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► To cite this version:

Mikhail Yakovlevich Veselovsky, Tatiana Vitalievna Pogodina, Raisa Vasilyevna Ilyukhina, Tatyana Anatolyevna Sigunova, Nina Fedorovna Kuzovleva. Financial and economic mechanisms of promoting innovative activity in the context of the digital economy formation. *Entrepreneurship and Sustainability Issues*, 2018, 5 (3), pp.672 - 681. 10.9770/jesi.2018.5.3(19) . hal-01829712

HAL Id: hal-01829712

<https://hal.science/hal-01829712v1>

Submitted on 1 Aug 2018

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FINANCIAL AND ECONOMIC MECHANISMS OF PROMOTING INNOVATIVE ACTIVITY IN THE CONTEXT OF THE DIGITAL ECONOMY FORMATION

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Received 26 October 2017; accepted 18 January 2018; published 30 March 2018

Abstract. The paper analyzes some financial, tax, information, communication, infrastructural, technological and organizational mechanisms of innovative activity promotion in conditions of transition to a digital economy. End-to-end technologies including "Big Data", "New Production Technologies", "Quantum Technologies", "Technologies of Virtual and Augmented Realities", the possibilities of their application in various sectors of the national economy were singled out and analyzed. The role of end-to-end technologies in the development of the Russian economy and promotion of innovative activities of companies was studied. A comparative analysis of the main indicators of informatization of the society of Russia and some leading foreign countries for the period of 2005-2015 was carried out. The conclusions were made about an insufficient use of the Internet in Russia, primarily in rural areas, which hindered the social progress of Russian society. The leading role of digital (information) technologies in solving social problems, including education, social services and healthcare, was defined. The necessity of development of electronic services in the sphere of education and health was proved. Ways of cluster development based on the example of the Kaluga Region in the development of digital technologies were studied. The influence of development institutions on stimulating innovation activity in Russia was analyzed.

Keywords: digital economy; financial and economic mechanisms; end-to-end technology; innovative activity; innovative territorial cluster

Reference to this paper should be made as follows: Veselovsky, M.Y.; Pogodina, T.V.; Ilyukhina, R.V.; Tatyana Anatolyevna Sigunova, T., A.; Kuzovleva, N.F. 2018. Financial and economic mechanisms of promoting innovative activity in the context of the digital economy formation, *Entrepreneurship and Sustainability Issues* 5(3): 672- 681. [http://doi.org/10.9770/jesi.2018.5.3\(19\)](http://doi.org/10.9770/jesi.2018.5.3(19))

JEL Classifications: O33, 038

1. Introduction

A required condition for the implementation of innovative activities in the company is the availability of financial resources to ensure the implementation of innovative processes of companies, the process of commercialization of the innovations being created (Ignatavičius et al. 2015; Tvaronavičienė; Černevičiūtė 2015; Zemlickiene et al. 2017; . Innovative activity is a constantly renewed innovation process. There are several main criteria for this phenomenon: innovation activity is directly related to the implementation of research work, which is the initial stage in this process; this activity is characterized by the presence of several stages; there is a transition from scientific developments to practical activities with successful implementation of earlier stages of innovation activity, the stage of commercialization of innovations and their mass distribution; the innovation process is influenced by the processes associated with the formation of the digital economy (Rajnoha et al. 2017; Menshikov et al. 2017; Baronienė, Žirgūtis 2017). The purpose of the work is to identify some financial and economic mechanisms that promote the development of innovative activities in Russia in the conditions of the digital economy. To achieve this goal, the following tasks were identified: to study the features of the development of the digital economy in Russia; to identify the features of using financial and economic mechanisms to promote innovation; to analyze the tendencies of informatization of society, the development of education in healthcare in Russia in comparison with other countries of the world; to study the regional features of stimulating innovation in Russia.

2. Methods

The theoretical and methodological base of the research is based on the works of domestic and foreign scientists in the field of economics, corporate finance, investment and innovation management. During the research, the theoretical and methodological approaches to the development of financial and economic mechanisms for promoting innovation in a digital economy were generalized. In the process of this study, the methods of statistical, coefficient, dynamic, and comparative analysis were used.

