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ASSESSING THE IMPACT OF INFORMATION SPACE ON ECONOMIC SECURITY IN THE REGION

The article deals with the relevant issue of the influence of information space on the current state of economic security of Russian regions. In the modern society, the information space is an objectively existing phenomenon, which performs a number of constructive and destructive functions and has a direct impact on the economic security of regions. The research of Russian and foreign scientists in the field of information theory, philosophy, mathematics, economics have become the theoretical and methodological basis of the paper. Transition to the information society has changed the status of information resources. The analysis of the statistical data of authoritative Russian and foreign sources has allowed us to reveal the main tendencies of modern society. Information processes have the most significant impact on such areas as health and safety, education, science, culture, socio-political sphere, as well as the quality of life. However, threats to economic security are under transformation. Therefore, there is a need for changes in the assessment of the economic security of regions. We proposed a technique for the evaluation of economic security based on the comprehensive assessment of several groups of indicators. The number of groups and a set of estimated indicators can be defined by experts. The results of the proposed method are demonstrated on the example of eight Federal Districts of Russia. The authors used official statistics, since they covered different spheres of citizens throughout the whole state territory. The assessment includes 32 indicators distributed into nine groups: economy, food, information resources, etc. Calculations have revealed the regions with lower security level — Siberian and North-Caucasian Federal Districts. The proposed methodological approach and quantitative estimates can be used to predict and improve economic security management in regions.

Keywords: information resources, informatization, information space, development indicators, quality of life, comprehensive assessment, group of indicators, rank region, the security level, economic security, assessment methodology

Introduction

Modern information society dictates new ways and forms of the development of a traditional economy based on information and communications technology (ICT) in order to manage production and business processes, cooperation with contractors, promote products and services to the market and carry out financial operations as well. Virtual space draws investors' attention, thereby, becoming a medium of economic activity and a source of tangible profit.

Information, being an intangible resource, is surrounded by particular tangible facilities such as computer machines, mobile devices, information and communication nets, modern gadgets, etc. The economy of the information society is based on mutual reinforcement of tangible and informative components [1].

Worldwide companies which use IT-technologies in their activity perform rapid development and provide more opportunities for employment. According to analysts of the Boston Consulting Group (BCG), a share of Internet economy in GDP of developed countries increased by 1.2 p.p. in 2016 and was equal to 5.5 % in comparison with 2010. In Russia, that share was 2.8 %[1], whereas the growth of online market in the country accounts for 18.3 % annually[2].

The main features of modern economy are determined in the book "New Rules for the New Economy" by the American economist K. Kelly:

— globality of the changes taking place;

— handling the intangible benefits: ideas, information, relationships;

— close intertwining and interaction of particular segments of the new economy.

Kelly considers that communications are not just a sector of the economy but the economy itself [2].

Development of information technologies, increase in the demand of population for information services, the emergence of global information and telecommunication systems led society to a new kind of economy. It includes the production of computer machines, means of communication, the

[1] The Internet Economy in the G20. BCG Report, 2016. Available at: https://www.bcg.com/documents/file100409.pdf (date of access: 22 November 2017).

[2] Russian Internet portal and analytics agency TAdviser. Available at: http://tadviser.ru (date of access: 12 May 2017). (In Russ.)

supply of information services and products. The role of the information economy is essential, since it influences all the aspects of social development [3].

The general trends in the development of information society, however, reflect that these processes open up both the new opportunities and the new challenges. A high level of informatization of economic branches makes society dependent on the security level of information and telecommunication technologies that results in the reassessment of economic security factors and risks. Threats are transformed. New emerging metrics of economic security require the improvement of methods for assessing the impact of information space on the level of economic security.

The opinions of scientific communities were significantly changed as they were determined by the level of economic development and the features of political situation describing a certain historical period. In general, the processes that have taken place in the history of studied economic security issues forced scientists to investigate the patterns and trends of the modern world more closely.

Due to identified relevance, the aim of the research is the formalization and assessment of the impact of information space on the economic security in regions.

