



**Supplementary Notebook (RTEP - Brazilian academic journal, ISSN 2316-1493)**

## **NON-DIGITAL FACTORS OF DIGITAL ECONOMY DEVELOPMENT IN RUSSIA AND THE WORLD**

Elena F. Nikitskaya <sup>1</sup>

Meri A. Valishvili <sup>2</sup>

Vera E. Afonina <sup>3</sup>

<sup>1</sup> *Plekhanov Russian University of Economics, Russia, [elena-nikitskaya@yandex.ru](mailto:elena-nikitskaya@yandex.ru)*

<sup>2</sup> *Plekhanov Russian University of Economics, Russia, [Valishvili.MA@gmail.com](mailto:Valishvili.MA@gmail.com)*

<sup>3</sup> *Moscow State Institute of International Relations, Russia, [Afonina\\_Vera@mail.ru](mailto:Afonina_Vera@mail.ru)*

**Abstract:** *The article examines the conceptual aspects of the essence of the digital economy, the prerequisites for its development and its basic elements. In spite of widespread international recognition of the digital economy as a scientific category and as a mainstream of global development, a generally accepted approach to its methodological foundations has not been formed in expert circles. The authors have found out some common positions in respect of digital technologies, which are considered in modern conditions as a driving force for accelerating economic growth and increasing labor productivity, as well as an infrastructure component of the national innovation system of the government. The article defines non-digital factors of digital economy development, including state policy, legislative framework, human capital and the system of fundamental and applied research. Based on the analysis of statistical data and development forecasts, the authors assess tendencies in the development of the digital economy, as well as possible negative consequences for the socio-economic development of Russia. It is shown that digitalization and particularly the formation of Industry 4.0 will significantly change the existing employment relations, lead to reviewing the system of education and personnel training and reshape the system of social protection of citizens.*

**Keywords:** *digital economy; information and communication technologies; innovative economy; digitalization.*

### **INTRODUCTION**

The spread of digital technologies over a long period of time determines the directions of economic and social development and gradually leads to fundamental changes in people's lives. The driver of digital initiatives in all countries, without exception, is the government, which actively promotes the development and commercialization of technologies. In recent years, there is unfolding of the next wave of

transformation of the business and social models caused by the occurrence of the digital technologies of new generation, which due to the scale and depth of their influence is called "pass-through", - artificial intelligence, Internet of things, robotics, wireless technology (Wi-Fi) and several others. According to some estimates, their implementation will increase labour productivity in companies by 40%. In the near future, nothing else than the effective use of advanced digital technologies will determine the international competitiveness of not only particular companies, but also the whole countries that form the infrastructure and legal environment for digitalization.

Informatization and computerization, as the previous stages of development, required mainly the simple introduction of computer engineering, and later computers in solving certain economic problems. Digitalization, in turn, requires reconsideration of the very basis of the country's economy, and in contrast to the so-called "analog" economy, in which production, distribution and exchange are based on limited material resources with unlimited needs of society, is based on the spread of virtual technologies and platforms. The necessity of Russian economy digitalization is primarily connected with the formation of a technological structure of the national economy that meets the demands of competitiveness in world markets, and the creation of the digital economy has acquired the status of a government goal. It is extremely important for Russia to transform the economy as soon as possible into a modern one – information and digital. This way has no alternative, otherwise the existing social and economic problems will inevitably get worse, which will lead to a deep technological and then socio-economic lag of Russia from the leading countries of the world.

The realization of accelerated implementation of digital technologies in the socio-economic sphere is one of the goals of the national development in Russia. Despite the positive changes taking place in the economy due to the introduction of digital platforms and technologies, digital development of the economy can have negative consequences in terms of social relations on an international scale. Despite the fact that Russia does not take high positions in the world rankings in terms of the level of development of the digital economy, it has established a foothold in the group of the countries following the leaders, while improving its measures in certain rankings and sub-indices from year to year. It is necessary to implement digital and innovative development programs at all levels of the government systematically, taking into account all possible problems, risks and negative consequences for society as a result of the implementation of such programs.