3. Result

3.1. Features of the digital economy development and the use of financial and economic mechanisms to promote innovation in Russia

The digital economy of Russia includes the most innovative and technological segments of the market, in which the added value is created using information technology. In 2015-2017, the digital economy in our country accounted for about 3% of GDP, while the growth rate of this sector was 8.5 times higher than the average for the last five years. The ecosystem of the digital economy includes eight sectors: government and society, marketing and advertising, finance and trade, infrastructure and communications, media and entertainment, cybersecurity, education and personnel, and start-ups. Unfortunately, the influence of digital economy on the development of industry, agriculture, electric power and transport in Russia has not been sufficiently studied. The issues of interaction and interrelationship between the digital economy and science have not been worked out. Therefore, the potential of digital economy has yet to be revealed both from the point of view of science and practice. The theoretical basis for the development of the digital economy is the concept of asymmetric information and agency relations. The essence of the concept of asymmetric information is that individuals can receive benefits from owning certain information that is not available to other subjects of financial and economic activity. The concept of agency relationship is the existence of contradictions between the sales representatives of the company and its

owners and this ultimately leads to additional agency costs. In general, the development of information technology will help reduce the severity of information asymmetry due to transparency and accessibility for a wide range of stakeholders. In addition, due to the development of digital technologies, agency costs, related to the need to monitor the activities of sales representatives and the reduction the opportunities for their undesirable behavior, will be reduced.

Thus, the digital economy has turned into a real productive force of society, the driving force behind the development of the Russian economy. Given that the share of the digital economy will account for more than 35% of GDP by 2025, it is important now to provide effective financial and economic mechanisms to promote the development of digital technologies (Federal State Statistics Service; Santo 2005). Innovation activity is a continuous process of consistent work on the transformation of innovations into products and launching it to the market for commercial use. Under the conditions of the Russian reality, innovative activity is confronted with obstacles related to the search for ideas, developing solutions, finding sources of financing, bringing innovative products to potential customers, meeting current obligations, ensuring victory over key competitors and other factors. To overcome the above-mentioned problems, it is necessary to gradually and effectively solve them based on the planning of the innovation process, at each stage of its implementation (Sandu et al. 2013; Steele 1975; Schumpeter 1995; Twiss 2002; Weitzman 1998). To solve these tasks, some financial and economic mechanisms used in the digital economy can help. The most important problem in promoting innovation is providing it with sources of funding. A distinctive feature of financing innovative activity is a variety of sources of financing and the set of various directions of the innovation process in general and its separate objects. The role of credit resources in financing innovative activities of Russian companies is relatively small due to the high cost of attracting them; they are used by no more than 5% of companies. One of effective methods of financing is leasing, which allows obtaining equipment for production without heavy expenses; at the end of the term, the leasing contract can provide for the transfer of equipment rights to the lessee and it usually does not provide for advance payments. It is also possible to single out franchising as a form of indirect financing of innovation processes, which allows cutting costs for the development of production technology, market conquest, advertising, etc.

The sources of funding of innovative processes should be attracted taking into account the following factors:

- cost of attracting the source – the lower the cost of attracting a particular source of financing, the lower the weighted average cost of the company's capital;
- availability of the specific source – a company cannot always take a bank loan to implement its certain innovative projects because of the complexity of its receipt;
- reimbursable or unrecoverable type of financing;
- possible impact of this source of financing on the financial stability and financial condition of the company.

In market economy and in the conditions of the uncertainty of the market environment, it is necessary to look for new sources of financing innovative processes, to select the optimal combination of all available resources for effective implementation of innovative activities.

The classification and characteristics of financial and economic mechanisms to promote innovative activities that are appropriate for use in the regions of Russia taking into account the formation of the digital economy are presented in Table 1.