Theory of the issue

The theoretical and methodological base of the research is presented by theories of related subject areas, mainly by information theory, mathematics, philosophy, economics. The basis of information theory has its roots in the works of C. Shannon [4], N. Wiener [5], A.P. Ershova [6], I.B. Novikova [7], R. Hartley [8, pp. 5–35], V.M. Glushkova [9]. Much attention was devoted to the question of the research of information issues in the economy in the works of the American economist G. Stigler [10, c. 53–54].

Economic science regards information as one of the key resources. As Yu. M. Kanygin states, “Information resource like an enzyme links energy, labour—activates material factors from their latent condition” [11].

Russian legislation determines information resources as selected documents or a set of documents in information systems (libraries, archives, funds, data banks and other information systems that store information)[3].

T.I. Stavtseva views information resource as a new factor of production and as a form of direct involvement of science in production process [12].

V.L. Inozemtsev notes a fundamentally different nature of information resource: in comparison with finite resources such as capital and land, information resources are able to boundlessly regenerate and accumulate; capital and land have a limited number of users while information resources can be used simultaneously by any number of them [13].

T. Stewart emphasizes in his works the property of information inexhaustibility [14]. During the process of information consumption by society and its production use, the stocks of information resource continue to grow due to its constructive changes, developing experience and specific application.

Any scientific direction forms a special terminology with the system of consistent concepts that reflect the content of a specific field of knowledge. Within the system, terminological relations are built between concepts due to the ontology and essence of given subject area. The emergence of new concepts leads to the revision of terminological relations system. A special role is assigned to terms of interdisciplinary significance that require careful study and harmonization. "Information resources", "information", "information space" are among them.

For the first time among Russian scientists, the term of "informatization" was used by the experts of human sciences. In 1987, the Soviet philosopher A.I. Rakitov defined informatization as a progressive increasing use of information technologies for the production, processing, storage and transmission of information, a process in which technological, economic, political, cultural and social mechanisms are combined together [15].

Academician A.P. Ershov interpreted the term "informatization" in his works as an organization of society's life when the use of reliable, comprehensive, and timely knowledge lies at the basis of all socially significant types of human activity [16].

The Russian scientist A.D. Ursul treats the concept of "informatization" as a system-activity process of information acquisition. He considers information as a resource of management aimed to create an information society and further progress of civilization. The scientist notes in his works

[3] On information, information technologies and protection of information. Federal Law No. 149-FZ of 27 July 2007. Available at: http://www.pravo.gov.ru (date of access:16 December 2017). (In Russ.)

that information and communication technologies are instrumental support of human activity but informatization should be socially oriented [17]. The image of information society was reflected in the works of the Japanese scientist E. Masuda [18].

Informatization of society, as well as use of ICT in all spheres of human life, has led to the creation of information space.

Much attention is paid to information space issues in the works of V. Ya. Tsvetkov. The scientist divides the information space into two types: natural and artificial. The first type serves as a source of human knowledge as it reflects the real world. A person creates artificial information space based on knowledge and experience, which is an explanatory model on the one hand and serves as an instrument for influencing the world around on the other hand. Artificial information space is the result of society informatization, since it is created on the basis of human knowledge [19].

Information space is formed by information resources, information and communication technologies, and information infrastructure. The emerging powerful information space has a significant impact on various areas of activity and on every participant of it. Participants of information space are presented by citizens, social groups, public organizations, companies, government bodies, which in the process of their activities have an impact on society itself.

Modern trends of information society

The results of analyses show that the majority of researchers recognize information processes that mediate economic and communication processes as the main direction of development of modern society.

At the beginning of the 21st century, several international rankings were elaborated in different countries in order to compare the levels of information society development. The rankings holding by the United Nations (UN), the International Telecommunication Union (ITU) and the World Economic Forum (WEF) are considered among analysts as the most credible.

The E-Government Development Index (EGDI), which is calculated every two years, is one of the key indicators of information society development in the countries all over the world. The assessment has been carried out by the Department of Economic and Social Affairs of the United Nations since 2001. In 2014, Russia ranked 27th in EGDI and was included in the group of countries with a high index[4]. In 2016, the country was in the 35th place[5].