The formation of the digital economy is a priority for most countries – economic leaders, including the countries of the European Union, the United States, Japan and others. As a rule, these countries are characterized by a long period of the realization of the "agenda of digital development" and the continuity of the priorities – from creating the basic infrastructure of information and communication technologies (hereinafter – ICT) to development of the policy in this sphere and the programs to support the broad implementation of digital technologies. The first pan-European initiative for the transition to the information society was e-Europe, accepted by the European Parliament in 1999, which was forming the information infrastructure and the latest technologies in the following years. For the time being the development programs of European countries are based on a comprehensive digital agenda, which includes the digital transformation of the public administration system, strengthening information security, and developing digital competencies.

An interesting fact should be mentioned. Despite the long-term systematic work of a number of countries on the development of information technologies and the transition

to the digital economy, in the Digital Evolution Index (Digital Planet, 2017) rating, for example, the United States and Germany are on the border of outstanding and fading countries, i.e., despite the existing high level of digital development, there has recently been a slight slowdown due to the presence of some barriers on the way to innovations. The most promising region in the world in the digital sphere became Asia, particularly the countries such as China and Malaysia. Asian countries are attractive to investors, and the government extensively encourages businesses to introduce advanced technologies. Russia in this rating is on the border of emerging and prominent governments, i.e. it possesses a number of competitive technologies, but infrastructure and management shortcomings negatively affect the processes of their development and widespread use. The multidimensionality of digitalization processes, the lack of a generally accepted unified approach to determining the essence of the economy digitalization and the factors causing it, as well as the ambiguity of the consequences, require a comprehensive study of this phenomenon in the context of socio-economic development of the governments.

## METHODOLOGY

The purpose of the research is to identify non-digital factors that directly affect the processes of the development of the digital economy, as well as to generalize the possible positive and negative consequences of socio-economic development of society due to the transition to industry 4.0. A significant part of the research is dedicated to the analysis of the main approaches to determining the essence of the digital economy. The methodological basis of the research is a system of general scientific, interdisciplinary and special methods of cognition that have developed in the economic sciences, such as analysis, synthesis, scientific analogy, inductive, deductive and system approaches. To identify digital and non-digital factors that influence the development of digitalization processes in Russia and the world, the authors consider the main indicators of innovative development presented in the research of the World Bank, the World Economic Forum, the Organization for Economic Cooperation and Development and the European Centre for the Development of Vocational Training. The statistical data for further analysis and evaluation of particular quantitative indicators of innovation activity are presented on the basis of the data from the statistical services of the European Union and the Russian Federation.

## THE RESULTS OF THE RESEARCH

Digital transformation in modern society is one of the fundamental basis for further sustainable development. The newly emerging phenomenon of the digital economy, driven by information technology and innovation, is becoming increasingly important in the digital society. A starting point in the development of the digital economy can be considered the occurrence and beginning of mass use of the Internet in the 1990s. The Internet is still the basis for the growth of the digital economy, but the occurrence of new information and communication technologies (hereinafter referred to as ICTs) in the early 2000s and 2010s gave a new impetus to economic development. During this period,

the Internet of Things (IoT) appeared; mass use of mobile smart devices; development of digital models and services; distribution of Big Data, etc.

Despite a long period of development of the digital economy by itself, the scientific community has not developed a unified approach to determining its essence till these days (see table 1). This term was firstly used in 1995 by American computer scientist from Massachusetts Institute of Technology Nicholas Negroponte (1995), who identified the main feature and advantage of the digital economy - the lack of physical products and their substitution by information products (or digital products), allowing to save resources and reduce transaction costs due to the introduction of electronic commerce through the Internet. In 2016, after the publication of the World Bank report "Digital dividends" (2016), this term received wide international recognition.