Table 1. Financial and economic mechanisms of innovative activity promotion while formation of digital economy

No.	Types of mechanisms	Characteristic
1	Financial	Grants' extension from the regional budget; budget investments.
2	Tax	Extension of investment tax credit, tax benefits in terms of amounts to be credited to the regional budget.
3	Information	Information support of the innovation project; electronic services to the public and entrepreneurs; creation of databases, which can be addressed by firms looking for partners in their field of activity.
4	Communication	Consultative support of the innovative project before its payback.
5	Infrastructural	Creation of centers for collective use of scientific equipment for small and medium-sized organizations and research centers.
6	Technological	Creation of network of digital platforms for research in the field of digital economy, the main end-to-end technologies ("Big Data", "New Production Technologies", "Quantum Technologies", "Virtual and Augmented Realities Technologies").
7	Organizational	Determination of the needs of the economic sectors in information technologies, monitoring of research and development, creation of competence centers for expert support of research and development conducted in the country; formation of innovative territorial clusters.

Source: developed by authors

Thus, financial and economic mechanisms for promoting innovation activity include seven sectors – financial, tax, information, communication, infrastructure, technology and organizational ones. All blocks of financial and economic mechanisms are interrelated and represent a complex and multilevel system. The basis for innovation in the digital economy will be the creation of end-to-end technologies, which are key scientific and technical areas that have the greatest impact on the development of new markets and improving existing ones. In the Russian Federation, the most common technologies are manufacturing end-to-end technologies including "Big Data", "New Production Technologies", "Quantum Technologies" and "Technologies of Virtual and Augmented Realities".

The "Big Data" technology is designed to store large amounts of data using domestic media and communication equipment. This technology will contribute to the improvement of information and communication between the subjects of financial and economic activity. The "New production technologies" end-to-end technology includes some groups of technologies for creating products in the digital space, managing the life cycle of complex engineering facilities, managing a scientific and industrial enterprise, digital production, logistics, requirements and quality management, single information space and others. The "Quantum technology" includes quantum computing and modeling, quantum communications and cryptography, quantum frequency standards and quantum sensors.

"New production technologies" and "Quantum technologies" will be most effectively used in the production sector of the national economy (industry, electric power, etc.).

"Virtual and Augmented Realities Technologies" are aimed at software development, hardware creation, information interaction within the digital platform network and electronic trading platform (Program "Digital Economy of the Russian Federation" 2017; Adler 2003; Van den Ban & Hawkins 1996). The use of this end-to-end technology will be most effective in the financial markets and in the financial sector of the Russian economy.

3. 2. Use of information technologies in solving social problems of the Russian society development

However, the transition to the digital economy will allow solving not only economic (increasing the competitiveness of the national economy ensuring sustainable economic growth), but also some social tasks (improving the quality of life of the population, reducing differentiation in the standard of living of rural and urban populations, improving the quality and accessibility of services). It is necessary to give pride of place to the development of the informatization of society, the education and health system (Table 2).

Table 2. The main indicators of the informatization of society, the development of education in healthcare in Russia and other countries in the world for the period of 2005-2015

Indicators	2005	2010	2011	2012	2013	2014	2015
1. Russia							
1.1. Online population, per 100 people	15	43	49	64	68	71	...
1.2. The share of households with the Internet, %	9	48	57	64	69	73	75
1.3. Number of students enrolled in higher education programs, per 1000 people	68	65	61	58	54	51	48
1.4. Population size per 1 physician	...	200	...	...	...	206	218
1.5. Population size per 1 hospital bed	...	107	...	...	...	115	120
1.6. Number of newly reported cases of HIV infection	32,704	57,214	59,592	59,713	63,560	73,538	...
2. Germany							
2.1. Number of Internet users, per 100 people	68	82	81	82	84	86	
2.2. Share of households with the Internet, %	62	82	83	85	88	89	90
2.3. Number of students enrolled in higher education programs, per 1000 people	...	...	...	...	35	36	...
2.4. Population size per 1 physician	...	269	...	...	...	243	...
2.5. Population size per 1 hospital bed	...	121	...	...	...	122	...
2.6. Number of newly reported cases of HIV infection	2,492	2,714	2,699	2,978	3,288	3,525	...
3. USA							
3.1. Online population, per 100 people	68	72	70	79	84	87	...
3.2. Share of households with Internet, %	...	71	72	75	...	80	...
3.3. Number of students enrolled in higher education programs, per 1000 people	58	66	67	67	63	62	...
3.4. Population size per 1 physician	...	412	...	...	...	392	...
3.5. Population size per 1 hospital bed	...	333	...	...	...	...	...
3.6. Number of newly reported cases of HIV infection	41,129	36,000	35,000	35,000	35,000	...	...