To assess the achievements of countries in terms of the development of information and communication technologies, the ICT Development Index was developed in 2007 by the International Telecommunication Union, a specialized unit of UN that defines the world standards in the field of ICT.

Eleven indicators are used for its calculation, including access to information and communication technologies, use of ICT, skills, and practical knowledge of information and communication technologies of the population in evaluated countries. The index is one of the most important indicators of socio-economic prosperity of states. The research presented in 2017 showed that the Russian Federation occupied the 45th place among 176 countries in the world and, compared to 2013, dropped over five positions[6].

In 2002, the World Economic Forum and INSEAD International Business School developed the Networked Readiness Index (NRI). Groups of indices that define the market, political and infrastructural environment in a country, the willingness of authorities, enterprises, and population to apply network technologies, as well as ICTs, are used to calculate NRI.

According to the results of the research conducted in 2010, Russia occupied the 80th line in a ranking among 133 countries[7]. In 2016, the Russian Federation took the 41st place in the Network Readiness Index. One hundred thirty-nine states were involved in the research of 2016. Over the past five years, Russia has actually improved its position twice in the rating of the World Economic Forum[8].

Information space has the most significant impact on the following areas of society's life.

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[4] United Nations E-Government Survey 2014. Available at: http://unpan.org (date of access: 20 July 2014).

[5] The UN E-Government Ranking. Available at: (date of access: 29 November 2017). (In Russ.)

[6] Ranking of ICT Development of Countries. Humanitarian Technologies. Analytics portal. Available at: http://gtmarket.ru/ratings/ict-development-index/ict-development-index-info (date of access: 29 November 2017). (In Russ.)

[7] Measuring the Information Society 2014. Available at: http://itu.int (date of access: 20 July 2017).

[8] The Networked Readiness Index (NRI). Available at: http://www.tadviser.ru/index.php (date of access: 1 December 2017).

Table 1

Population using information resources, 2015–2016, % of total population in the federal district between the age of 15 and 72

№	Federal district	Population using the Internet		Population using the Internet for ordering popular goods and services				Population who face threats of information security	
				Clothes and shoes		Financial services			
		2015	2016	2015	2016	2015	2016	2015	2016
1	Central	79.9	82.2	40.4	37.3	26.4	33.3	33.3	33.5
2	Northwestern	82.1	84.2	47.4	53.3	22.9	24.5	43.2	38.5
3	Southern	76.4	80.6	47.5	54.3	27.0	24.5	37.9	33.7
4	North Caucasian	75.7	81.0	43.2	52.3	13.3	22.5	32.1	30.2
5	Volga	74.0	78.1	46.0	53.5	28.3	31.5	31.8	29.0
6	Ural	78.8	82.8	47.5	46.6	24.8	32.2	32.6	27.1
7	Siberian	76.3	78.4	48.3	53.8	19.8	19.4	32.5	26.2
8	Far Eastern	78.8	81.3	60.4	59.4	28.1	31.2	30.6	26.1

The authors prepared the table based on the data of the State Statistics System (Russia in numbers. 2017. Abstract analytical collection (2017). Rosstat. Moscow, 511. (In Russ.))

1. *Safety and health*. Current level of diagnostics, development of 3D-printing technologies allows not only maintenance of human health, but also modernization of human body.

2. *Education and science*. The main trend in this area belongs to the development of smart education related to the use of cloud technologies based on large data centers.

3. *Socio-political sphere*. According to the State Statistics System, the share of government bodies, state authorities of the subjects of the Russian Federation and local governments that used the Internet in the total number reached 90.5 % in 2011, and 95.5 % in 2016[9]. At the same time, new threats related to information terrorism, cybercrime, information wars arise in socio-political sphere.

4. *Culture*. In 2011, the share of Russian cultural institutions that used the Internet was 62.6 %. In 2016, this indicator increased up to 82.3 %. However, the share of electronic publications in the total number of library funds remains low. In 2011, this indicator was equal to 0.40 % and to 0.45 % in 2016. At the same time, the share of libraries with Internet access to full-text electronic resources in the total number of libraries did not exceed 2.5 % in 2011, 5.9 % in 2016[10].