**Table 1.** The definitions and concepts of the digital economy

Source	Definition
The World Bank (The World Development Report, 2016).	The digital economy is a system of economic, social and cultural relations based on the use of digital information and communication technologies.
British Computer Society (Urmantseva, 2017).	The economy, which is based on digital technologies, however, we mostly understand this as the actualization of business operations in markets founded on the Internet and the World Wide Web.
The G20 Program for development and cooperation in the field of the digital economy (n.d.).	The digital economy refers to a wide range of economic activities, which includes the use of 1) digital information and knowledge as a key factor of production, 2) modern information networks as an important area of activity, 3) the effective use of information and communication technologies as a factor of productivity growth and economic structural optimization.
The Decree of the President of Russia №203 "On the strategy for the development of the information society in the Russian Federation for 2017-2030" (May 9, 2017).	an economic activity where the key factor of production is big digital data, the processing and analysis of which, in comparison with traditional business models, helps to manage various types of production, technologies, equipment, storage, sale, and delivery of goods and services.
Program for the development of the digital economy of the Russian Federation until 2035 (The decree of the Government of the Russian Federation № 1632-R, July 28, 2017).	The digital economy is a set of social relations arising with the use of electronic technologies, electronic infrastructure and services, big data analysis and forecasting technologies in order to optimize production, distribution, exchange, consumption and increase the level of socio-economic development of states.

The source: compiled by the authors.

As can be seen from the provided examples, perceptions of the digital economy vary significantly. In a narrow interpretation, the digital economy is limited to economic activity connected with the sale of electronic goods and services. Broadly speaking, the digital economy is represented as a type of commercial activity for the production and sale of electronic goods and services. Considering broader definitions, for example, of the World Bank, we can talk about global processes of digitalization of society on the whole, which affect all the spheres of human activity without exception. Different reasons for developing each of the definitions can be singled out. From a technological point of view, within the framework of the resource approach, we speak of digitalization exclusively as technologies which are necessary for the functioning of the economic system. While the structural approach is based on a comprehensive transformation of the economy based on the introduction of new information technologies and platforms. The business model

focuses on the widespread use of advanced business technologies, mainly from the part of online commerce or online business.

In addition, we can talk about two main vectors of digitalization development: on the one hand, it is the process of increasing involvement of people in the processes of informatization and the formation of a new social environment and the so-called "Internet of people" (IoP-Internet of people). The digital social environment is characterized by the digitization of scientific knowledge, the development of e-government and the transfer of various mass events to the online format. On the other hand, digital transformation is taking place in the economic sphere, based on changing technological patterns and reshaping the structure of industries. In fact, the digital economy reflects the transition from the third industrial revolution to the fourth, the so-called "Industry 4.0". While the third industrial revolution resulted in the transition from analog electronic devices to digital technologies, the fourth is based on the foundation of the digital revolution, which involves embedding computational resources in physical processes, where equipment, sensors and information systems are connected throughout the entire value chain that goes beyond a single organization or business.

It is the level of ICT development that obviously determines the potential opportunities and conditions for the emerging digital economy in any state. However, it is necessary to take into account not only digital and information factors of economic development on the way of digitalization, but also such factors as the level of human potential development, the number of researchers and specialists involved in the development and implementation of innovations, the development of R&D and the number of registered patents, etc. All the mentioned above factors can be referred to non-digital ones. The grouping of factors affecting digitalization, digital and non-digital ones is fixed by the system of indicators of the "National index of digital economy development (National index of development of the digital economy: Pilot implementation, 2018)" (see table 2).

**Table 2.** The Grouping of digital development factors

Digital factors	Non-digital factors
New digital technologies	State policy and strategic planning
Shared digital platforms and services	Institutions designed to enable economic development, including legislation, regulation, and standards
Digital infrastructure	Human capital
	R&D and innovations in the digital economy

The source: compiled by the authors based on the National digital economy development index.

