metal powders. The scientific center also introduces technologies for producing import-substituting cryogenic steels and materials for gas turbines and hydrogen energy at Russian plants.

The domestic company SIU System (JSC NPO SISTEM) has practical skills in the dissemination and introduction of additive technologies into production. Among the client companies there are large corporations, trade and industrial companies, leading universities in Russia, and the CIS. So, only for the needs of dentistry, SIU System prints more than 250 thousand models of jaws per year for aligners correcting the bite.

The Russian manufacturer of engineering and dental-certified photopolymers, HARZ labs, began its activities in 2017 in Moscow. A year later, the company launched the production of photopolymer resins in the Moscow Region. Currently,

products from HARZ Labs meet the needs of the Russian market and are delivered to more than 65 countries worldwide. By 2020, the company had developed a large production capacity and entered the association of 3D printing specialists in medicine. In 2021, the company's employees produced 30 thousand kilograms of photopolymer products.

Helping people in difficult situations is also important. New support measures are being taken all the time. The Mayor of Moscow has created a commission to improve the sustainability of the city's economy in the face of sanctions. The city will index social benefits and social assistance, introduce targeted assistance tools, and make other decisions to support the required level of wages for state employees.

Support for the employment of residents of the capital is formed based on the established priorities in the context of sanctions restrictions:

- New jobs are provided for IT specialists;
- Recruitment for a new flow of engineers is open;
- The Design Factory is operating (the project is aimed at developing the entrepreneurial activity of designers, developing solutions for import substitution and preservation and creation of jobs in the creative sector);
- Projects are being implemented to create technology parks (the creation of almost seven thousand jobs is implied), etc.

36.4 Conclusion

SDGs implementation at the level of cities still look uncertain, which cannot but affect the understanding of how the practice of strategic planning will develop in the future.

Simultaneously, the crisis phenomena revealed many new risks for sustainable development, helped to identify "bottlenecks" in the economy and the social sphere, and gave impetus to developing new industries within the framework of import substitution.

There is a need for a radical revision of program documents. Economic sanctions further exacerbated the problems with domestic production.

To ensure the country's technological sovereignty, it is necessary to revise federal government programs and large projects with budget financing and support to avoid inefficient expenditure at all budget levels (Sazonov et al., 2018).

Thus, the urban priorities during external restrictions are shifting toward methods of making operational decisions based on constant monitoring and analysis of changes.

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Chapter 37

Development of Banking Activities During the Decline in the Economic Activity of the Population



Nelli V. Tskhadadze, Tatyana A. Timkina, and Nadezhda K. Savelyeva 

Abstract The paper proves the relevance of introducing new indicators for evaluating the activities of a commercial bank due to the growth of innovative development. Digitalization has firmly entered the life of society, affecting all areas of life. Evaluation of the commercial sector is of fundamental importance when choosing a development strategy and analyzing strengths and weaknesses. The availability of up-to-date methods for evaluating the activities of a commercial bank creates a comprehensive view of the structure of the industry as a whole, as well as a specific bank in particular. The relevance of this research is due to the importance of innovative services in the everyday processes of every citizen's life. Currently, the main emphasis is placed on the financial analysis of the bank; there are no criteria for evaluating its innovative activities. Evaluation of banking products involves a comparative analysis according to irrelevant criteria (e.g., the number of offices, ATMs, and staff's "smiling"). The authors of this research analyze the existing assessment methods and substantiate the relevance and significance of assessing the bank's advantages, considering competitors' services and environmental conditions.

Keywords Commercial bank · Competitiveness · Innovation activity · Digital services · Remote service

JEL Classification L1 · L22 · N20

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37.1 Introduction

The state of the country's banking sector reflects the state of the economy in general. Difficulties of commercial banks are currently associated not only with the unstable economic situation but also with sanctions. Having passed the period of self-isolation with dignity and the transition to remote work channels during the COVID-19 restrictions, banks rapidly began to increase profits. Analytical reports of the Bank of Russia for 2021 indicate an excess profit of 2.4 trillion rubles, which is almost half the profit of the previous year (1.6 trillion rubles). In turn, 2022 can be characterized as unprofitable for Russian commercial banks.

The turning point was the end of the first quarter due to a sharp slowdown of 50% in consumer lending in the first weeks of March. This trend is connected with the tightening of requirements for borrowers due to the rise in the cost of loan products based on an increase in the key rate to 20% per annum. In an unstable economic situation, retaining current and attracting new customers are a top priority for a commercial bank.

37.2 Materials and Method

The purpose of innovations in the financial sector is to form a system of advanced and efficient format for providing banking services. Polyanin and Dolgov state the relevance of digital services, "... the transition of business models to a digital and mobile form or a change in business culture to provide a better consumer experience contribute to the transformation of banks from a classical financial institution into digital organizations..." (Polyanin & Dolgova, 2018). The development of the banking system is strictly connected with a competition. Therefore, innovation is one of the main competitive advantages that provide the bank with a client portfolio and market position. Artemiev notes, "The market development is ensured by increasing the volume of processed information. Further automation of business processes covers all new areas and forces companies and organizations, regardless of industry and size, to process and store huge amounts of information, which forces them to modernize their IT infrastructure" (Artemiev, 2018). According to an infographic study by Juniper Research, the number of digital banking and remote banking users in the world is expected to reach 2.4 billion by 2020 and increase by 54% to 3.6 billion by 2024 (Mamadiyarov, 2020).

Digitalization is a massive transformation, and it is too early to talk about a complete transformation. A tipping point is currently underway, which is accompanied by a partial transition to digital media (paper is important). The financial sector is a leader and pioneer in a high-tech process. The use of Internet resources for companies in all fields of activity can be characterized as a relatively mature and effective tool. Cloud systems are actively used in the work of private companies, including the banking sector.

According to the research center “EY Building a better working world research center,” the theoretical provisions of the study regarding the relevance of using artificial intelligence, mobile applications, outsourcing to reduce costs, etc. are confirmed (EY US Diversity, 2022). Let us consider the types of services that are of interest to the consumer in the context of mobile applications and compare the share of each product by region. We calculated the shares of digital banking, financial services, investment, and traditional banking for each of the presented groups of countries. Mobile applications have different functionality and, consequently, different types of customer satisfaction needs. A comparative assessment of developed countries led to the following conclusions:

- The optimal distribution of mobile applications is presented in Europe. The focus is on three main areas: digital banking, financial services, and investment products;
- North America is characterized by a large share of applications that provide financial services. The population of these regions has bank accounts; customers conduct transactions using standard basic applications;
- The countries of the Middle East are distinguished by a large share of digital banking; this pattern is logical: with a low level of financial services and the complete absence of a traditional bank, the population prefers to use specialized loan applications;
- In Russia, there is a lack of data on digital banking due to the low proportion of the adult population that does not use banking services at all (25%). A high share of financial services may indicate a large list of banking products. The indicators of investment applications are defined as positive because their number is not inferior to similar indicators in the world’s leading countries. When consuming financial services, the population often uses traditional service channels. In general, the analysis has shown the competitive position of Russian banking compared to the banking services of developed countries, which indicates a positive development trend.

Thus, based on the studied world reports on the activities of the Russian banking sector and a comparative analysis of indicators with developed countries, it is necessary to form the main trends in the financial sector. The assessment of the EY world agency characterizes Russian banking as developing and competitive (EY US Diversity, 2022; UNCTAD, 2021). The interest of foreign and domestic citizens is gaining momentum, and the level of confidence is increasing. Cashless payments are becoming more popular than cash payments.

37.3 Discussions

The exchange of data is still a topic of discussion because the creation of resources for the effective and secure exchange of information is one of the main problems. Let us consider the advantages of cloud integration, as well as its types and possibilities (Fig. 37.1).

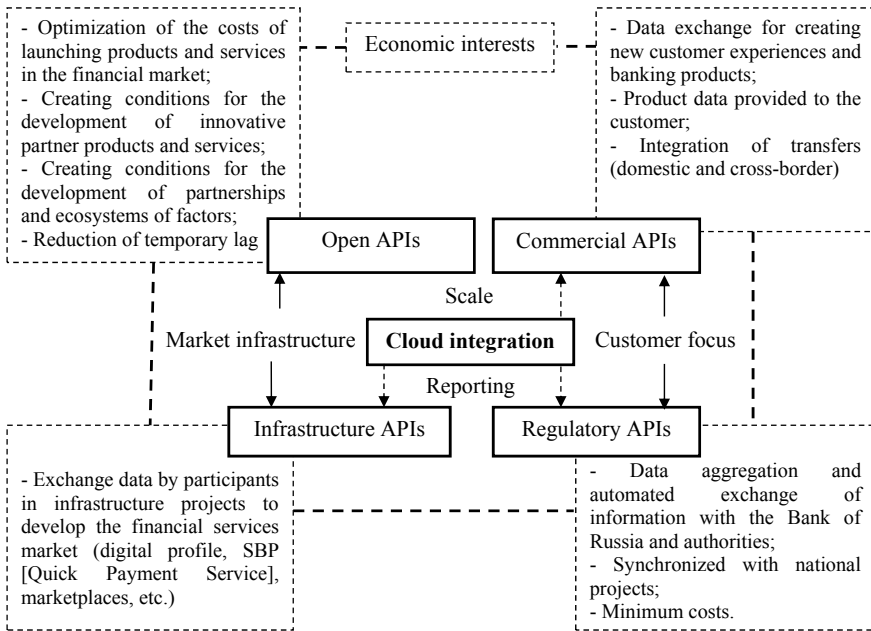


Fig. 37.1 Functionality of remote service and information exchange tools. Compiled by the authors based on (FinTech Association, 2019)

Digitalization forms new tools and platforms for introducing effective business based on Internet technologies. The activity of the banking sector has its own characteristics and difficulties. Cloud technologies make it possible to exchange information and establish new connections between market participants—ecosystems. Figure 37.1 shows the main advantages of digital cloud systems, which act as technological tools.

Based on the studied types of cloud integration, we can highlight the main principles of the operation of digital services in the banking industry. These principles are as follows:

1. **Infrastructural transformations.** In this case, we are talking about raising the level of technological progress and creating conditions for the development of the banking industry and the economy (e.g., marketplaces, Elastic Block Store [EBS], SBP [Quick Payment Service], and remote services).
2. **Regulatory regulation.** Unlike many other areas, banking is subjected to regulation and licensing. In this case, the operation of approved digital work services is assumed.
3. **Scale.** It implies creating a single service for the exchange, analysis, and coordination of data within the industry but also the ability to coordinate joint activities, minimize costs, etc.
4. **Focus on the consumer and the formation of a competitive environment** by providing an expanded list of services.