5. *Quality of life*. Nowadays new priorities appear among the human values: information, innovations, virtual communication, social networks, electronic gadgets, etc. According to the State Statistics, in 2016, 28.5 % of the population between the age of 15 and 72 used the Internet to obtain the following state and municipal services: healthcare and medicine, taxes and fees, services of the Ministry of Internal Affairs and the State Traffic Safety Inspectorate, science and education. In turn, traditional basic values such as life, health, family, material welfare, education, career, liberty and creativity undergo certain transformations because they are associated with the process of life and communication virtualization (Table 1).

At the same time, the uncontrolled influence of information space on society became the peculiarity of the modern era. These phenomena require careful study, since their existence leads to negative economic, social, outlook consequences.

Methodological guidelines on the assessment of economic security of region

In the conditions of information society, the quality of population's life serves as one of the main principles of progress at the present stage. Therefore, high economic performances do not always determine the successful development of territories; they are likely means for achieving a high quality of life.

According to J. Stiglitz, J.P. Fitoussi, the quality of social sphere is characterized by education and health, social security and others indirectly defining the level of society development and the quality of the political system. Today this is of great importance, since the State Development Index is presented by the quality of life, not by the level of GDP [20].

[9] Russia in numbers. 2017. Abstract analytical collection. (2017). Rosstat. Moscow, 511. (In Russ.)

[10] Russia in numbers. 2017. Abstract analytical collection. (2017). Rosstat. Moscow, 511. (In Russ.)

The level of economic and social development, conditions for the realization of citizens' constitutional rights approve the achievement of the world economic power by our country. In accordance with the concept of socio-economic development of the state for the period until 2020, "this means high standards of personal security, access to education and health services of the required quality, the necessary level of living facilities, access to cultural benefits and environmental security" [11]. At the same time, adopted in 2017, the Strategy for Economic Security of the Russian Federation for the period up to 2030 among the challenges and threats to economic security notes, "an increase in population disparity in personal incomes, a decline in the quality and accessibility of education, medical care and, as a result, the quality of human potential" [12].

Methodical tools for the assessment of economic security in region proposed by authors are based on official statistical data, since it centers on different spheres of citizens' life on the whole territory of a country.

The index calculated for the economic security of region involves an integrated assessment that allows gathering disparate information about compared objects into one composite measure. Integrated assessment makes it possible to rank compared objects across the entire set of characteristics and determine advantages or disadvantages of each object over the others.

First of all, it is necessary to determine the groups of indicators of economic state in a region: economy, food, ecology, education, health, information space, etc. For each group, it is required to specify its own set of indicators.

In the next stage, ranks based on the values of specific indicators for each region are determined by sorting the values in ascending or descending order according to the logic of particular indicator: 1 — the lowest rank, N — the highest one. The value of N corresponds to the number of evaluated regions. As a result, the set of ranks $\{P_{ij}^r\}$ will be generated, where r corresponds to the order number of region, i — the number of a group of indicators, j — the index number in a group.

Sub-indices of social and economic security of region are determined for each group of indicators by the following formula:

$$s_i^r = \frac{1}{n_i N} \sum_{j=1}^{n_i} P_{ij}^r, \quad (1)$$

where n_i — the number of indicators in the i group.

It follows from the Formula 1 that the values s_i^r are normalized and in the range from $1/N$ to 1.

The calculated sub-indices are aggregated to calculate a regional index of social and economic security S^r. The validity of the results depends on appropriate choice of weighting coefficients, which determine the advantages of certain groups of indicators. The following formula is used to calculate the index:

$$S^r = \sum_{i=1}^{m} K_i s_i^r, \quad (2)$$

where m is the number of groups of indicators; i — order number of a group; K_i — weighting coefficient of a group of indicators determined by expert estimation in a way that the sum of weighting coefficients is equal to 1; s_i^r — sub-index of region for the i group of indicators, calculated by the formula (1).