In the process of developing the digital economy, an increasingly important role is played by people with their knowledge, experience and skills, which increase opportunities in the labor market. At the same time, the requirements for competencies and qualifications are constantly changing. Digitalization of the economy and automation of many processes that previously required "live" human labor leads to job cuts, while the demand for highly qualified personnel in advanced specialties increases. According to some forecasts, about 5% of current professions can be fully automated by using modern technologies. However, it is more likely that in the near future only part of jobs may disappear, i.e. certain tasks will be fully automated - "about 60% of professions have at

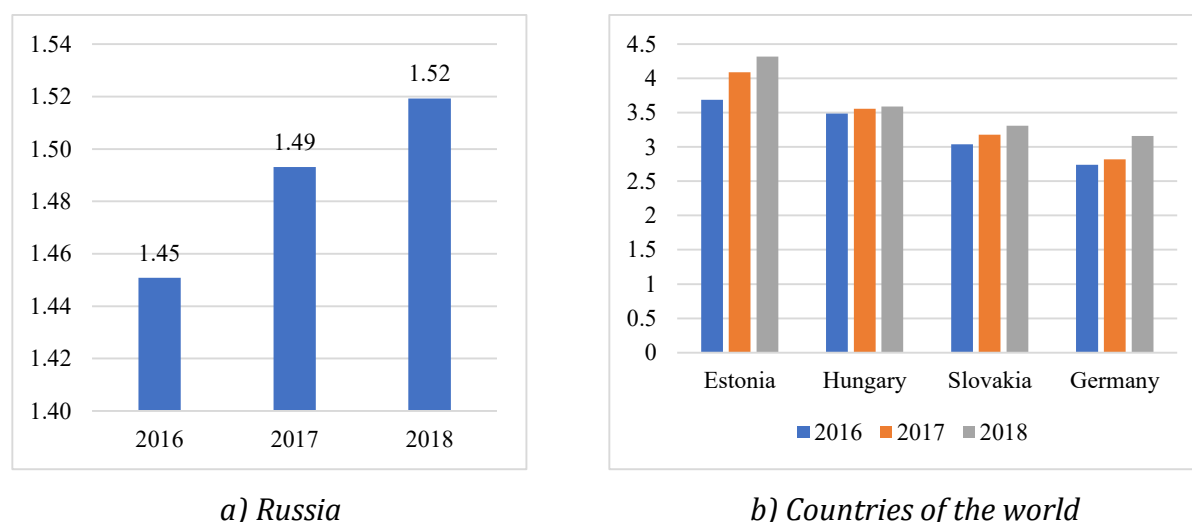


least 30% of activities that can be technically automated" (Manyika et al., 2017, p. 5). As for the pace of changes, this process is likely to take decades but not years.

According to preliminary estimates of some researchers, in the case of single-point automation, about 55% of jobs in Russia could be liquidated (Zemtsov, 2018), first of all, we are talking about resource-based industries and professions with formalized repetitive operations. According to the OECD research (2018), about 40% of employees with secondary education are at risk of losing their jobs due to automation of production activities, and only 5% of employees with higher education in the specialties are in demand. The author of the article "The digital economy and the future of European welfare states" (Greve, 2019) Bent Greve believes that Europe is the global region where the greatest concern is expressed about the problems of transition to the digital economy. As Greve points out, with the introduction of new technologies and changing labor markets, some welfare states are better prepared than others, including their ability to provide sustainable financing. The possible tendencies will be a continuing transition to reduction of the number of jobs in industry due to widespread automation. However, the work is not going anywhere, and new jobs are expected to be created. However, the quantity and quality of these new jobs are unknown.