37.4 Results

The use of innovative tools in the provision of services to the consumer characterizes relevance and competitiveness, as well as the ability to respond to the challenges of the external environment and meet the needs of the client. The popularity of remote services is developing and scaling so rapidly that a competent assessment of the effectiveness of activities makes it possible to assess the position of the bank among competitors and trends with minimal time losses. As the Bank of Russia notes, small- and medium-sized banks suffer significantly in the digital environment due to the expansion of market leaders through ecosystems (Bank of Russia, 2019).

Analysis of methods for assessing the activities of a bank, such as the Servqual, L. V. Tselikov's Methodology, Kromonov's Method, Cash Flow Return on investment, CFROI, Herfindahl–Hirschman Index, Lind Index, E. V. Zakharov's Method, O. I. Mityakova's Method, and R. Fatkhutdinov's Methodology "Stress testing," revealed certain features. First, most of the existing methods consider the bank's efficiency in terms of the final financial results. Simultaneously, indicators of liquidity, profitability, and stability practically duplicate the methods of the Bank of Russia. Second, another distinctive characteristic of the methods is the assessment of the bank's activities in terms of the quality of the services provided. The second group of methods makes it possible to form an assessment of the bank based only on qualitative (non-price) indicators. The basis is not current comparative criteria but conditions that have been important before digitalization and the mass use of remote services. Third, none of the methods place emphasis on innovative products, the use of IT technologies, fragmentation in the banking sector, and the creation of competitive advantages. Thus, creating additional tools for monitoring current trends is a hot research topic. The formation of trends in the context of globalization and the expansion of territorial boundaries has certain advantages. Nevertheless, like any innovative activity, it is accompanied by risks. Let us discuss trends in a banking activity that are not considered in these methods (Fig. 37.2).

Innovative activity has undeniable advantages. It is also subjected to risks because the bank's activities are a priori strictly regulated, and any changes are accompanied by high costs for development, purchase, licensing, etc. Due to the difficult economic situation caused by the consequences of the COVID-19 pandemic, the fall in incomes of the population, and the debt burden of the population and organizations, it is necessary to assess the resource potential correctly.

The rapid change in business technologies has allowed banks to adapt to the situation of limitations and begin to increase turnover by creating new products and services that meet the contemporary needs of the client, as well as creating secure services that ensure public confidence in the new format of work.

Today's business model generates demand for innovative products. The methodology for performance evaluation should be based on balanced scorecards and effectively determined the bank's competitive advantages. Included in the assessment system along with financial analysis, monitoring of qualitative parameters reflects a holistic picture, considering promising areas of development.

Trends	Results	Risks
Competition criteria are determined not by price but by the scale and innovative developments	Development of remote services and digital support; the main criteria are speed and simplicity	The pursuit of digital services can provoke the bankruptcy of banks due to the high costs of implementation
Development of non-banking services on the scale of commercial banks	Formation of marketplaces and ecosystems	Consolidation of banking organizations may lead to an oligopolistic market
Optimization of banking instruments for the implementation of new types of services	Formation of new services, working conditions with the client	Difficulties with the population's perception of abrupt innovations
Simplification of the procedure for obtaining a service	Increasing demand for lending (credit and mortgage)	High leverage, considering debt risks
Development of biometrics	Simplified identity verification procedure, ease of obtaining third-party services through the bank as an intermediary	Risks of data leakage, sale of individual data, growth of cybercrime
Development of the fast payment system	Ease of transfer between clients, simplified system, data exchange, increased competition	The growing fragmentation of the banking sector
Reducing the number of banks	The emergence of new partners and alliances, new types of cooperation	The development of large banks and the increase in the already large scale, the reduction of competition

Fig. 37.2 Trends in the contemporary banking sector, considering prospects and risks. *Source* Developed by the authors

Based on the analysis of existing methods, 32 criteria were formed that reflect the scale and effectiveness of innovative tools for the bank's activities based on the opinions of five experts. Three experts are representatives of banks; the other two are theorists in the banking industry.

Their main task was to analyze the feasibility of including a commercial bank in the performance evaluation criteria. According to experts, some indicators do not reflect innovative tools but are effective marketing tools to improve the bank's rating and attract customers. Thus, all indicators can be conditionally divided into two blocks. The first block characterizes the innovative tools of the bank in terms of creating effective work. The other block characterizes marketing tools, considering trends (Table 37.1).

Table 37.1 Classification of innovative services within the framework of the bank

Innovative work tools	Marketing tools
Availability of chatbots 24/7	Availability of bank communication based on WhatsApp, Facebook, and Telegram messengers
Support for modern payment systems	Application rating in Appstore and Google Play
Formation of biometric data of the client	Number of reviews per app
Possibility of online application	Number of downloads in Appstore and Google Play
Possibility of online registration of the service	Views on YouTube
Remote account management	“Green” banking
Closing an account online	
Marketplace	
Member of the Fast Payment System	
Opportunity to interact with government organizations	
Registration of statements and certificates online	
Registration of electronic bank cards	
Service for the self-employed	
Opening accounts for legal entities	
The speed of resolving the issue remotely	
Opening a deposit online	
Investment products	
Insurance	
Registration of an individual entrepreneur or LLC	
Communication with state services	
International transfers	

Source Developed by the authors

In this case, it is necessary to focus on the first block of criteria because it directly reflects the effectiveness of innovative tools in terms of the bank’s activities in relation to the client. The formation of a comprehensive list of services creates privileges relative to other market entities, commensurate with the market leaders and industry trends.

The relevance of the chosen topic is determined by the problem of evaluating the activities of a commercial bank, considering innovative digital tools used in the work in the conditions of globalization and the spread of the Internet. In these conditions, to ensure timely monitoring of the state of the banking industry, such a methodology is needed that meets recent trends in working with clients in the format of dedicated work and digital tools of commercial bank activity. The availability of

innovative digital banking products is a competitive advantage in conditions of high market concentration. The analysis of such services allows one to timely adjust the activities of a particular bank, considering the external environment (competitors) and internal capabilities. Analysis of the presence or absence of innovative mechanisms for providing products and services to the client forms the level of competitiveness of the bank. Nowadays, due to digital transformation and an increase in the share of remote services, most services provided through Internet technologies are innovative tools for the activities of a commercial bank.

37.5 Conclusion

The analysis has shown an insufficient list of criteria that can comprehensively assess the activities of a commercial bank, taking into account digital service channels. Thus, it is necessary to take a comprehensive approach to assessing the innovative component of the bank, taking into account the analysis of its financial results in dynamics, the price characteristics of the products provided, and the innovative tools themselves.

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Chapter 38

Approaches to the Development of the International Trade Concept



Tatyana M. Vorotyntseva 

Abstract The development of international trade by expanding knowledge, forming an equal legal and technical basis and social and economic conditions, and providing a favorable environment to improve the well-being of society of all participating countries is a priority task of our time. The concept of international trade has been studied for quite a long time. Nevertheless, scientists have not come to an unambiguous result. To develop a fundamental direction for unifying this concept, it is necessary to analyze definitions recommended primarily by international organizations, such as World Trade Organization, Organization for Economic Cooperation and Development. Economists who study international socio-economic relations note that the qualitative content of international trade has changed due to the emergence of alternative new theories of trade, including models of internationalization and globalization. The development and scaling of integration negatively affect the preservation of customs and economic spaces of countries. It is necessary to apply mechanisms of interaction and control of state supervisory bodies and business communities. The basic components of this system are elaborated as a result of the analysis of the conceptual and categorical apparatus in the field of international trade. The authors systematized trends in the development of global economic processes. The authors also formulated approaches to the development of the concept of international trade development, which includes a mechanism for harmonizing the modules of philosophy, digitalization, and policy. In deep contact, these modules involve the reduction of trade restrictions and barriers through legal, organizational, and management measures and the synergy of the three-module relationship. The main aspects of interaction can include the reduction of juvenile barriers, the increase of managerial innovations that bring the parties closer to common goals, the elimination of the effects of subjectivity, and the use of digital and other new technologies in the management of processes. The main provisions of the concept of development of

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international trade are aimed at deregulating world trade and motivating the development of domestic economies and the competitiveness of subjects of foreign economic activity.

Keywords International trade · Internationalization · Multinationality · Globalization · The logic of exchange · production · and innovation · Digitalization

JEL Classifications F02 · F47 · O11

38.1 Introduction

Foreign economic activity is evolving to include more and more of the world's economies in the international economic sphere. The state of the international environment in the twenty-first century can be characterized by gradualism that began with internationalization (Vorotyntseva & Filatkina, 2022). International trade develops according to regular process trends, forming links between suppliers and consumers within predictable variations (Chupina & Chupin, 2022). The exchange of goods makes economic growth possible by excluding all goods and services necessary for consumption from national production. Through international trade, a country can acquire imported, more competitive products needed to accelerate the country's economic development. In this regard, the development of the theory of international trade is predetermined by the need to assess possible future designs of the multilateral trading system and its effectiveness (Wang, 2001).

A special role in the regulation of international trade is played by multilateral agreements operating within the framework of international organizations:

- General Agreement on Tariffs and Trade (GATT);
- World Trade Organization (WTO);
- General Agreement on Trade in Services (GATS);
- Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS);
- United Nations (UN) and others.

The essence of international trade is insufficiently explored. Thus, the legal and scientific literature provides different definitions of the term. The World Trade Organization interprets international trade as “the flow of goods resulting from the cross-border movement of goods” (WTO, 2001). The United Nations regulates the “international sale of goods” (Germain, 1996).

The Organization for Economic Cooperation and Development refers to international trade as “import and export activities” (Herdegen, 2013, pp. 66–67).

In general, the systemic elements of the formation of international trade can be presented as follows (Shuyskiy, 2019):

- (a) Production of goods (services);

- (b) The stages of the life cycle of goods, such as transportation and control of goods at customs borders;
- (c) Entities—multinational companies, suppliers of goods;
- (d) State bodies that control the objects and subjects of international trade (Strelkova, 2018).

In recent years, alternative conceptual approaches have become widespread: globalization, network trade, innovation, and universal competition (Dulsky, 2010; Dulupçu & Demirel, 2009; Kocheva, 2011; Portansky, 2010). The entry of nations into the international marketplace stimulates the growth of economies, provided that there is fair competition.