Table 2

Scale for the determination of economic security level of a region

Indicator	Economic security level of a region in accordance with the index value			
	$0 \le S^r \le 0.25$	$0.25 < S^r \le 0.50$	$0.50 < S^r \le 0.75$	$0.75 < S^r \le 1$
Level of security	dangerous	low	medium	high
Identification mark				

Table is prepared based on the authors' own research.

[11] On the conception of long-term socio-economic development of the Russian Federation for the period until 2020. Order of the Government of the Russian Federation of 17 November 2008 No. 1662-r. With amendments and additions. Compilation of the legislation of the Russian Federation 2008. No. 47. Art. 5489. (In Russ.)

[12] On the strategy of economic security of the Russian Federation for the period until 2030. Decree of the President of the Russian Federation of 13 May 2017 No. 208. Available at: http://cosultant.ru (date of access: 1 February 2018). (In Russ.)

The obtained results can be translated into assessments: dangerous, low, medium, and high levels of economic security. For this purpose, the following scale is proposed (see Table 2).

Note that the number of groups and the number of evaluated indicators can be determined due to expert opinion.

Table 3

Sub-indices of economic security calculation in the federal districts of the Russian Federation in 2014–2016

Year	Sub-indices of economic security calculation in the federal districts of the Russian Federation							
	Central	North western	Southern	North Cauca-sian	Volga	Ural	Siberian	Far Eastern
Economy								
2014	0.75	0.70	0.45	0.30	0.48	0.60	0.43	0.80
2015	0.75	0.70	0.45	0.30	0.48	0.60	0.43	0.80
2016	0.78	0.73	0.45	0.30	0.48	0.58	0.43	0.78
Food								
2014	0.50	0.50	0.65	0.50	0.65	0.40	0.65	0.58
2015.	0.55	0.55	0.63	0.50	0.65	0.35	0.63	0.55
2016	0.55	0.55	0.68	0.50	0.70	0.35	0.60	0.53
Ecology								
2014	0.38	0.38	0.81	1.00	0.38	0.38	0.38	0.81
2015	0.38	0.38	0.81	1.00	0.38	0.38	0.38	0.81
2016	0.38	0.38	0.81	1.00	0.38	0.38	0.38	0.81
Health care								
2014	0.67	0.79	0.50	0.27	0.50	0.50	0.56	0.71
2015	0.60	0.75	0.52	0.27	0.54	0.50	0.63	0.69
2016	0.56	0.69	0.63	0.29	0.52	0.48	0.58	0.71
Education and culture								
2014	0.60	0.77	0.44	0.13	0.65	0.52	0.73	0.60
2015	0.63	0.79	0.42	0.17	0.69	0.50	0.69	0.63
2016	0.63	0.77	0.48	0.17	0.67	0.48	0.69	0.60
Living facilities								
2014	0.59	0.50	0.69	0.56	0.78	0.50	0.53	0.31
2015	0.59	0.56	0.66	0.56	0.72	0.50	0.56	0.31
2016	0.59	0.56	0.66	0.59	0.72	0.50	0.56	0.25
Employment								
2014	0.81	0.75	0.56	0.13	0.69	0.75	0.25	0.31
2015	0.63	0.81	0.56	0.13	0.63	0.75	0.25	0.44
2016	0.75	0.88	0.69	0.13	0.69	0.63	0.25	0.31
Crime								
2014	0.50	0.56	0.81	1.00	0.50	0.44	0.19	0.50
2015	0.63	0.63	0.69	1.00	0.44	0.44	0.13	0.56
2016	0.56	0.56	0.75	1.00	0.50	0.44	0.19	0.44
Information space								
2014	0.81	0.81	0.50	0.31	0.44	0.63	0.31	0.69
2015	0.75	0.78	0.33	0.28	0.53	0.60	0.50	0.73
2016	0.73	0.78	0.38	0.23	0.50	0.68	0.50	0.73

Identification marks:

	dangerous		medium
	low		high

The table is prepared and calculated by the authors on the data basis of the State Statistics System (Regions of Russia. Socio-economic indicators. 2017. Statistical collection (2017). Rosstat. Moscow, 1402).