In the absence of work in the case of replacing people with machines, it is necessary to work out possible measures of social protection and guarantees of human rights at the state level. As support measures, the government can offer its citizens lifelong learning programs, reduce the average working week, and provide adequate income guarantees for workers who lose their jobs during the transition period (Mckinnon, 2019). However, as a positive tendency, we can point out the occurrence of new forms of employment encouraging people to engage in individual activities. New types of jobs have occurred as a result of innovative implementation and adaptation of digital technologies, as evidenced by working with digital platforms supported by applications. The different and often controversial classification of certain labor relations (self-employed / independent contractor / employees) sometimes when working with an online platform has complicated the regulation of national labor markets. However, these jobs represent "work" (Johnston, Land-Kazlauskas, 2018; Graham, Woodcock, 2018). As long as people are working, there will be a need for national labor codes, as well as for social benefits protection.

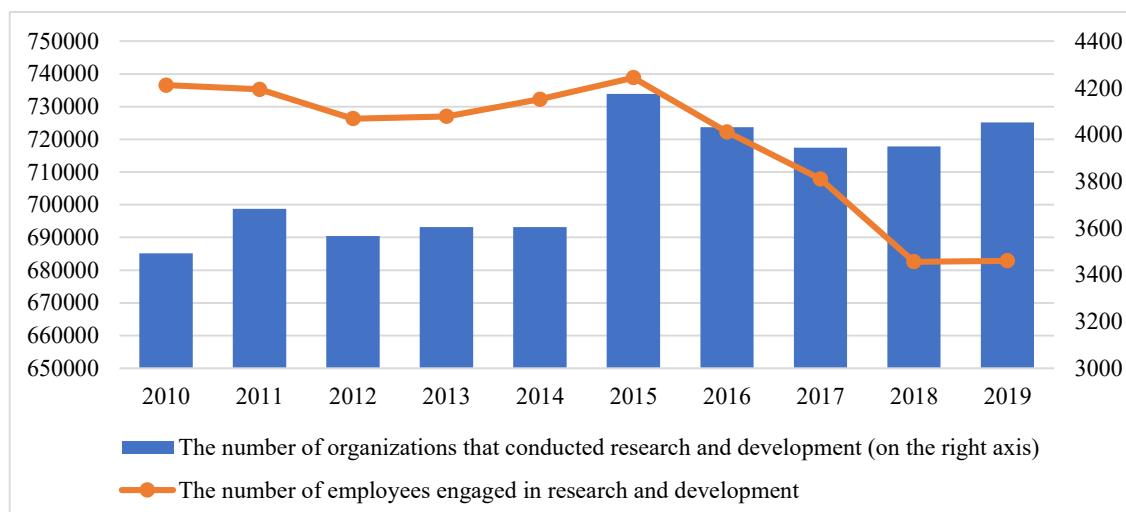
Worldwide there is a growing demand for ICT professionals and specialists with "digital dexterity" - the ability and desire to use new technologies to improve business results (Gartner, 2018). In addition, it is necessary to distinguish between basic digital literacy skills, i.e. PC and Internet user skills, and so-called advanced digital skills that are directly related to digital technologies. Advanced skills are part of the job functions for professionals who support the digital environment (Cedefop, 2016). Figure 1 shows the employment rate of ICT professionals in different countries.



The source: compiled by the authors according to the data of Rosstat and Eurostat (n.d.)  
**Figure 1.** The rate of ICT specialists among the working population

As can be seen from the data presented in the figure, the rate of ICT specialists in the total number of working people in Russia is extremely small - on average about 1.5% over the past three years, which is almost 2.5 times less than the average for the EU countries (about 3.5%). The shortage of ICT specialists has a number of negative consequences for further development. In addition to directly constraining the development of the ICT industry itself and the digitalization of business, the problems of providing qualified personnel to public sector enterprises are becoming more acute due to their transition to the commercial sector of the economy. Besides the experts of the World Economic Forum rated low Russia's ability to attract and retain talented specialists, in particular, in the rating of the WEF global competitiveness index for 2019 (The Global Competitiveness Report, 2019), Russia ranks 27th in terms of "Digital skills of the active population" and 47th in terms of "Easiness of finding qualified employees", which indicates that the existing information skills of employees do not fully correspond to the real needs of employers.