Tekeeva and Uzdenova (2021) note that international trade is a system of international commodity and monetary relations formed by the foreign trade of all world countries.

The opponents point out that the qualitative content of the concept of integration has changed significantly in recent years (Nenadyshina, 2021).

Until recently, goods were produced by national economic entities. Foreign trade exchange was based on raw materials, foodstuffs, and finished industrial products made in individual countries, respectively, by national commodity producers. The current reality is characterized by the integration of transnational companies with rigid coupling mechanisms, which is due to the need to meet the interests of buyers promptly. However, as an approach to optimize the positioning of the country in the international trade and economic system, it is necessary to increase the production of high-tech competitive goods by domestic producers (Sycheva, 2022).

38.2 Materials and Methods

During the research, the authors applied the methods of synthesis and analysis of the conceptual and categorical apparatus, as well as point modeling of the concept of development of the field of international trade.

38.3 Results

One of the important characteristics of globalization includes innovative production associations that include all stages of the life cycle of goods and services. Transnational companies implement processes for shaping strategies and tactics for promoting and controlling goods. The complex of such processes is a key factor in promoting globalization (Ismail, 2021).

The development and scaling of integration negatively affect the preservation of customs and economic space of countries. There is a need to apply mechanisms of interaction and control of state supervisory bodies and the business community.

Globalization shows the need to actualize the tasks of customs services, competence development, and the correlation of public relations in the area of customs regulation.

According to the author, the regulation of globalization has differences in approaches to the structure of the concept, the rationality and periods of procedures, evaluation of results, prospects, and other things. Economic growth with a proper synergy of national economic complexes of states requires a fundamental basis in the form of science-based and structured industrial policy (Tkachuk & Pak, 2019).

The internationalization process implies the spread of trade activities beyond the borders of countries, economic development outside the geography of countries, and the birth of new markets. Globalization has the goal of taking national business beyond the country’s borders. Nevertheless, in contrast to internationalization, globalization is fragmented on the world stage (Mikhailushkin & Shimko, 2008). The concepts of internationalization and globalization should be analyzed as autonomous entities, despite their interrelationship. According to the author, it is necessary to consider the logical sequence of the development of world connections. The first stage includes globalization with the fragmentation of individual economic activities by country. The next stage is internationalization into transnational companies with the unification into a single complex with a single purpose. Obligations between subjects of the association are established considering the interests of all parties. To achieve the goal, a guiding methodology can be designed with appropriate levels of interaction requirements. Simultaneously, the levels of interaction of the business community in all spheres and stages of trade form a unified approach to determining the value.

The direction of expansion of economic processes based on mechanisms of contiguity is shown in Fig. 38.1.

The exchange logic is based on the work of economic entities of individual countries that exchange information, resources, or means of production. The supply and demand mechanism governing this exchange characterizes the degree of internationalization through indicators such as the volume, quality, and persistence of international trade flows.

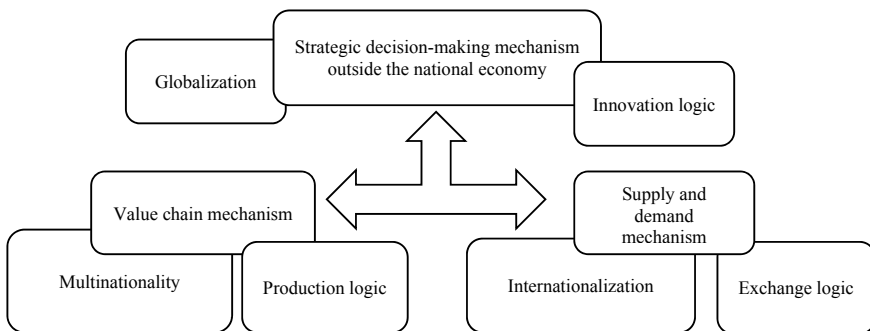


Fig. 38.1 Direction of the expansion of economic processes based on mechanisms of contiguity. *Source* Developed by the author

The production logic is characterized by the regulation of production processes in space and time and the planning and management of material flows. Despite operations in the global space, national companies remain in the status of national companies.

Transnational companies direct financial, raw material, and other flows to foreign economies while coordinating all stages of the life cycle of goods and services.

The logic of innovation involves the creation and movement of value in the global community, but it is the corporations that have the increment. To combine individual elements into a unified system in management, innovations are used to ensure the formation of a strategic role in implementing corporate philosophy.

Transnational corporations are not tightly linked to a single nation's economy. The company's head office and branches are usually located in different countries and use the WTO and WCO models, standards, and guidelines for management purposes.

Processes in the global economy can be examined through three categories of commercial enterprises:

- National companies located in national territories and not internationalized;
- Partially internationalized companies that transcend national borders;
- Mature transnational corporations with a completed process of internationalization.

Thus, on an international scale, the system of regionalization is gaining momentum, new markets are emerging in different regions of the world, and a production and market framework is being created that influences international trade and customs policy.

Adapting global trade patterns to national markets reinforces the gains of globalization for the business community and local markets. According to the author, constructing models of the international economy causes innovations and creates additional approaches to developing international trade.

Building such models requires a systemic analysis of such factors as content, interdependence, algorithms, and prospects for integration using scientific methods and brainstorming sessions that give impetus to the upward movement from globalization to internationalization.

Disproportionate phenomena are known to lead to points of foreign trade tension, which give acceleration and contribute to stabilizing restructuring in all areas of life. In the scientific literature, this phenomenon is called the source of self-development, which is the basic element of evolution.

According to the author, with the rapid introduction of digitalization, the development of socio-economic relations faces the phenomenon of bifurcation, in which there is a clear tendency to develop economic indicators to the smaller or larger side.

It is known that self-development aims to improve the quality of life, including a systemic intellectual pursuit of analysis, processing of the external and internal environment, and implementing new ideas. However, implementing state foreign trade policy is a complex dynamic process of achieving set goals, which involves public authorities and civil society institutions that affect the functioning of international economic actors (Nemirova, 2020).

Table 38.1 shows the fundamental aspects of the development of international trade and the model of governance, including three interrelated modules: philosophy, digitalization, and policy, affecting the removal of barriers to international trade through the application of juvenile, guiding measures, and the development of tripartite relations (Chupina et al., 2021). In a narrow sense, the aspects of the development of the international trade and management model under consideration are aimed at ensuring the implementation of the goals of countries in foreign trade relations with third countries (Vorotyntseva et al., 2018).

Processes of economic integration take place in the presence of differentiation, which is characterized by universality. These are realities that involve the growth of global economic and social policies through new models of economic governance. New governance models can only be built with a new model of cooperation between countries and enterprises.

The interrelationship of the modules presented is based on the following narratives:

- Free trade promotes an international division of labor focused on the ability to produce goods at a lower price with maximum added value and profit, enabling a more efficient global distribution of material and intellectual resources and increasing state and business revenues.
- Agreements concluded by the EAEU countries are binding on the institutions of the EAEU and the member states. The WTO agreement is considered a mixed agreement in the EAEU legislation because it covers the EAEU countries and countries outside the union, so its application is specific.
- WTO decisions are binding on parties to a dispute; they must accept them unconditionally and resolve issues in a flexible manner through negotiations and agreements that respect the rule of law, good administration, and other universal principles, as well as WTO dispute settlement, overseen by the Dispute Settlement Body (DSB) of the WTO General Council.
- Information technology transforms the subject form of products into an informational form: e-commerce technologies simplify the tasks of buyers and sellers by removing uncertainty about time and place. The WCO participates in this module, creates a single intangible base, and customs classification of goods and

Table 38.1 Interdependent modules of international trade development

Philosophy			
Formation of a system of concepts and principles to implement the concept of international trade			
Policy		Digitalization	
Reduction of obstacles in foreign trade activities through juvenile and guiding measures aimed at developing tripartite relations			
The mechanism for removing legal barriers	The development of leadership innovations that unite the interests of the party	Subjectivism in overcoming obstacles	Digitalization of process management

Source Developed by the author

other digital systems that enhance economic development and compliance with market safety and consumer goods. For example, blockchain technology can be a solution to problems such as unnecessary costs, low productivity and efficiency, risk (Vorotyntseva et al., 2019).

- Information technology and digital technology give a chance for the free movement of goods and services, essentially guaranteeing the originality and safety of goods and their delivery to the consumer.

The main provisions of the concept of development of international trade are aimed at reducing the oversight of international trade to ensure the development of the national economy and competitiveness of foreign trade entities.

It is known that the viability of the national and global economy largely depends on the level of probability of using innovative technologies obtained during the development of civilization. The relationship between integration and differentiation will be optimal only when it is possible to relatively change the system's properties.

38.4 Conclusion

The results of the conducted research indicate that the concept of the development of international trade is based on innovative approaches to the management of global economic policy: countries reorient their policies through joint cooperative efforts aimed at creating a model of economic cooperation that considers the interests of trading partners, including the economic security of countries (Zykov & Zykova, 2016).

According to the author, philosophy, policy, and digitalization must become fundamental aspects of the development of international trade. Their interaction can lead to the removal of barriers to international trade through legal, organizational, and managerial measures.

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Chapter 39

Contradictions of Historical Consciousness of Russian Youth in the Conditions of the Formation of Information Society (Based on the Results of Empirical Research in Togliatti)



Irina V. Tsvetkova 

Abstract The research focuses on the pressing problem of the formation of historical consciousness in the formation of the information society. The widespread use of information technology has a contradictory effect on historical consciousness. On the one hand, there is an increase in the availability of sources. There is an opportunity to express different points of view in relation to the evaluation of historical events. On the other hand, means to manipulate individual and public consciousness are widely used. The research aims to investigate the contradictions of the historical consciousness of young people based on theoretical sources of foreign and Russian scientists and the materials of a questionnaire survey conducted in Togliatti in 2011 ($N = 248$) and 2021 ($N = 287$). The methodological basis of the research is the sociological interpretation of the concept of historical consciousness. This makes it possible to consider historical consciousness as a complex structure, which includes knowledge of history and values, beliefs, and emotions associated with the evaluation of historical events. The analysis of the research results shows that within ten years, there have been significant changes in the motivation of the younger generation to acquire historical knowledge. The survey results show a decrease in the importance of patriotic values as a motivation for gaining historical knowledge. There is a contradiction in the respondents' answers between the widespread use of Internet sources and the low level of trust in their objectivity. Many respondents noted that historical information on the Internet is biased and evokes negative emotions. The survey results show a number of contradictions in forming the historical consciousness of young people caused by the predominant influence of Internet sources.

