The Economic Security Threats of the Region in Terms of Digitalization: Assessment and Development of Leveling Tools

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Abstract The authors substantiate the assumption that in the conditions of intensive digital development, the set of traditional threats to the economic security of the region is supplemented by threats from the digital environment. The authors attempt to systematize traditional threats to the economic security of the region and threats from the digital environment, and also described the peculiarities of their manifestation. The authors propose a methodology for assessing threats to the economic security of the region in the context of digitalization. The chapter proves that the reduction of threats to economic security created by the digital environment requires the formation of an institutional framework for cybersecurity of the digital space; the maintenance of digital hygiene and the introduction of cognitive goal-setting systems; the implementation of regional programs to improve the digital literacy of the population; the development of regional education systems.

Keywords Region · Economic security · Threats · Digital development · Threat leveling · Real economy · Financial sector · Social sphere

JEL Codes O11 · O33 · R11 · R58

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1 Introduction

Currently, all economic entities of the regional economic system (individuals, households, enterprises, public administration bodies) are somehow included in the information space. They use a whole range of digital technologies to organize interpersonal interaction, work with contractors, develop internal communications, automate production processes, as well as manage various subsystems. Digital technologies make it possible to make their activities faster and more mobile, to get the maximum amount of required information in a short time, to take into account all the many factors of the external and internal environment to improve the quality of decisions made (Akatkin et al., 2017). For example, in 2020, more than 4.54 billion people worldwide had access to the Internet, which is 7% more than in 2019 (Web-Canape, 2020), 89% of companies have embarked on a digital business strategy (Forbes, 2018). E-government systems in many countries have long passed from the stage of formation to the stage of transformation of relations between government and citizens, enterprises and non-governmental structures using digital technologies, and further contextualization (Pavlyutenkova, 2019). As a result, the usual threats to the economic security of the region are supplemented by new ones created by the digital environment (Kapustina et al., 2020; Karpunina et al., 2020; Molchan et al., 2019).

In the context of the COVID-19 pandemic, the importance of the digital sector and information technology has increased significantly (COVID19, 2020). This made the problem of maintaining the security of the regional economy and society even more urgent.

It is necessary to develop effective tools for their identification at the time of occurrence and timely leveling to prevent emerging threats to economic security and reduce the amount of damage from their implementation. However, the solution to this problem is complicated by the lack of statistical information and the limitations of quantifying the probability of threats.

2 Materials and Methods

The purpose of the study is to reveal the factors of threats to the economic security of the region at the stage of digital development, as well as to find effective tools for assessing emerging threats and leveling them.

Research objectives: (1) systematize the economic security threats of the region at the stage of digital development; (2) propose a methodology for assessing threats to the economic security of the region in the context of intensive digital development; (3) offer tools for leveling threats to the economic security of Russian regions in the context of digitalization.

Research methods: analysis of scientific literature, comparative analysis method, graphic method, systematization method, method of economic and statistical analysis, system approach.

3 Theoretical Basis of the Study

The theoretical basis of the research is the publications of scientists on the issues of ensuring the economic security of the regional economic system, as well as the systematization of threats at the digital stage of development. Huber et al. (2010) argue that economic security is a characteristic of the state of an economic system with a certain level of stability and the ability to prevent emerging threats to the well-being of society The achievement of a state of economic security is influenced by many factors of a financial, political, economic, and social nature (Edelev, 2007; Kalinina, 2010; Kremlev et al., 2007).

In terms of intensive digital development, the range of traditional threats to economic security is expanding due to the emergence of new threats. And these are not always threats of an informational nature associated with data leakage and the development of cybercrime schemes (Karpunina et al., 2020). These are also social threats associated with increased social inequality due to different access to information technologies, rising unemployment due to automation of production activities and management processes (Kapustina et al., 2020). Digital technologies contribute to the development of the "on-demand economy", which leads to the reduction of small businesses and brings real economic damage to the economic system of the region (Chebotarev et al., 2016; Gorulev, 2018; Voronkov, 2019).