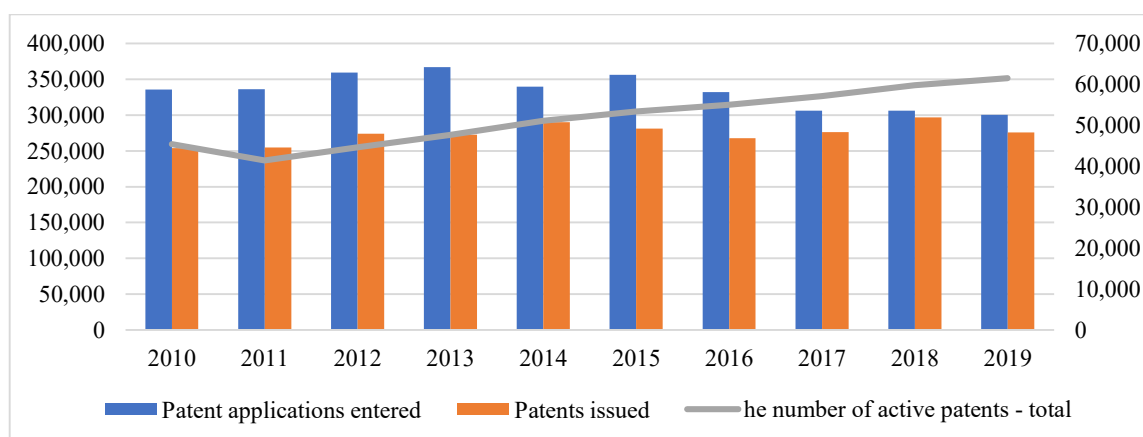
In addition to human capital as a non-digital factor in the development of the digital economy, it is necessary to consider the indicators reflecting the state of the scientific and technological complex that conducts R&D and creates innovations for the digital economy. The above-mentioned report of the World Bank "Digital dividends" emphasizes that in order to strengthen the foundations of digitalization, governments need to focus on three key components: integration, efficiency and innovations. The main driver of progress in the digital economy is the knowledge obtained as a result of research and development (hereinafter referred to as R&D). The level of R&D development can be determined with the help of the quantitative indicators of innovation activity and the effectiveness of the research. The most common indicator for evaluating the innovation sector of the economy sphere is the number of innovative enterprises, as well as the number of employees engaged in research and development (see figure 2).



The source: compiled by the authors according to the data of Rosstat

**Figure 2.** The indicators of innovation activity

Based on the presented data, we can conclude that the rapid reduction of research and development staff is a direct threat to the further development of advanced technologies. In absolute terms, the number of researchers for the period from 2000 to 2019 decreased by 52 thousand people. Taking into account the selective choice of personnel for scientific activities, the long period of their training and achievement of professional results - it is a significant loss that cannot be quickly replaced due to the specifics of scientific work. One of the reasons for the destruction of the human resources potential of science became the rapid reduction in government spending on research and development, which led to the flow of highly qualified employees to other areas of economic activity. The effectiveness of scientific research and development depends on a number of factors, which, in addition to the qualification of personnel, include the institutional organization of science, infrastructure support, and above all, the degree of sensitivity of the economy to scientific results. From the point of view of the latter factor and a qualitative assessment of the effectiveness of the research, it is necessary to consider the indicators assessing the final results of intellectual activity, particularly, the receipt of patent applications and the issuance of protection documents in Russia (see figure 3). This indicator also reflects the level of the country's innovation potential.



The source: compiled by the authors according to the data of Rosstat

**Figure 3.** The correlation of entered patent applications and patents



Traditionally, a large share of patents in Russia falls on universities and research institutes giving the economy breakthrough ideas and innovative products. However, the best ideas may not be in demand by the market and business entities, so the economic sense of conducting such developments is lost (Nikitskaya et al., 2019). According to the estimates of some experts, only 1 invention out of 500 patented ones is successfully implemented in real production (Dondukov, Vorontsov, 2000; Semenov, 2007). At the same time, industrial enterprises are in urgent need of advanced technologies that would ensure their competitiveness in world markets.