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Keywords Historical consciousness · Russian youth · Sources of information · Contradictions of consciousness · Motivation · Patriotism · Civic identity · Critical thinking

JEL Classifications A14 · J31 · O15

39.1 Introduction

The problem of shaping the historical consciousness of young people is relevant in connection with the need to confront the transformation of values of the younger generation under the influence of Western civilization.

In today's ideological struggle, the values of patriotism are being transformed by nationalist ideas. Speculation on the ideology of patriotism is often used to justify extremist slogans, for example, Drozdova and Rudetskiy (2021).

Falsification of historical knowledge about Russia's past is considered by researchers as one of the manifestations of manipulation of public consciousness to create myths that distort the national consciousness. Chernykh (2021) argues that the historical education of the younger generation acts as a means of countering the ideological influence of Western propaganda.

The research aims to investigate the factors of the historical consciousness of young people, among which Internet sources are of great importance.

39.2 Literature Review and Methodology

Russian researchers consider historical consciousness as a value attitude of the people to their past, which serves as one of the basic foundations of civil and national identity. The historical consciousness of today's youth is characterized by differentiation caused by the spread of values of individualism. The influence of this factor brings the self-determination of the individual in a wide choice of values to the forefront. Suchilina (2020) draws attention to the fact that knowledge about the past is viewed by young people through a system of pragmatic and individualistic attitudes that question the need for continuity of traditions in intergenerational relations.

Along with the concept of historical consciousness, scientific publications use the category of historical memory. Kohan et al. (2021) note that this concept characterizes the value attitude of social subjects to the past, which includes emotions, feelings, and perceptions. Historical memory establishes connections between generations, forming a coherent image of the past.

Researchers point out the differences between the concepts of historical consciousness and historical memory. Historical memory characterizes the generalized representation of collective experience transmitted through pre-scientific forms of knowledge. Historical consciousness is broader in content. Yu. S. Repinetskaya notes that there are several levels in the structure of historical consciousness (2017).

The first level is influenced by everyday perceptions. At the second level, historical consciousness is enriched by emotional and sensual images. The third level includes the formation of historical knowledge, its systematization, and the establishment of a connection with beliefs. The fourth level is characterized by comprehension of information about the past based on theoretical perceptions.

Kalinina et al. (2016) believe that contemporary historiography experiences a crisis, which is expressed in the existence of many concepts. Many of them, lacking scholarship status, claim to possess the absolute truth in interpreting history. The transformation of historical consciousness is also expressed in a change in the system of values that act as its foundation. We are primarily talking about the values of patriotism, which have lost their former ideological significance in today's conditions.

Russian authors note that the historical consciousness of contemporary Russian youth is contradictory. This condition is a consequence of the social risks under which the formation of the younger generation takes place. Russian researchers note that there is a paradoxical pluralism in the assessment of significant historical events of national history in the public consciousness.

Branitsky (2017) believes that the perception of the country's history by young people is characterized by eclecticism, caused by the influence of different models of historical interpretation. Researchers note the impact of information technology on the formation of the historical consciousness of today's youth. Some of the historical material that is published on the Internet is a source of scientifically sound information about the past, while others are influential in the creation and dissemination of myths. As a source of historical information, the Internet has several advantages over other sources. These advantages primary include the simplicity and efficiency of information retrieval, the ability to choose accessible materials, and a wide range of visualization options. However, the use of Internet information sources raises several problems, in particular, the problem of forming a critical attitude to historical information.

Emelyanenko et al. (2021) point out that information from the Internet is perceived by many users as a source of facts that do not require further analysis and verification.

Some authors point out the shortcomings of history teaching in educational institutions. According to Lesina (2018), class hours are insufficient for the formation of systemic historical knowledge in the system of higher education.

Kalinina and Rimskeya (2016) note that the use of information from the Internet as a source of information about history is a factor in parascience. Parascience is characterized by the transference of irrational ways of comprehending reality to the objects studied by history. Parascience is a source of mysteries and riddles of history, which, on the one hand, increase interest in the past and, on the other hand, call the validity of scientific knowledge into question.

The actual problem of contemporary history education is the optimal combination of the scientific approach to historical knowledge and its ideological orientation. Historical consciousness is characterized by mythologization, which is caused by ideological influence and the psychological needs of people to understand the meaning of historical events (Korshunova & Hammatov, 2019).

For the younger generation, the main source of information is the Internet. This opens up a wide range of possibilities in the use of different types of sources, textual and visual. However, the wide availability of contradictory sources brings the problem of shaping the critical thinking of young people and the ability to independently search for and evaluate information to the forefront.

39.3 Research Design

To obtain information about the attitudes of young people to historical knowledge, a survey of students of Togliatti State University was conducted in October 2021.

The research objects are respondents aged 17–25 years old. The survey involved a total of 287 people. This sample allows us to estimate the reliability of the results at the 95% level with a sampling error of 5%. In terms of gender, 39% of the participants are female, and 61% are male. Students of technical specialties are represented by 48% of the respondents, and humanities—by 52%. Among students of technical specialties, 88% are male and 12% are female. Among students in the humanities, the ratio is reversed: 38% are male and 62% are female. This research model allows us to compare with the results of a similar survey conducted in 2011 among the students of Togliatti State University, which involved 248 people.

39.4 Results

At all stages of the historical development of society, historical knowledge is an important means of socialization for the younger generation. History fosters an appreciation for the activities of past generations and respect for spiritual traditions. The basic imperatives defining the educational function of history are severely tested by the fundamental changes that have taken place in Russia in recent decades. These changes have a particularly strong impact on young people. Nowadays, young people, by virtue of the peculiarities of their situation to a greater extent than other generations, are subjected to a transformation of values, including attitudes toward the historical past.

Students were asked the question, “What do you think you need to know Russian history for?” Survey participants could choose no more than five answer options. Most respondents see history as a means of broadening their horizons and erudition. This answer option was mentioned in 78% of the questionnaires.

According to 59% of the respondents, history is a source for learning from past generations. Young men choose this answer option 6% more often than the average for the array: 65% of male respondents chose this answer option. Accordingly, women consider history as a source of experience of older generations less often (51%).

Half of the respondents (50%) described history as a way to engage with the culture of the people. Women choose this answer option in 58% of the questionnaires, 8% more often than in the array. For young men, this answer option is less typical, with 45% of respondents choosing it.

A third of those surveyed believe that history helps to understand modernity better and form moral qualities.

According to 30% of respondents, history fosters a sense of patriotism. Women note this option in 35% of the questionnaires, which is 5% more than for the array. On the contrary, young men are less likely to view history as a means of forming patriotism.

According to 16% of respondents, history is necessary for professional training. The option “other” is marked in 4% of the questionnaires. Additionally, 1% of the respondents found it difficult to answer the question.

Table 39.1 shows the difference in motivations for learning history, which can be seen by comparing the survey results for 2011 and ten years later, in 2021.

The results of the two studies demonstrate that over the past ten years, there has been an increase in the importance of motifs that characterize the connection between generations and the connection with cultural traditions. The importance of the ideological functions of historical knowledge is reduced for the respondents. They are less likely to see it as a means of fostering patriotic and moral qualities.

Survey participants were asked if they were interested in the history of Russia. A third of respondents (33%) answered in the affirmative. The option “partially interested” was chosen by 53% of the respondents. It should be noted that 14% of the respondents are not interested in history. Students in the humanities are 9% more likely to be interested in history, with 42% of respondents indicating this option. Representatives of technical professions are 5% more likely to say that they are not interested in the history of Russia.

Table 39.1 Dynamics of motivations for students to study history 2011–2021 (in % by columns)

Motivations for studying history	2011	2021	Index
Broaden one’s horizons and erudition	44	78	+34
Study the experience of older generations	18	59	+41
Join the culture of the nation	15	50	+35
Better understand modernity	16	33	+17
Build moral character	40	32	–8
Foster a sense of patriotism	39	30	–9
Get professional training	4	16	+12

Source Compiled by the authors

Respondents were asked, “From what sources do you get information about Russian history?” According to 85% of the respondents, they get information about history from the Internet.

According to 59% of the respondents, they use textbooks as a source of information about history. Women by 7% more often highlight this answer option in 66% of the questionnaires.

Feature films with historical themes are a source of knowledge about history for 49% of respondents. Among students of technical specialties, respondents marked this answer option 6% more often than in the array; students of humanitarian specialties marked this option less often—in 45% of questionnaires.

Information about history from professionals (teachers or scientists) is relevant to 38% of the respondents.

One-third of survey participants (33%) cited popular science films as a source on history. Students in the humanities select this answer option 9% more often than the average for the array and students in technical fields 11% less often.

Eyewitness accounts are important to 16% of respondents. Women mentioned this option 6% less often than the average for the array; men, on the contrary, mentioned this option more often.

Archival documents are important to 12% of the respondents. Journals are noted as sources of information about history by only 6% of respondents; newspapers are indicated by 2% of the respondents.

Students were asked to answer the question, “How much do you trust the following sources about Russian history?” The answer was supposed to be graded on a five-point system: 5 points—completely trust, 1 point—do not trust, 0—no answer.

According to the data received, among the sources of Russian history, respondents more often trust the lectures of teachers. The average score is 3.9 points. Women assess the level of their trust in this source at the level of 4.3 points, and men give an assessment of 3.6 points.

Confidence in textbooks on the history of Russia is 3.7 points. The level of trust in textbooks for women is higher—4 points, and for men is lower—3.5 points.

Students trust history websites at the level of 3.1 points. Confidence in scholarly publications on historical topics is rated at the level of 2.9 points. The confidence of women in this source corresponds to 2.9 points. The confidence of women in this source corresponds to 2.8 points.

Blogs of history enthusiasts on the Internet received a score of 2.1. Men are more likely to trust this source, their score is 2.2; the score of women is 1.9.

Humanities students express more confidence than the array average in lectures by teachers on Russian history, textbooks, and scholarly publications. Students in technical disciplines are more likely to express trust in the blogs of history enthusiasts on the Internet.

Although students often use the Internet to acquire knowledge of history, they more often express confidence in such sources of historical information as lectures by teachers and history textbooks.

Survey participants were asked to express their attitudes toward judgments that characterize contradictory information about Russia’s past, which influences the

public consciousness. The opinion that information is becoming more objective was held by 22% of the respondents. Men share this opinion 8% more often than women.