4 Results

The author's approach to structuring the economic security of the region in the context of digitalization involves the identification of two types of threats traditional economic security threats of the region and threats generated by the digital environment (Fig. 1).

The traditional economic security threats of the region can be attributed to the threats that arise in the real sector of the region's economy, in the monetary and financial sphere, as well as in the social sphere (Kupreschenko & Fedotova, 2010; Lomachenko, 2016; Orlova et al., 2016; Shatrovskaya, 2016) (Fig. 2).

In our opinion, the assessment of traditional threats to the economic security of the region can be based on a generally accepted methodology, which includes the following stages:

1. formation of a system of indicators of economic security (the real sector of the region, the monetary and financial sphere of the region, the social sphere of the region);
2. determination of their threshold values;
3. reduction of indicators to a dimensionless form (rationing);
4. calculation of the integral index of economic security of the region and comparison of its value with the integral threshold equal to one (Khasanov & Korableva, 2019).

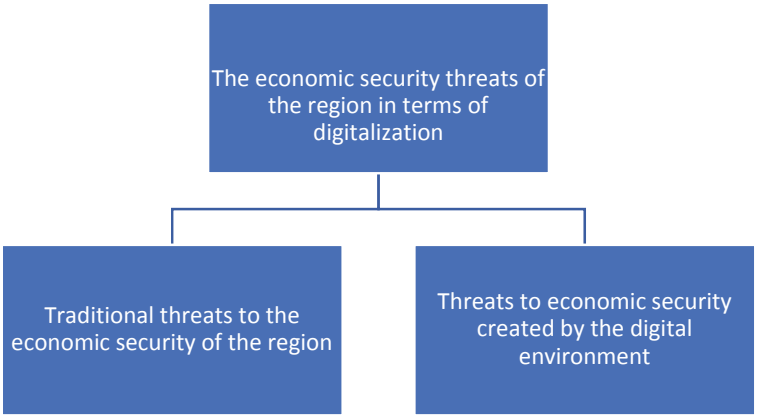

Fig. 1 Systematization of the economic security threats of the region in terms of digitalization. *Source* Compiled by the authors

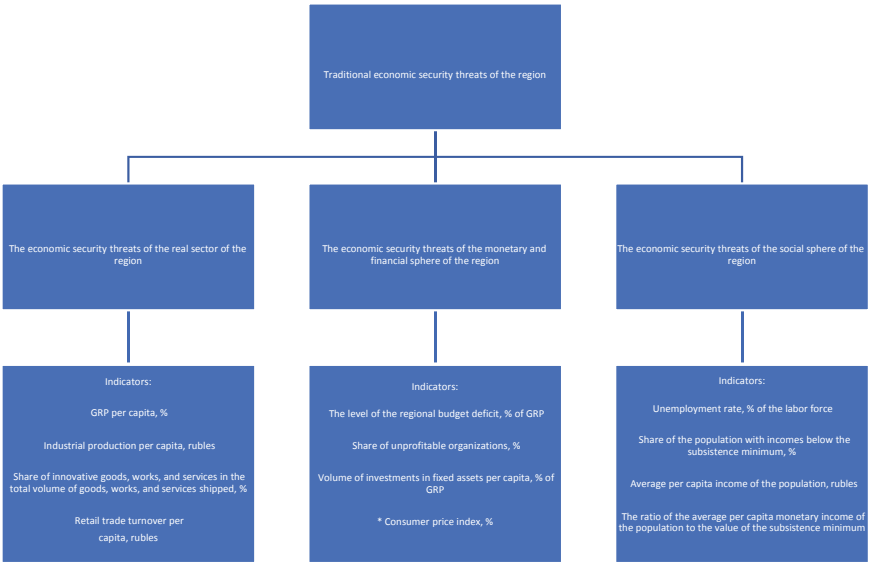

Fig. 2 Indicators for identifying traditional economic security threats of the region. *Source* Compiled by the authors

As part of the implementation of this methodology, we will analyze some indicators of the economic security of Russian regions and their threshold values (Table 1).