## DISCUSSION

Having considered some features of the development of digitalization processes at the level of individual states, having analyzed certain indicators characterizing non-digital factors of digitalization of the Russian economy, it is possible to identify a number of both positive and negative consequences connected with the manifestation of the digital trend in the economy. As possible positive consequences of the digitalization of the economy, we should first of all include a reduction in production costs, as N. Negroponte also wrote, the competitiveness and profitability of activities are also increased due to the occurrence of new forms of business and the acceleration of business processes, and many other things. However, despite all the possible positive effects, for Russia, the trend towards digitalization of the economy is inextricably linked with the challenges associated with Russia's lagging behind a number of Western countries in a number of indicators. The challenges also include national and information security of the country on the world stage, as well as competitiveness in the global market. The most serious negative consequences of digitalization of the Russian economy include: a significant reduction in the number of jobs, as well as the problem of large-scale retraining of personnel to meet the requirements of the new economy, the appearance of unscrupulous users of digital services (for example, "piracy" and digital fraud). If the situation does not change radically, Russia will be deprived of the prospects for further innovative development.

## CONCLUSIONS

Based on the results of the research, we can say that in recent years, Russia has been actively developing its digital economy. At the same time, at the global level, Russia is noticeably lagging behind economically developed countries: the country's digital sector is still relatively small, and there is a lag in such indicators as the number of knowledge-intensive enterprises and the share of the population employed in the ICT sector. At the moment, the share of the digital economy in Russia's GDP is about 4%. Based on the development goals, all necessary institutional and infrastructural conditions should be created, as well as obstacles and restrictions on the creation and development of a high-tech economy should be eliminated. The exponential growth of mobile communication and the number of Internet users, the contribution of information and communication technologies to economic growth, job creation, the restructuring of

companies and businesses in general, and the accelerated development of e-commerce contribute to the transition to the knowledge society.

The digital economy requires expanding knowledge about new products and services, increasing the importance of learning and innovation, globalization, and sustainable development. A huge amount of information changes the way markets function, allowing enterprises to restructure and prepare new opportunities to create value based on the information available. The digital economy defines a new level of management with an emphasis on transparency of processes and management in decision-making based on the accuracy and completeness of data. Digital technologies enable the collection and processing of large amounts of information and stimulate innovation, which gives organizations more opportunities and incentives to improve the quality and efficiency of their work. However, the role and significance of non-digital factors in digitalization cannot be understated. The level of human potential, the personnel composition of the economically active population, the intensity of research and development – all these are the most important factors for stimulating the development of the digital economy. With only digital advantages, no state will be able to implement fully its digital development agenda.

## ACKNOWLEDGEMENT

The article was prepared with the financial support of the Russian Foundation for Basic Research (RFBR) in the framework of the scientific project No. 18-010-00986 A “Research of institutional conditions and organizational and economic mechanisms for overcoming innovative inhibition at the regional and municipal levels” (2018-2020)..