Source: Rosstat: www.gks.ru

Thus, in Russia, the number of Internet users per 100 people, the share of households with access to the Internet compared to Germany and the United States is somewhat lower. The rapid increase in the number of newly reported cases of HIV infection in Russia in 2005-2015 is a matter of great concern – by 2.25 times, up to 73,538 people. At the same time in Germany, these figures are more than 20 times lower, in the US – 2 times lower. In addition, there is an increase in diseases of the population in Russia associated with high blood pressure and malignant diseases. Unlike Germany and the United States, there is a negative dynamics of population growth per hospital bed and one doctor in Russia, a decrease in the number of students enrolled in higher education programs per 1000 population (Twiss 2002; Gokhberg 2017; Association of Innovative Regions of Russia). None above information contributes to the social progress of Russian society, condemning it to degradation and the growth of social inequality.

To improve the situation in the social sphere, some innovative approaches, financial and economic mechanisms are needed. In particular, it is necessary to develop e-services in the field of education and healthcare (online registration for a kindergarten, doctor's appointment, taking information, online consultation, doing homework via electronic media, preventive assistance to the population using the Internet, etc.). This is especially true for rural areas, where there are significant problems in ensuring the accessibility and quality of services in the field of education and health.

When considering the features of innovation processes in Russia, it should be noted that in recent years, companies have become increasingly focused on developing their innovative activity. This is mainly because company executives are fully aware that it is innovation activity in a new market economy that will help companies to develop most effectively. However, there are a lot of unsolved problems in the development of the economy in general and the innovative activity of companies in particular, such as the absence of large innovative companies that are able to give the experience of practical innovation activities to others; the difficulty in attracting financial resources at the stage of introduction of innovative developments due to high cost of commercializing the innovation and the length of the payback period; lack of the necessary regulatory and legal acts that could regulate the conduct of innovation in companies. In addition, many Russian companies lack modern technological base for research. Problems arise in the implementation of commercialization of innovations. They are manifested in the fact that many studies simply do not reach the process of commercialization and remain incomplete, and just a small number of innovative ideas reach production and distribution.

Regional features of stimulating innovation in Russia

Currently, depending on the adopted strategy for the development of the region and the degree of its development, the use of the cluster mechanism can become a priority area of regional innovation policy. It is possible to create either one innovative territorial cluster or a network of clusters. There are some innovative territorial authorities in Russia in the field of information technologies such as "Fiztek XXI" (Central Federal District), "Development of Information Technologies, Radio Electronics, Instrumentation, Communications and Information Telecommunications" (North-West Federal District), Innovative Cluster of Information and biopharmaceutical technologies (Siberian Federal District). Regions that succeeded in creating and developing innovative territorial clusters include the Republics of Tatarstan, Bashkortostan, and the Moscow, Samara and Kaluga Regions (Gokhberg 2017). The second direction (creation of a network of clusters) is a priority for the Kaluga Region, which successfully applies the cluster approach for the development of investment and innovation processes (Weitzman 1998; Association of Innovative Regions of Russia; Porter 1993; Veselovsky et al. 2015).

In 2013, the State Program of the Kaluga Region called "Development of Entrepreneurship and Innovations in the Kaluga Region" was developed, the implementation of which is envisaged in the period from 2014 to 2020 in one stage at the expense of budgetary sources of financing (Table 3).