The evaluation of the results of the analysis is based on the comparison of the achieved values of the indicators of economic security of the regions with their threshold values (Krivorotov & Kalina, 2010; Mityakov et al., 2013; Tatarkin &

Table 1 Regional economic security indicators and their thresholds, 2019

Indicator	Threshold value	Actual value for 2019
Economic security of the real sector of the region		
Gross regional product per capita, rubles	Not less than the average for the Russian Federation	507,794
The volume of industrial production per capita, rubles	Not less than the average for the Russian Federation	402,142
The share of innovative goods, works, services in the total volume of shipped goods, works, services, %	Not less than the average for the Russian Federation	7.2
The degree of depreciation of fixed assets (%)	No more than 60	60
Retail trade turnover per capita, rubles	Not less than the average for the Russian Federation	203,029
Economic security of the monetary and financial sphere of the region		
The level of the regional budget deficit, % GRP	No more than 3	3
The share of unprofitable organizations, %	No more than the average for the Russian Federation	31.9
The volume of investments in fixed assets per capita, % of GRP	No more than 25	25
Consumer price index, December to December last year, %	No more than the average for the Russian Federation	102.5
Economic security of the social sphere of the region		
Unemployment rate, % of the labor force	No more than 4	4
The share of the population with incomes below the subsistence minimum, %	No more than 7	7
Average per capita monetary income of the population, rubles	Not less than the average for the Russian Federation	31,422
The ratio of the per capita monetary income of the population to the subsistence minimum	Not less than 3.5	3.5

Source compiled by the authors based on Federal State Statistics Service of the Russian Federation, (2020), Khasanov & Korableva, (2019)

Kuklin, 2007), as well as country averages. Exceeding the threshold values for positive indicators and finding the values of negative indicators below the threshold indicates the appearance of signs of a decrease in the economic security of the region. The choice of the normalization method determines the dynamic range of the results visualization. The most adequate method of normalization is proposed in the work of Mityakov et al. (2013), where the power dependence allows to ignore insignificant details in the case of a significant excess of the threshold values by the indicators. A

Table 2 Information for interpreting the results of a comprehensive (integrated) assessment of economic security in certain areas of the region

The value of the integral index of economic security	Conclusion
I < 1	Unstable (crisis, pre-crisis) state of the sphere under the study
I ≥ 1	Safe state of the sphere under the study

Source compiled by the authors based on Khasanov & Korableva, (2019); Mityakov et al., (2013)

comprehensive (integral) assessment of security in certain areas of the region is based on the calculation of the integral index as a weighted sum of normalized indicators:

$$I = \sum_{i=1}^{n} x_i * w_i \quad (1)$$

where x_i—normalized indicator value X_i, w_i—a weighting factor that reflects the degree of significance of indicator X_i, i = 1, …, n. The conclusion about the state of the studied area of the region is formed based on the data presented in Table 2.

The intensification of digitalization becomes an objective factor in the development of the regional economic system, which brings unconditional benefits for the territory and expands the available opportunities. Numerous studies point to the benefits of digitalization for the development of various sectors of the regional economic system. For example, Molchan et al. (2019) attribute to the benefits of digitalization an increase in labor productivity in the real sector of the region's economy due to the introduction of more efficient technologies and systems for automating production activities. The digitalization of financial services creates conditions for the expansion of the consumer segment and the number of financial service providers, as well as a multiple acceleration of operations and an increase in the quality of services provided. However, the unconditional benefits of digitalization hide some threats to the safe functioning of the region (Fig. 3).

Threats of an information and technological nature in the region arise due to the increase in the number of enterprises operating in digital form and using digital technologies to optimize production and sales processes, as well as the strengthening of the information openness of the regional space caused by the expansion of access to the Internet. In terms of digitalization, the probability of information leakage and the development of various forms of cybercrime are growing (Karpunina et al., 2020). The high level of dependence of enterprises on digital technologies creates conditions for the emergence of information failures in the economy of the region (Table 3).