According to 63% of the respondents, information about history is becoming more biased. Women indicate this option 5% more often. It should be noted that 15% of the respondents found it difficult to answer the question.

Opinions on how interest in history changes in the face of the spread of contradictory information about Russia's past divided respondents into approximately two equal groups: 48% of the respondents believe that interest in history is increasing and 40% of the respondents have the opposite opinion that interest in history is declining. The rest of the respondents (12%) found it difficult to answer the question.

Among women, there were 8% more respondents who felt that interest in history was increasing. Men are 5% less likely than the array average to share this view.

Students in technical specialties are 7% more likely to report declining interest in history. Humanities students are less likely to share this view.

According to 32% of the respondents, a great deal of controversy about the country's history builds pride in the country's history. According to 36% of the respondents, this fact leads to bitterness and frustration. The remaining respondents (32%) had difficulty answering the question.

Students in technical specialties are 8% more likely than the array average to believe that conflicting information about history influences people to experience bitterness and frustration. Fewer students in the humanities share this view. Humanities students are 7% more likely to have difficulty answering the question.

39.5 Conclusion

With the widespread use of information technology, Internet sources serve as a source of historical knowledge for most respondents (85%), while lectures by teachers are cited half as often (38%). However, the opposite ratio is observed when analyzing the credibility of sources of information about Russian history.

Faculty lectures have more credibility with students than online publications. The low level of trust in scientific publications on history also characterizes the inconsistency of factors influencing the historical consciousness of young people. Representatives of the younger generation are oriented to the perception of information in a simplified, popular form. Thus, scientific sources about history are rarely used by students and do not arouse much trust.

The high popularity of the Internet is due to the accessibility of information and the possibility of getting acquainted with different positions on current problems of historical knowledge. However, this pluralism of opinions on the Internet is perceived by young people ambiguously. About half of the respondents believe that this increases interest in Russian history. However, the other half of the respondents believe that interest in history is declining.

The pluralism of positions and points of view presented in the interpretation of historical events causes an ambiguous emotional reaction in the younger generation.

About a third of the respondents feel pride in the accomplishments of their ancestors, a third feel bitter and disappointed, and a third find it difficult to give an unequivocal characterization.

It should be noted that two-thirds of survey participants believe that information about Russia's past published on the Internet is not objective.

The research results show that the historical consciousness of the younger generation is influenced by many contradictory factors. This is reflected in the fact that there is a transformation of the motives for obtaining historical knowledge.

Ten years ago, historical knowledge served primarily as a means of shaping moral and patriotic values for students. The research conducted in 2021 showed that the function of broadening horizons and erudition came to the fore in the motives for gaining historical knowledge among students. Simultaneously, representatives of the younger generation view historical knowledge as a means of mastering the experience of past generations, the study of culture, and an understanding of modernity. Thus, historical knowledge is seen by students as a factor of civic and national identity, in which patriotic and moral values are less important than ten years ago.

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Chapter 40

Innovative Activity of a Commercial Bank During the Period of Economic Transition



Tatyana A. Timkina, Nadezhda K. Savelyeva , and Alexandra D. Kryukova

Abstract The research defines the essence of innovation in the context of the activities of a commercial bank. The research is devoted to studying the innovative activities of commercial banks, considering the increasing relevance of Internet technologies. Remote service has become firmly established in the life of a person. The presence of virtual channels of interaction with customers determines the level of competitiveness of a commercial bank. The analysis of the scale, effectiveness, and profitability of the innovative digital services provided is a priority task for the banks and the regulatory authorities. In accordance with the massive spread of Internet technologies in the banking sector, it is necessary to form a list of relevant criteria for evaluating the effectiveness of innovative activities of commercial banks. The authors analyzed the current IT systems that form the basis of the banking sector. The relevance of the research is confirmed by the growing costs of introducing and distributing innovative products. The authors analyzed the methods of evaluating commercial bank activities and justified the need to include indicators reflecting the effectiveness of digital services.

Keywords Digital services · Commercial bank · Remote service · Competitiveness · Innovation activity

JEL Classifications L1 · L22 · N20

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40.1 Introduction

With the growth of Internet services, commercial banks are striving to expand the boundaries of their activities; their functionality increases significantly through diversification by introducing non-banking services and forming bank ecosystems. The traditional bank with the usual type of service and the lack of digital services is no longer competitive. The vector of orientation toward financial transactions is shifting toward a multiservice bank with a large functionality of banking products and non-banking services. The importance of Internet technologies in implementing innovative products is so great that this aspect of activity cannot be ignored in the current assessment of the bank's performance.

The formation of tools for analyzing the effectiveness of a commercial bank will make it possible to assess the rationality and scale of the introduction of innovative products and evaluate the effectiveness of the bank and its competitors.

40.2 Materials and Method

Structural changes in the business processes of national economies cause the processes of globalization. The commercial structure was no exception due to digitalization based on the expanded use of the Internet. Innovative activity in any field is a confirmation of the effectiveness of business structures. With current trends, effective bank operation and competitiveness are provided by innovative activity, which is the main tool and is required in a stable banking market.

The term innovation has been considered by many foreign and Russian scientists. The Latin origin of this term reveals the essence of this concept. Thus, the first syllable "*in*" means "in the direction," whereas "*novation*" implies "change." Thus, if translated literally, innovations are understood as "in the direction of change." Innovative activity has always been implemented in the production process. However, for a long time, it was understood as a completely different process, and the term itself had different interpretations. Thus, in 1954, M. Kaleski defined innovation as an intangible asset for production to grow (Kaleski, 1991). The neoclassical school paradigm assumed innovative activity as a resource in the form of information about the object. In this case, we are talking about open innovations—a new way of solving familiar tasks that pass freely from the source to the population. According to Romer (1990), "the process of redistribution of knowledge is accompanied by monopolistic competition, a kind of overflow of knowledge, which, in this case, is the spread of innovations in economic processes."

40.3 Results

The year of self-isolation became another test for commercial banks. The banking sector adequately overcame the consequences of the COVID-19 pandemic and showed a good basis for effective work. Self-isolation and remote work were a catalyst for the digital transformation of business processes. Adapting existing production processes became a primary goal for absolutely all sectors of the economy. The objectives to achieve the goal were the analysis of growth points considering available resources, efficiency improvement, and search for opportunities to maintain the current position in a competitive market.

The rapid transformation of the banking market has become the focus of attention of all bank managers, the Government of the Russian Federation, and the Bank of Russia. The key issue, in this case, is the analysis of the consequences of organizational and structural changes. The President of the Association of Banks of Russia characterizes the ongoing changes as the implementation of pre-formed changes even before the COVID-19 pandemic: “optimization of the customer path and digital transformation, reduction of the marginality of traditional banking operations and the use of economies of scale, strengthening the influence of the state on various aspects of the banks’ activities and their clients” (EY Global Financial Services, 2021). Digitalization of the banking sector is being built in several directions. According to TAdviser, the most common direction is remote banking systems (RBSs) (TAdviser Business Portal, 2021b).

Data on the number of projects implemented by the financial sector in 2021 are analyzed. The data confirm the current relevance of systems of remote work with the client. An equal indicator of the RBS is an electronic document management system associated with the increased digitization of already available data, as well as the further complete transition to the electronic storage of information. With the increased data amount, the need for computer tools and software products for analyzing and forecasting the activities and needs of the client is also growing. Thus, business intelligence (BI) projects are the third most popular item. Deepening the bank’s orientation toward the client, there is a need for a comprehensive analysis of the clients’ individual desires and behavior, considering digital technologies and the use of Internet services by the consumer. There is an opportunity to evaluate the client’s behavior concerning external factors, which makes it possible to provide the largest possible volume of services (CRM system). When switching to a remote mode of operation, banks strive to minimize temporary losses by using automated banking systems, which makes it possible to partially automate banking processes while saving transaction time and human hours and reducing costs. Thus, we can note banks’ comprehensive approach to the digitalization process.

Any innovative product, its development, and its implementation require high costs and systemic and efficient work. Let us consider the amount of money spent by the leaders of the banking industry on implementing innovative products.

The analysis of financing digital instruments showed that PJSC VTB stepped up the work on introducing digital products in 2019. In its turn, the industry leader

PJSC Sberbank sharply increased the budget for IT technologies from 26.8 to 66.8 billion rubles, which indicates the formation of market trends with the largest share. Subsequently, financing gradually increased without sharp fluctuations; by the end of 2020, Sberbank spent 118.8 billion rubles on digital trends.

When analyzing the activities of PJSC Sberbank over the past few years, the dynamics of the profit structure are apparent, with a quarter accounted for by net commission income. This situation is typical for small banks (up to 26%), but if we talk about larger banks, the percentage does not reach 25%. Considering the structure of commission income, it can be noted that they consist mostly of non-credit activities of a commercial bank. It can include payment and cash services and card transactions. Thus, as of January 1, 2021, the ratio of net commission income to net interest income of Sberbank, the country's leading bank, was 34.37% (TAdviser Business Portal, 2020, 2021a).

Digitalization changes all business processes. The results of already familiar evaluation indicators also require changes considering today's realities. Almost all banks have an indicator over 25%. The factors that influence the growth of commission income may differ; one of them is the growing demand for remote services. A bank's competitiveness is one of the main goals of implementing digital technologies in the production process. Customer needs are based on today's realities, demands, and pace and quality of life. In accordance with the listed criteria, the consumer needs to receive the most profitable product and service, considering the speed of implementation, ease of use, and advantages. In other words, qualitative criteria are used to assess banking activity. Thus, banks seek to expand the list of non-financial services, that is, their competitive advantage. In this case, the vector of development is shifting from attracting customers with favorable prices to a high level of digital services and products. These reasons provoked the development of the bank's ecosystems.

The next criterion for analyzing the bank's activities, indirectly reflecting innovative development, is the cost-to-income ratio (CIR). This indicator determines the efficiency of a commercial bank; the final values should be within 50%. The essence of the analysis is to find the percentage ratio of operating income and expenses of the bank. If the first indicator increases, then the percentage will be lower; that is, the bank copes with its obligations (Fig. 40.1).

The CIR is used to characterize banking activities in terms of the number of costs to ensure operations and the bank's income. The analysis showed the effective activities of PJSC Sberbank, Sovcombank, Raiffeisen Bank, VTB, and AlfaBank. From the point of view of remote servicing, it is necessary to justify the profitability of the operations carried out for the bank itself.