Table 3. Volumes and structure of sources of financing of the state program of the Kaluga Region called "Development of entrepreneurship and innovation in the Kaluga Region" from all sources of financing

Indicator name	Unit of measurement	Including by years						
		2014	2015	2016	2017	2018	2019	2020
Public funds	thousand roubles	301,632	245,128	173,528	131,095	142,575	144,057	145,528
	%	37.5	51.8	43.2	36.2	38.2	38.4	38.7
Federal money	thousand roubles	502,272	228,000	228,000	230,800	230,800	230,800	230,800
	%	62.5	48.2	56.8	63.8	61.8	61.6	61.3

Source: developed by authors

Thus, more than 60 percent of the funds are allocated from the federal budget. The program provides for the development and approval of a number of regulatory and legal acts of the region that regulate innovation activities.

In 2012, an agreement on cooperation was signed between the Government of the Kaluga Region and OAO Russian Venture Company, which provided for joint work concerning the development of innovative activities, the creation of a venture and 'sowing' investment system in the Kaluga region, and the interaction with other regions of the country. Because of the implementation of the agreement, it is planned to form venture funds in the region, including in the format of public-private partnership.

Thus, the development of innovative activities in the Kaluga region is carried out on a phased basis, in accordance with the developed development strategy. Because of the second stage of the development of this Strategy, clusters should be formed, in which innovative developments will be carried out. The innovative infrastructure of the region, in particular, the development institutions that promote the implementation of innovative activity at all stages of the company's development taking into account the priority development of information technologies in the digital economy should help to form these clusters.

4. Discussion

The problem of financial support of innovative activity is most acute in the development of innovative processes. At the same time, the successful finding of sources of financing innovative processes and their optimal combination can promote the development of innovative processes. The presence of a high degree of uncertainty in the results of research and development, long payback time of investments determine the need to invest a large amount of funds in innovative activities (Federal State Statistics Service; Adler 2003; Köhne 1996).

Developing open innovation, clusters contribute to the accumulation of various participants in innovation, such as federal and regional authorities, development institutions, venture investors, lending institutions, resident companies of clusters and research institutes. These participants, due to their sources, contribute to the financial support of innovative activities of companies within the territorial clusters. Due to the multiple sources of financing within the clusters, the process of diversifying the risks of financing innovative processes of companies is ensured. Because of the gradual reduction of these financing risks, the clusters will become more attractive as

organizational structures that contribute to the most effective organization and financial support for innovation activities (Van den Ban 1999; Buermann 2000; Pogodina et al. 2015).

The need to ensure a successful process of commercialization of companies' innovation is because only this way helps return of money invested in research, development and production of innovation funds. In addition, the complexity of implementing the process of commercialization of companies' innovation in a modern economy is determined by high risks of innovative processes of companies, that is, a long time lag between the development of innovation and its delivery to the consumer, the complexity of implementing the innovation marketing process due to lack of demand for innovative development and inability to find consumers (Santo 2005; Van den Ban & Hawkins 1996; The World Bank 2013, 2012).

Additional difficulties in the commercialization of innovations can arise due to inefficient planning of the innovation process and the lack of a clear system of commercialization of innovations, the development of which should begin at the early stages of the innovation process, namely the stages of the idea of innovation and the development of the concept of an innovative product (service). At present, the resident companies of innovation clusters are assisted in the implementation of the commercialization process by development institutions. The role of these institutions is not only to give financial provision of scientific and technical developments; they also find consumers of innovative developments.

Conclusion

Thus, in the conditions of transition to the digital economy, financial and economic mechanisms are modernized in terms of using end-to-end technologies that will promote innovation in the Russian regions and will improve the quality of life of the population. The impact of the information technology in the development of education and healthcare, social security of the population with quality services is especially significant. In general, the resource and advantages of the digital economy will help solve many of the current problems associated with lowering unemployment, creating an effective public sector, improving the environment, creating innovative companies and increasing the competitiveness of the national economy.

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