The data presented in Table 2 indicate an increase in access to the Internet and the use of digital technologies in the regions of Russia, and, therefore, a growing likelihood of threats of an information and technological nature. The leading regions

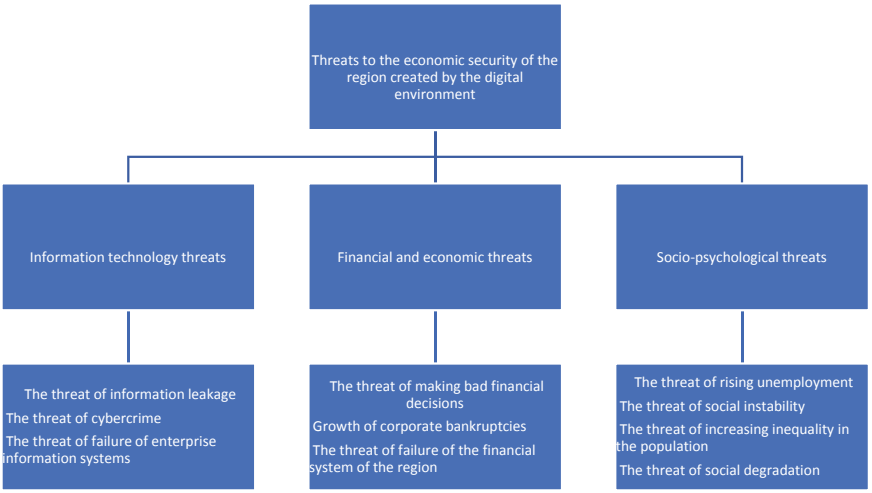

Fig. 3 Systematization of threats to the economic security of the region created by the digital environment. *Source* Compiled by the authors

of Russia in terms of the dynamics of digital development indicators are the Central Federal District, the North-Western Federal District, the Volga Federal District, and the Ural Federal District. According to the National Coordination Center for Computer Incidents, in 2018, there were more than 4.3 billion information attacks on the critical information infrastructure of the country (Rg, 2019). The targets of the attacks were objects of the financial sector—38% of the total number of attacks, public authorities—35%, the defense industry—7%. The regions of the Russian Federation with the highest growth rates of registered crimes committed using ICT technologies are St. Petersburg (462.7%), the Jewish Autonomous District (192.9%), Moscow (181.3%), the Republic of Ingushetia (180%), the Republic of Buryatia (167.5%) (Cybercrime & cyber conflicts: Russia., 2021). In general, regional-wide information technology threats can cause the under-production of GRP (Karpunina et al., 2019).

Financial and economic threats are realized in the form of increasing factors that lead to the bankruptcy of enterprises, failure in various elements of the financial system of the region. Such threats arise due to the unjustified use of digital tools to the detriment of traditional ones, and the uneven distribution of market power between financial service providers and consumers, leading to distortions in the structure of the regional financial system. The uncertainty of environmental factors and the reduction of business income of the population (as a result of the lack of adaptation to digital conditions in business structures) can lead to an increase in the number of unprofitable enterprises and a decrease in budget revenues in the region (Salikov et al., 2019). Ackerman et al. (2015), Brynjolfsson and McAfee (2014) note the trend of job polarization and the emergence of the threat of ousting only low-and medium-skilled professionals from the labor market, their skills are becoming insufficient to

Table 3 Indicators of access and use of digital technologies in the regions of Russia, 2013–2019