## REFERENCES

- 1 Cedefop. (2016). Digitalisation and Digital Skill Gaps in the EU Workforce. Retrieved from: [http://www.cedefop.europa.eu/files/esj\\_insight\\_9\\_digital\\_skills\\_final.pdf](http://www.cedefop.europa.eu/files/esj_insight_9_digital_skills_final.pdf).
- 2 Digital Planet. (2017). How competitiveness and trust in digital economies vary across the world. Retrieved from: [https://sites.tufts.edu/digitalplanet/files/2020/03/Digital\\_Planet\\_2017\\_FINAL.pdf](https://sites.tufts.edu/digitalplanet/files/2020/03/Digital_Planet_2017_FINAL.pdf).
- 3 Dondukov, A.N., Vorontsov, V.A. (2000). The scientific and technical sphere of Russia is on the brink of a new century. *Information society*, 6, 3-6.
- 4 Eurostat. (n.d.). The digital economy and society: data base. Retrieved from: <https://ec.europa.eu/eurostat/web/digital-economy-and-society/data/database>.
- 5 Gartner. (2018). 4 Steps to Develop Digital Dexterity in Your Workplace. Retrieved from: [https://www.gartner.com/binaries/content/assets/events/keywords/digital-workplace/pcce13/4\\_steps-infographics-3.pdf](https://www.gartner.com/binaries/content/assets/events/keywords/digital-workplace/pcce13/4_steps-infographics-3.pdf).
- 6 Graham, M., Woodcock, J. (2018). Towards a fairer platform economy: Introducing the Fairwork Foundation. *Alternate Routes*, 29.
- 7 Greve, B. (2019). The digital economy and the future of European welfare states. *International Social Security Review*, 72, 79– 94.

- 8 Johnston, H., Land-Kazlauskas, C. (2018). Organizing on-demand: Representation, voice, and collective bargaining in the gig economy (Conditions of Work and Employment series, No. 94). Geneva: International Labour Office.
- 9 Manyika, J. (2017). A future that works: Automation, employment and productivity. San Francisco: McKinsey Global Institute.
- 10 Mckinnon, R. (2019). Introduction: Social security and the digital economy – Managing transformation. *International Social Security Review*, 72, 5-16.
- 11 National index of development of the digital economy: Pilot implementation. (2018). Moscow: State corporation "Rosatom".
- 12 Negroponte, N. (1995). *Being Digital*. New York: Alfred A. Knopf. Retrieved from: <http://web.stanford.edu/class/sts175/NewFiles/Negroponte.%20Being%20Digital.pdf>.
- 13 Nikitskaya, E.F., Valishvili, M.A., Ivanova-Shvets, L.N., Astapenko, M.S. (2019). Institutional conditions and organizational and economic mechanisms of innovation activity development in Russia: monograph. Moscow: the Publishing House "Creative economy".
- 14 OECD. (2018). *Transformative Technologies and Jobs of the Future*. Background report for the Canadian G7 Innovation Ministers' Meeting Montreal, Canada 27–28 March 2018. Retrieved from: <https://www.oecd.org/innovation/transformative-technologies-and-jobs-ofthe-future.pdf>.
- 15 Semenov, T. (2007). Legal regulation of the innovation process: problems and contradictions. *Problems of management theory and practice*, 7, 78-84.
- 16 The decree of the Government of the Russian Federation № 1632-R. (July 28, 2017). On approval of the program "The digital economy of the Russian Federation".
- 17 The Decree of the President of the Russian Federation № 203. (May 9, 2017). "On the strategy for the development of the information society in the Russian Federation for 2017-2030".
- 18 The G20 program for the Development and Cooperation in the Field of the Digital Economy. (n.d.). Retrieved from: <http://www.eurasiancommission.org/ru/act/dmi/workgroup/materials/Pages>.
- 19 The Global Competitiveness Report. (2019). Retrieved from: [http://www3.weforum.org/docs/WEF\\_TheGlobalCompetitivenessReport2019.pdf](http://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf).
- 20 The World Development Report. (2016). *Digital dividends: Overview*. Washington: The World Bank. Retrieved from: <https://openknowledge.worldbank.org/bitstream/handle/10986/23347/210671RuSum.pdf>.
- 21 Urmantseva, A. (2017). Digital economy: how experts understand this term. RIA Nauka. Retrieved from: <https://ria.ru/20170616/1496663946.html>.
- 22 Zemtsov, S.P. (2018). Potential robotization and the economy of ignorance in Russian regions. XIX April International Scientific Conference on the problems of economic and social development. Moscow: The National Research University Higher School of Economics.