Translation

Table 4

Results of calculation of economic security indices in the federal districts of the Russian Federation in 2014–2016

Federal district	Year	Regional index of economic security (excluding the influence of information space)	Regional index of economic security (excluding the influence of information space)	Changes (+/–)
Central	2014	0.60	0.62	0.02
	2015	0.59	0.61	0.02
	2016	0.60	0.61	0.01
Northwestern	2014	0.62	0.64	0.02
	2015	0.65	0.66	0.01
	2016	0.64	0.65	0.02
Southern	2014	0.61	0.60	–0.01
	2015	0.59	0.56	–0.03
	2016	0.64	0.61	–0.03
North Caucasian	2014	0.49	0.47	–0.02
	2015	0.49	0.47	–0.02
	2016	0.50	0.47	–0.03
Volga	2014	0.58	0.56	–0.02
	2015	0.56	0.56	0.00
	2016	0.58	0.57	–0.01
Ural	2014	0.51	0.52	0.01
	2015	0.50	0.51	0.01
	2016	0.48	0.50	0.02
Siberian	2014	0.46	0.45	–0.02
	2015	0.46	0.46	0.00
	2016	0.46	0.46	0.00
Far Eastern	2014	0.58	0.59	0.01
	2015	0.60	0.61	0.01
	2016	0.55	0.57	0.02

The table is prepared and calculated by the authors.

Research results

The methodology was tested on calculations of social and economic security indices in eight federal districts. The authors selected 32 indicators divided into 9 evaluated groups according to the following requirements:

— quantitatively reflect the main factors affecting the level of threats to economic security;

— values of indicators are annually calculated by the Federal State Statistics Service in the context of the subjects of the Russian Federation;

— values of indicators are published in official editions of the Federal State Statistics Service.

Table 3 presents the results of calculations for each group based on data from the Federal State Statistics Service for 2014–2016.

During the determination of regional indices, we consider all groups of indicators as equally important. It is for this reason that the values of weighting coefficients Ki are equal in our calculations.

The results of calculation revealed a low level of socio-economic security in the North Caucasian and Siberian federal districts (Table 4). The data obtained in the table demonstrates that current situation in the North Caucasian federal district is affected by the situation in the sphere of education, culture, employment, and information space, whereas a low score in the Siberian federal district is mainly due to problems in education, culture and a high level of crime in the region. For other districts of the Russian Federation, the level of economic security is estimated as average and regional indices are slightly different from each other: the variation ranges from 0.12 to 0.15.

Conclusion

The following results were obtained during the research.

Based on the review of the domestic and foreign literature, a system of concepts which have interdisciplinary significance including the concepts of "information", "information resource", "informatization", "information space" is defined. The majority of researchers believe that the main direction of the development of modern society involves information processes mediating economic and communication processes. The widespread use of information and communication technologies that contribute to the development of information society has generated many problems, as a result of them, the issues of ensuring economic security remain relevant.

The analysis of informatization processes in society and introduction of information and communication technologies in economic, social, and spiritual spheres proves the changing nature of consequences. The economy of information society is characterized, on the one hand, by the emergence of new branches of material production and service sector due to the development of information technologies, communications and mass communications; on the other hand, modern ICTs have led to transformation of threats to economic security and contribute to development of negative phenomena in society. This requires a redefinition of methodology for assessment economic security, taking into account the indicators of information space.

The authors proposed a methodology for assessment economic security of a region, taking into account the influence of information space. The methodology is based on integrated assessment and allows ranking compared regions by the whole set of characteristics.

The methodological approaches to assessment described in the article can be considered as a definite basis for improving management of economic security system of the regions in Russia.

Further research in this area will allow obtaining more accurate results taking into account the depth of dynamic range of statistical data reflecting the duality of information space. It can be used for forecasting and making decisions in management within the region, as well as for assessing the economic security of the state.

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