Region	The number of broadband Internet subscribers per 100 people of the population		The population using the Internet, as a percentage of the total population		The share of organizations using the Internet, % of the total number of surveyed organizations of the relevant subject of the Russian Federation		Organizations using cloud services, % of the total number of organizations in the business sector	
Years	2013	2019	2013	2019	2013	2019	2013	2019
Russian Federation	16.53	21.7	60.7	88.6	88.1	91.2	18	27.1
Central Federal District	18.73	26.0	61.6	90.9	87.9	93.1	20	31.6
North-Western Federal District	20.08	23.9	71.7	89.5	92.3	92.1	20	27.7
Southern Federal District	12.97	17.7	57.7	87.2	85.9	91.8	17	26.1
North Caucasus Federal District	5.17	8.6	38.8	88.6	89.2	77.7	20	18.6
Volga Federal District	18.2	22.0	60.3	88.5	88.7	92.8	16	26.3
Ural Federal District	18.66	24.6	65.4	87.9	91.2	91.7	20	28.6
Siberian Federal District	14.83	20.3	60.5	85.1	84.7	89.4	18	22.7
Far Eastern Federal District	13.47	17.5	59.4	87.0	86.0	91.1	16	23.2

Source compiled by the authors based on Federal State Statistics Service of the Russian Federation, (2020), HSE, (2020)

compete with digital technologies, artificial intelligence, and automated information processing and management decision-making systems. However, not all researchers recognize this threat to economic security. For example, Fossen and Sorgner (2019) conclude that the ongoing digital changes do not cause a decrease in employment in all professions, and the creation of digital platforms can contribute to the growth of non-standard employment, an increase in the number of short-term, part-time or low-paid jobs. This type of threat leads to a reduction in the company's income and aggregate demand, and as a result, a deterioration in the well-being of the region's population. In turn, this leads to an increase in emotional experiences associated with the fear of future job loss, loss of social status, and personal degradation, and it becomes the cause of another risk of economic security—the risk of social instability as a result of intensive digital consumption (Molchan et al., 2019). This problem was

even more urgent for the Russian regions during the COVID-19 pandemic when the pace of development of digital technologies and the expansion of online services showed accelerated dynamics (COVID19, 2020). In Russia, as of April 2020, 82% of residents were involved in the digital environment, and 71% of them used the Internet daily, mainly to communicate with their loved ones and get news about the country and the world. The role of online services in such industries as trade and finance has significantly increased (Malysheva, 2020). Russians began to spend significantly more time (up to 19%) in social Internet services, and among young people, this figure was noticeably higher and reached 27% (WCIOM, 2020).

The assessment of the described threats to economic security created by the digital environment is currently difficult due to the lack of regional statistics reflecting these incidents. Nevertheless, at the state level, the assessment of such threats to economic security is possible using statistical methods of variance (formula 2) and mean square deviation (formula 3).

$$\sigma^2 = \left(\sum_{i=1}^{n} \left(x_i - x_{(mid)i} \right)^2 / n \right. \tag{2}$$

$$\sqrt{\sigma^2} = \sqrt{\left[\left(\sum_{i=1}^{n} \left(x_i - x_{(mid)i} \right)^2 / n \right] \right.} \tag{3}$$

where σ^2—variance; x_i—value of the ith indicator, $x_{(mid)i}$—the arithmetic mean of this sample; n—volume of collected empirical values; $(x_i - x_{(mid)i})^2$—the square of the residuals; $\sqrt{\sigma^2}$—mean square deviation.

The indicators of international ratings can serve as a basis for assessing threats to economic security from the digital environment. For example, the Business Digitalization Index (HSE), the Cybersecurity Index, the Human Development Index (HDI).

5 Conclusion

The most effective ways of leveling the traditional economic security threats of the region are:

1. implementation of measures to improve the efficiency of the use of natural, material, financial, and intellectual factors in the region;
2. development of a system of financial incentives for production growth and increasing the income of regional enterprises;
3. creating an enabling environment for human development for the benefit of the region;
4. development of interregional cooperation to meet the production and social needs of the region.

Reducing the threats to economic security created by the digital environment requires the implementation of the following priority areas of state policy:

1. formation of the institutional base of the cybersecurity digital space;
2. maintaining digital hygiene and implementing cognitive goal-setting systems implemented at the level of large companies in the region and the regional management system, related to the implementation of protection systems against external intrusions and the distribution of access rights to information (Gorulev, 2018);
3. implementation of regional programs to improve the digital literacy of the population;
4. development of regional educational systems to create opportunities for retraining specialists to prevent their mass displacement from the labor market.

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