Digital transformation is possible provided that the population is ready for structural changes and the financial system can restructure business processes. Dynamically developing economic processes presuppose a stable, efficient, and competitive banking industry. The formation of favorable conditions for the work of banking organizations is one of the priorities of the Government of the Russian Federation.

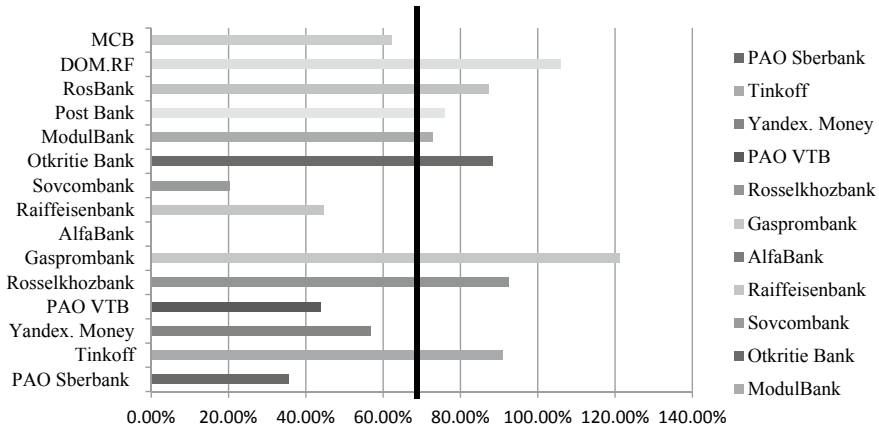


Fig. 40.1 Cost-to-income ratio (CIR), %. *Source* Compiled by the authors based on Bank of Russia (2022)

40.4 Discussion

Remote service creates new requirements for banking activities and, consequently, new evaluation indicators. Innovative tools used in the bank’s work are an indicator of its effectiveness. Traditionally, as mentioned above, three sets are used to analyze the bank’s activities. The first set analyzes liquidity, profitability, and risk tolerance and is called financial analysis. The second set of indicators is based on the evaluation of quantitative indicators, consisting of an analysis of the price conditions of banking products, interest on deposits, loans, exchange rates, etc. The qualitative indicators that make up the third set evaluate internal service and management quality (e.g., working hours, staff competence, number of offices, etc.).

The rapid growth of relevant innovative tools for the effective operation of commercial banks is rebuilding the usual analysis processes. Considering the qualitative indicators (e.g., the bank’s working hours), we can note that if earlier the availability of office centers, their number, and working hours were of significant importance, then now this fact is not a significant competitive advantage over other market participants. Quantitative parameters are also changing. Focusing only on the service’s price, regardless of the list of products, is no longer a priority; the client demands good service.

Thus, Internetization, conditions of self-isolation during the COVID-19 pandemic, and globalization have rebuilt all commercial activities, including commercial banks. In these conditions, the needs of the consumer have become different: new priorities and demand for innovative products have emerged. With increased competition, the bank seeks to expand the list of services by introducing additional services, often not even directly related to financial transactions. Banks become the main and multifunctional centers for carrying out commodity–money

relations, financial services, and products to meet basic needs (i.e., food, recreation, entertainment, purchase of medicines, etc.).

The bank’s activities are changing. The vector of development is changing innovative business processes within the bank (product sales tools) and externally (innovative services and products). If traditional banking is no longer of such a nature, the change of priorities gives reason to believe that existing methods cannot fully assess the effectiveness of banking activities. The analysis of current methods revealed the inconsistency of criteria for evaluating the effectiveness of banking activities.

All methods evaluate narrow blocks of activities, for example, an assessment of financial condition, an assessment of qualitative indicators, or an assessment of digital performance (Fig. 40.2).

The methods presented in Fig. 40.2 consider the bank’s activities in a narrow sense; that is, none of them analyzes the assessment in a complex.

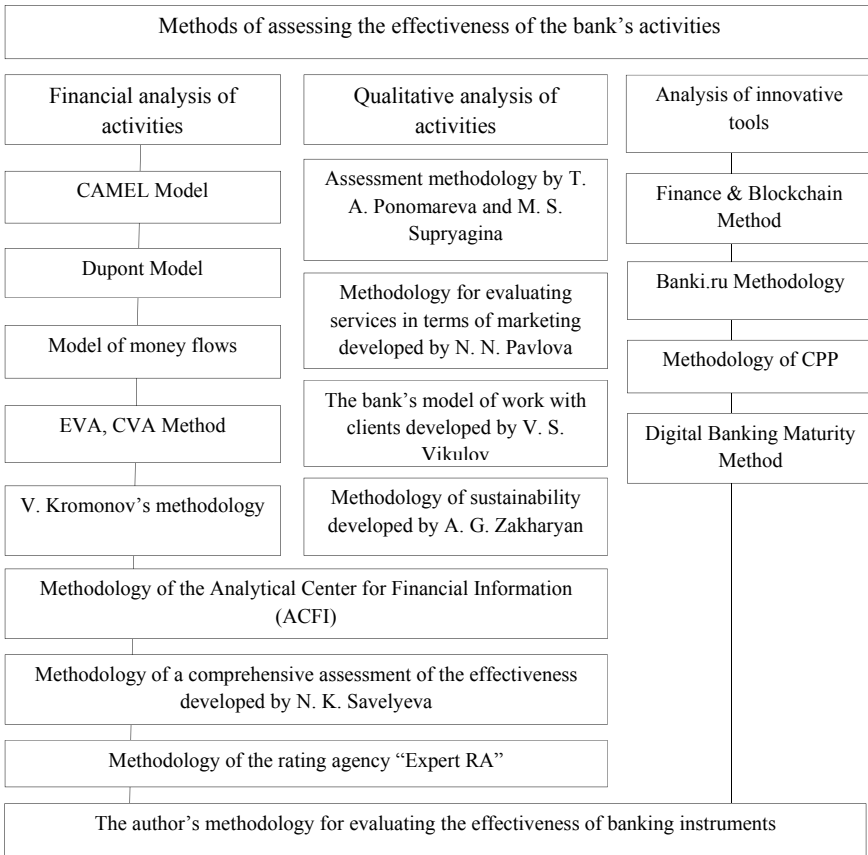


Fig. 40.2 Modern methods of assessing the activities of a commercial bank. *Source* Compiled by the authors based on Timkina (2022)

40.5 Conclusion

The rapid growth of innovative services and the expansion of the list of services form the competitive advantages of the bank. A well-timed analysis of competitors' activities will help competently to form a strategy and determine growth points. When analyzing the effectiveness of market instruments in general or innovative products in particular, it is necessary to comprehensively assess the bank's activities while not excluding financial analysis because it indicates the bank's stable development and the availability of resources for innovative development of activities. The analysis of the price segment of the provided services forms growth points and accents in implementing the bank's marketing strategy. The change in the priorities of price indicators is reflected in the focus on qualitative factors, while the price is also important in choosing a service provider. Therefore, it is necessary to analyze the price segment: the level of deviation from the average values for the industry as a whole or in a certain territory (federal district, region, or municipality). The services and prices analyzed in the second block are considered in the third block from the point of view of innovative implementation tools.

Under these conditions, the goal of a large-scale and universal analysis of the activities of a commercial bank, its place in the banking sector, and development prospects are achieved with a lot of relevant indicators and practical recommendations.

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Chapter 41

Risk and Uncertainty in the Management System of a Commercial Bank



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Abstract Structural and large-scale changes in the Russian economy create a high level of exposure to business risks, which makes the study of risks relevant. The paper defines the essence of risks and uncertainties, identifies their causes and functions, and provides risk classifications. Risks are of an economic nature, closely related to the financial sphere of the bank's activities, affecting its profits and losses. They are probabilistic in nature, depending on various factors and conditions. Also, risks have uncertain consequences. In many cases, it is impossible to calculate losses and scales of negative consequences accurately. Risks are dynamic indicators. Any organization strives to reduce the likelihood of risks, understanding that risks can bring big losses and leave a negative imprint on the financial and economic activities of the company. Ignoring the role of risk in drawing up the tactics of an organization slows down its development, hinders its further activities, and blocks the path to prosperity.

Keywords Economic situation · Laws regulating activities · Local government bodies · Tax system · Partnerships · Planning and management

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JEL Classifications O1 · O3 · O4

41.1 Introduction

Risk is a concept inherent in all spheres of human activity. Speaking about enterprises, it is worth saying that even the most favorable economic conditions do not deny the possible occurrence of risks—any adverse events that may pose a potential danger to the organization. Risk is attributed to economic concepts; it is closely related to the financial sphere of banks. The risk is probabilistic in nature; it depends on the factors and conditions affecting it (Burykin, 2022; Burkaltseva et al., 2022; Rudyk et al., 2022; Makovetsky et al., 2022).

The development of capitalist relations has prompted the emergence of various risk theories, whose proponents have given different definitions and the essence of this concept and investigated the problems of risk in entrepreneurship.

41.2 Background and Methodology

Enterprise risks are any negative events that threaten the bank's operations. These include actions or management decisions that can lead to losses or adverse situations.

In Russian economics, there is no universally recognized theoretical definition of risk; methods of risk assessment for any production situations are poorly developed; and ways and means of preventing and reducing risks are also underdeveloped. However, similar works inspired by unreliable trends have been published recently.

Classical and neoclassical theories of entrepreneurial risk have different views on the concept of risk. In classical theory, the risk is equated with expectations of losses in mathematical terms. Risk is the damage caused as a result of the chosen management decision. Stetsyuk and Petrova have developed the foundations of the neoclassical theory of risks. In this theory, entrepreneurs work under conditions of uncertainty, and their profit is a random variable. They look at two indicators: the expected profit and its probable fluctuations.

The consequences of risk are often presented only as a financial loss to the organization as a result of a wrong decision. Nevertheless, this is not the only way. Risks depend on many factors and conditions, many of which cannot be predicted. Thus, risks entail possible losses and obstacles to achieving results, as well as unexpected profits and favorable consequences (Baigireyeva et al., 2021; Niyazbekova et al., 2021; Petrova et al., 2022; Stetsyuk, 2018).

41.3 Discussion and Results

Many of the causes of risk have already become clear from the definition and its characteristics: inconsistency, alternativeness, and uncertainty. The causes of risk are the sources of their occurrence, and the factors are the conditions that contribute to the manifestation of the causes.

One of the divisions of risk factors is as follows:

- External, which are divided into political, socio-economic, environmental, scientific, and technical;
- Internal, which are divided into indirect (the political and economic situation in the country, the economic situation of the industry, international events, and natural disasters) and direct impact (laws regulating activities, actions of state and local government bodies, tax system, partnerships, competition of entrepreneurs, corruption, and others) (Khalilova et al., 2022; Niyazbekova et al., 2022; Novitsky, 2016; Solodov, 2017).

Internal factors arise during the functioning of the bank. In most cases, their impact is due to shortcomings in planning and management.

Basically, the factors of the internal environment are subjective. These include the principles of the company's activity and strategy, the resources of the organization and the rationality of their use, and the level of advertising.

There are also objective factors of the internal environment: production activity and management. An example may be an unexpected failure of computer systems or power outages (Evmenchik et al., 2021; Nurpeisova et al., 2021).

Generally speaking, the reasons for the risk include the following:

- Various natural phenomena and disasters;
- Conflicting trends and interests;
- Poor information;
- Randomness;
- Spontaneity;
- The impossibility of cognition of the object.

There are two main approaches to the description of risk functions. The first approach consists of four risk functions:

- Stimulating: there is a stimulation to evaluate risk factors in the aggregate due to the need to plan measures that are aimed at reducing the likelihood of occurrence and eliminating the consequences of risk;
- Protective: each organization is forced to search for means and forms of protection against risks;
- Compensating: risks provide additional profit, provided that the risk has a positive effect;
- Socio-economic: market activity and competition make it possible to identify social groups of effective owners in social classes and in the economy—industries

in which risk is acceptable (Gavrilova, 2018, 2019, 2020, 2021; Gorbacheva, 2020).

In the second approach, there are also four functions:

- Innovative: risk encourages the search for new solutions in the organization's activities, which will lead to more efficient production, beneficial for the organization and consumers;
- Regulatory: consists of influencing the decision-making process to reduce the likelihood of the risk or prevent it;
- Protective: manifests itself in cooperation with reliable companies, fulfilling their obligations on time and developing a reliable strategy;
- Analytical: analysis of all factors and conditions for the organization's successful operation (Gavrilova, 2021; Gorbacheva, 2020).

Classifying risks is difficult because there are many different versions based on their nature. Let us look at some of them:

1. By type of danger:

- Technogenic—related to any human activity;
- Natural—related to natural and climatic conditions;
- Mixed—natural factors resulting from human activity.

2. By spheres of manifestation:

- Commercial—organizations related to financial and economic activities;
- Political—related to the political situation of the country and the actions of state bodies;
- Social—related to the social situation of society;
- Environmental—associated with negative situations in the environment;
- Professional—with the fulfillment of their professional obligations.

3. If possible, anticipating:

- Predictable—can be predicted to a certain extent; it is possible to take some preliminary measures;
- Unpredictable—unexpected situations for which there is no way to prepare.

4. By time factor:

- Permanent—exists throughout the existence of the organization;
- Temporary—exists under the influence of factors: may appear and disappear.

5. By the amount of damage:

- Acceptable—practically does not affect the activity of the enterprise, relatively acceptable;
- Critical—cause quite severe damage to the organization;
- Catastrophic—large losses, the possible shutdown of the company;

In fact, savings are a widespread way of creating financial insurance directly for a financial institution. Therefore, in the literature, saving money to cover losses is often called self-insurance.

Variation is the process of dividing invested funds between different investment items that are not directly related.

Separation avoids the share of risk when dividing capital between different types of activities (e.g., buying shares of five different joint-stock companies instead of shares of one company increases the probability of their average income by five times and, accordingly, reduces the risk by five times).

The restriction is the establishment of a system of restrictions up and down, which helps to reduce the level of risk.

In economic activity, restrictions are often used when selling goods on credit, repaying loans, determining the size of capital investments, etc. Other types of sanctions are also applied, for example: temporary (loans, investments, etc.); structure (dividing personal expenses by the total amount); rate of return (setting the minimum level of profitability of the project), and others (Khussainova et al., 2019).

Thus, risk management is based on an objective search and mobilization of jobs to reduce the level of risk and increase income (profit) in an uncertain economic situation. The ultimate role in risk management is to maximize profits with the best ratio of profit and risk.

41.4 Conclusion

Risk classification should be understood as categorization into certain groups in accordance with specific criteria to achieve certain goals. The risk classification system includes categories, groups, types, and kinds of hazards.

Economic theory, which is still generally accepted and classified as business risk factors, has not yet been developed. In practice, there are many different types of indicators; the same type of risk can be expressed in different terms. Problems related to risk identification arise when the information is insufficient or incomplete. There is often a lack of attention to information. Each risk must be identified and assessed separately. Risks cannot be summed up. This will lead to incorrect management decisions.

Risk can be managed using various measures that allow predicting a risk event to a certain extent and taking steps to reduce the level of risk. The effectiveness of bank risk management is often determined by the classification of risks.

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Chapter 42

Investments of the Russian Federation: Trends, Features, and Prospects



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Olga M. Pasyukova, and Yulia I. Slepokurova

Abstract The paper aims to study the dynamics and structure of investments in fixed capital, assess the growth of investments in various sectors of the economy, and analyze the targeting of public and private investments. The methodological basis of the research includes scientific and statistical methods: the method of scientific generalizations, the method of structural and dynamic analysis, the grouping method, and the rating method. As a result of the research, the authors revealed that to improve the investment climate in Russia, it is necessary to ensure the effectiveness of managing many macro and microeconomic processes, including innovative activity in priority areas of material production, constant financing of a new scientific and technical base, ensuring the flow of funds from private investors, and, above all, the large corporate national capital, as well as attracting foreign capital in the form of direct investment, portfolio investment, and other assets.

Keywords Fixed capital · Analysis · Regions · Public investment · Foreign investment

JEL Codes E22 · R53

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42.1 Introduction

One of the factors of the country's economic and innovative development is effective investment activity, which contributes to ensuring high economic growth of the national economy and improving the welfare of society. Investments are considered an excellent additional source of profit, wealth, and other property. They contribute to economic growth and provide a positive financial climate for the country. Moreover, investments are an additional source for developing the national production of goods and services. Specific indicators of the country's socio-economic development depend on the forms, methods, and approaches to organizing and managing investment policy. The stability of the national economy and the development of its potential in terms of the activation of crisis trends and phenomena (particularly, increased competition in the global market, the application of sanctions restrictions, and the construction of market infrastructure that does not comply with the principles of fairness, openness, and honesty) depend on the level of efficiency of the latter.

Therefore, the issues of investment research are of particular importance, related to assessing the effectiveness of using the opportunities available to the country for increasing innovative activity, considering the development trends of various factors affecting the country's investment potential.

Investment attractiveness is of particular importance for every country. The indicators of investment attractiveness are the volume and growth rate of investments in fixed assets. The state of the investment climate in the country and regions, as well as ensuring its attractiveness for investors, depends on the effectiveness of investment decisions made by state authorities in implementing investment policy.

42.2 Materials and Methods

Features and prospects of the investment activity of the country and regions, as well as factors, programs, and decisions that affect its development, are studied in the works of Baldin (2010), Dzhincharadze (2012), Doroshkova and Savchenko (2018), Giraev (2019), Granadillo et al. (2016), Kamaeva et al. (2019), Kim and Voronina (2013), Kotenko et al. (2017), Lee et al. (2017), Maratkanova (2019), Naslunga (2017), Sabirova (2015), Shibina (2020), Serikov (2016), and Shibaev and Marushchak (2018).

The methodological basis of this research includes scientific and statistical methods: the method of scientific generalizations, the method of structural and dynamic analysis, the grouping method, and the rating method. The information base of the research is made up of official statistical reports provided by the Federal State Statistics Service of the Russian Federation (Rosstat, 2015–2020), the Ministry of Economic Development of the Russian Federation, as well as indicators calculated based on these data and information obtained from periodicals and resources of the

Internet. The analysis of the results of these methods was carried out using MS Excel and Statistika.

42.3 Results

According to the research, in 2020, companies of various forms of ownership directed 20,118.4 billion rubles of investments in fixed assets to the development of the socio-economic sector of the national economy of Russia, which is 98.6% compared to 2019 (at comparable prices). Over the past six years, the volume of investments has been approximately the same percentage of GDP annually. Now, it is kept approximately in the range of 16–18% (Shibina, 2020). If we evaluate investments in absolute terms, there is steady growth; relative indicators show a decrease in the level of investment in fixed assets starting from 2018 (Fig. 42.1).

According to statistics for 2020, domestic companies have mastered 88% of all investment funds that were aimed at strengthening fixed capital (against 85.6% in 2019 and 85.1% in 2018). The share of organizations with other forms of ownership in recent years accounts for less than 15% (Table 42.1).

More than 60% of capital investments aimed at the development of the economy are accounted for by organizations of private ownership.

According to the study of statistical data, 51.6% of all investments in 2020 were directed to the construction sector, while more than half of them were directed to the non-residential construction sector. An important indicator is the volume of investment in the active part of fixed assets. Thus, this indicator amounted to 37.4% in 2020, which is slightly more than in 2019 (37%). In 2020, the main source of financing was the own funds of sectoral economic entities (55.2%). Regarding the dynamics

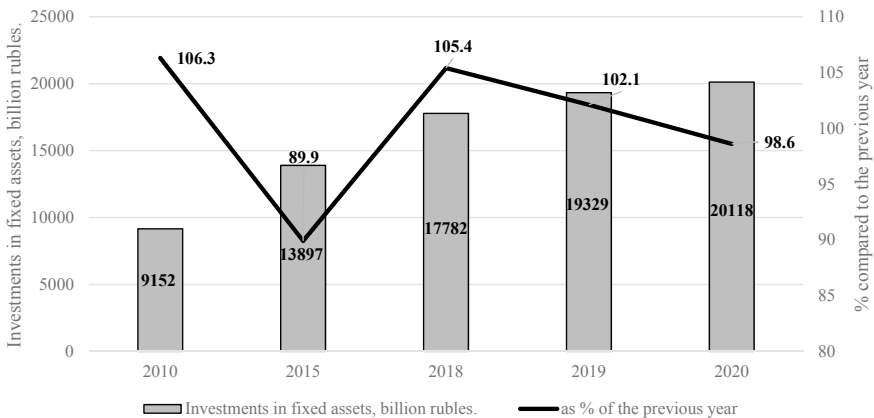


Fig. 42.1 Volume of investment funds allocated to fixed assets in 2010–2020. *Source* Calculated and evaluated by the authors

Table 42.1 Composition of investment funds (structure) allocated to the fixed capital of Russian companies, % of the total accumulated volume

	2020	For reference	
		2019	2018
Total	100	100	100
Including by forms of ownership of organizations			
Russian	88.0	85.1	85.6
– State	17.1	14.8	15.6
– Federal	8.2	8.0	8.2
– Subjects of the Russian Federation	8.9	6.8	7.4
– Municipal	2.9	2.3	2.7
– Public and religious organizations (associations)	0.05	0.05	0.05
– Public corporations	0.9	1.2	1
– Private	61.9	58.9	59.9
– Consumer cooperation	0.0	0.01	0.01
– Mixed Russian	5.1	7.9	6.4
Foreign	5.2	6.6	7.0
Joint Russian and foreign	6.8	8.3	7.4

Source Compiled by the authors

of attracting investments in fixed assets, it is worth noting that this indicator has been declining for four years in a row; in particular, it was 48.7% in 2017 and decreased to 47% in 2018, to 45% in 2019, and to 44.8% in 2020.

The reduction in investments by foreign investors and the outflow of foreign capital is explained by the geopolitical tension in Russia's relations with the West (Table 42.2).

According to the data, 55.2% of all investments in fixed assets in 2020 were accounted for by the own funds of market entities (attracted funds—44.8%, funds of budgets of all levels—19%). The amount of funds allocated from the federal budget in 2020 increased by 1.03% compared to 2019. The amount of funds allocated from the regional budgets increased by 1.85% for the same period.

In 2020, about 70% of all investments were directed to the six most priority sectors of the national economy as shown in Fig. 42.2.

In particular, compared to the previous period, a significant increase in investment volumes was noted in the production of medicines and materials used for medical purposes (+84.8%), healthcare and social services (+56.6%), information technology (+54.8%), publishing (+52.7%), and fishing and fish farming (+38.2%). A decrease was noted in the activities of water transport (−63.8%), production of textiles (−41.2%), air and space transport activities (−35.8%), coal mining (−32.9%), and electrical equipment production (−29.7%).

For a more detailed picture of the development of industries, let us consider the dynamics of growth in investment in various types of economic activity. In 2020, a

Table 42.2 Composition of financial investments in the development of the fixed capital of Russian companies in terms of sources of investment

	2020		In % to the end of 2019
	Billion rubles	In % of the total	
Investments in fixed capital—total	15,445.0	100.00	100.00
<i>Including by funding source</i>			
Own funds	8527.1	55.21	55.00
Involved funds	6917.9	44.79	45.00
Of them			
Bank loans	1534.9	9.94	9.75
Including loans from foreign banks	270.8	1.75	1.99
Borrowed funds from other organizations	750.2	4.86	4.82
Foreign investment	50.5	0.33	0.44
Budget resources	2950.7	19.10	16.20
<i>Including</i>			
Federal budget funds	1338.5	8.67	7.64
Funds from the budgets of the constituent entities of the Russian Federation	1430.1	9.26	7.41
Local budget funds	182.1	1.18	1.14
Means of state off-budget funds	34.0	0.22	0.20
Funds of organizations and the population for shared construction	505.2	3.27	4.27
Including funds of the population	396.0	2.56	3.11
Others	1092.4	7.07	9.32

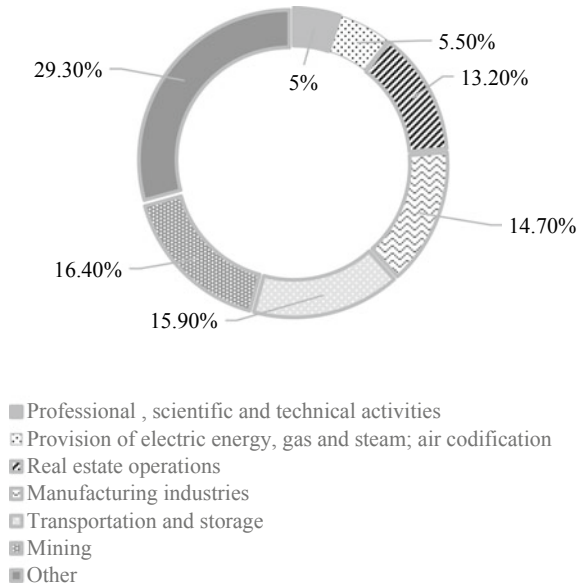
Source Compiled by the authors

decrease in investment growth rates affected several industries (wholesale and retail trade, transportation and storage, hotel and catering activities, real estate and property operations, administrative activities, and related services). The largest increase in investment compared to the previous year affected the education, health care, and scientific sectors (Shibina, 2020).

These figures are fully explained by the consequences of the COVID-19 pandemic in the world. The need to support the economy has led to lower interest rates and rapidly rising inflation, which provoked investors to look for more profitable options for investing money to save capital. These sources are the stock markets and the purchase of investment property.

Almost half of the total investment in fixed assets in 2020 was made in ten constituent entities of the Russian Federation (Moscow—17.7%, Yamal-Nenets Autonomous Area—5.3%, Moscow Region—5.2%, Khanty-Mansi Autonomous

Fig. 42.2 Priority investment areas by type of economic activity. *Source* Calculated and developed by the authors



Area—5.1%, Saint Petersburg—3.9%, Republic of Tatarstan—3%, Krasnodar Territory—2.5%, Krasnoyarsk Territory—2.4%, Leningrad Region—2.3%, and Irkutsk Region—2%) (Rating Agency RAEX, 2019).

Simultaneously, in 2020, the largest share of budget funds in the total volume of investments in the fixed capital of the federal district was observed in the Republic of Ingushetia (84.9%), North Ossetia-Alania (78.2%), Kabardino-Balkaria (72.6%), Dagestan (70.8%), and Sevastopol (79.8%) (Girae, 2020).

On the territory of nine constituent entities of the Russian Federation, the share of budget funds ranged from 2.6 to 9.9%, among them: the Republic of Komi, Krasnoyarsk Territory, Amur Region, Astrakhan Region, Omsk Region, Orenburg Region, Nenets Autonomous Area, Khanty-Mansi Autonomous Area (Yugra), and Yamal-Nenets Autonomous Area (Girae, 2019).

Considering the structure of the distribution of investments from the federal budget, the largest amounts of funds in 2020 were directed to the Central Federal District (26%), the Southern Federal District (17.6%), the Northwestern Federal District (14.2%), and the Volga Federal District (12.1%). These investments were targeted; in particular, they were aimed at developing the social sector and supporting infrastructure projects (Kuznetsova, 2014).

The limit of budget allocations for capital investments allocated for implementing the Federal Targeted Investment Program in 2020 was set at 893.1 billion rubles. As for private investments, for several years, the leading position in the structure of investments has been occupied by the residential and commercial real estate segment. The share of investments in existing facilities was 62% and in plots for development—38%. The highest interest was recorded in the retail real estate segment. The share

of investments in this sector was about 30%. Approximately the same volume was invested in office buildings. The volume of investments in residential real estate reached 24%. Investments in hotel assets also increased several times—from 2 to 6%. The total volume of completed transactions in the Russian real estate market exceeded last year's figures by 41% and amounted to \$4.5 billion.

42.4 Discussion

Nowadays, the investment climate in Russia is negatively affected by the following factors: sanctions imposed against Russia and counter-sanctions imposed by Russia; a drop in effective demand in Russia due to the devaluation of the national currency in 2014, and additional factors that emerged in 2020 (due to falling oil prices amid the COVID-19 pandemic); high volatility in commodity prices (oil), which increases long-term foreign exchange and macroeconomic risks for investors.

The problem of improving the investment climate in the Russian Federation is given great importance. Several measures and guidelines are taken, and programs and projects are developed to improve the investment climate. However, some factors, including inconsistency, lack of interaction, and fragmentation of initiatives, make it difficult to solve the problem of creating a favorable investment environment.

42.5 Conclusion

The research revealed that to improve the investment climate in Russia, it is necessary to ensure the effectiveness of managing many macro and microeconomic processes. Nowadays, to revive the country's economy, a significant influx of funds from private investors is needed, and above all, the large corporate national capital, which has managed to adapt to market conditions successfully and can provide a high return on invested funds. Investments are one of the most important drivers of economic development. The own funds of economic entities, budget funds (federal and regional), and investments attracted within the country and from abroad are important. An important aspect of a high-quality investment policy is the rational distribution of investment funds between regions and sectoral spheres of the national economy, as well as the effectiveness of their use. Investments (direct, portfolio, etc.) are a powerful catalyst for the activation of industrial and production potential, the development of the social sphere, and the implementation of infrastructure projects. This will allow the national economy to be competitive on the world market in conditions of permanent instability, destructive globalization, and escalation of conflict situations against the background of the struggle for resources, production factors, and sales markets.

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Future of Anti-Crisis Approach to the Provision of the Sustainability of Economy, Markets, and Governance in the Context of the Fifth Industrial Revolution (Conclusion)

The anti-crisis approach takes the management of sustainable development of the economy, markets, and enterprises to a new level where this development is systemic and continuous. According to the results obtained in the book, in the Decade of Action, the anti-crisis approach to managing sustainable development provides high results when considering the industry specifics of the markets, using the possibilities of the digital economy, particularly artificial intelligence, as well as the financial capabilities of state and corporate governance.

However, along with the new scientific knowledge, which has deepened the understanding of the essence of sustainable development management, the book has raised new questions related to the uncertainty of the prospects of the crisis approach to managing sustainable development of the economy, markets, and enterprises in the Fifth Industrial Revolution. The essence of this revolution is expected to involve the formation of a human–machine society in which effective communications involving human and artificial intelligence will be established.

In this regard, the crisis phenomena in society and economy 5.0 will be social and technical in nature. This will be a fundamentally new form of crisis of economic systems, which will be associated with unexpected risks to sustainable development and will, therefore, require adaptation of an anti-crisis management approach to it. Additionally, the Fifth Industrial Revolution, which will be accompanied by further automation, will further exacerbate the confrontation between the interests of energy security and environmental protection.

In this regard, economy 5.0 could see a symbiosis of environmental and energy crises occurring simultaneously and reinforcing each other. The anti-crisis approach to managing sustainable development will have to undergo major changes to develop mechanisms to respond to these emerging global challenges. It is proposed to devote future research in the continuation of this book to studying the prospects for improving the anti-crisis approach to managing sustainable development of the economy, markets, and enterprises in the context of the Fifth Industrial Revolution.