

DIGITAL TRANSFORMATION OF THE RUSSIAN ECONOMY: RISKS, PERSPECTIVES AND SCENARIOS OF THE INNOVATIVE DEVELOPMENT OF THE INDUSTRY

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Abstract

The goal of the paper is to present the results of the authors' research focused on the innovative and technological development of the Russian economy and define risks, perspectives and scenarios of the innovative development of the Russian industry. Achieving the goal of the paper is based on the analysis of the development of advanced technologies in Russia under the conditions of the advancing technological revolution. The results show a low share of high-tech production in the country's gross domestic product and a growing gap between Russia and leading countries in the field of digitization. The results allowed authors to define a number of problems that significantly limit the modernization of the Russian economy and that will be addressed by the traditional sectors of the Russian economy in the next decade. The main measure of success should be the rational choice of the optimal trajectory of the industrial and technological development of the country between "evolutionary" and "revolutionary" scenarios. The results indicate that the most appropriate scenario for the accelerated technological development in Russia is a combination of activities focused on the modernization of traditional industries and the development of new high-tech industries.

Key words: industrial revolution, digital economy, technological development, Russian Federation

JEL Code: L50, O32, O38

Introduction

The intensive development of new technologies leads to radical changes in world markets, approaches to industrial production or socio-economic conditions (Sekerin & Gorokhova, 2016). These changes are so crucial that the world may be experiencing the greatest technological transformation in its history (Li, Hou, & Wu, 2017) when natural wealth and

cheap labour cease to be the main factors of growth (Šikýř, 2015). These changes are referred to as the "new industrial revolution", which is based on the transition to high-performance flexible manufacturing (Idrisov, Knyaginina, Kudrin, & Rozhkova, 2018). New approaches to manufacturing are based on automation and robotics (Betelin, 2018), as well as on the intellectualization of production processes (Veselovsky & Kirova, 2017). New technologies should provide a fundamentally different quality of growth (Seth, Geshmukh, & Vrat, 2005; Koners & Goffin, 2007).

1 Goal and method

The goal of the paper is to present the results of the authors' research focused on the innovative and technological development of the Russian economy and define risks, perspectives and scenarios of the innovative development of the Russian industry.

Achieving the goal of the paper is based on the analysis of the development of advanced technologies, parameters of digitization and risks of technological development in Russia using empirical data on the digitization of foreign economies available in the scientific literature and the statistical data characterizing the state of development of the digital economy in Russia and provided by the Russian Federal State Statistics Service (Rosstat) and other Russian and international organizations. To formalize and summarize the results of the research, comparative, abstract-logical, inductive-deductive and statistical methods were used. Based on this data, it was possible to define priorities and scenarios of the technological development of the Russian economy. The results of the authors' research were summarized in the monograph published in 2017 (Veselovsky & Kirova, 2017).

2 Results

The results of the authors' research are presented in three parts, focusing on: 1) the current state of technological development of the Russian economy in connection with the coming new industrial revolution; 2) risks of the technological backwardness of the Russian economy in the global world; 3) priorities and possible scenarios of the technological development of the Russian economy.

2.1 The current state of technological development of the Russian economy in connection with the coming new industrial revolution

The analysis of the world technological development shows the critical lag of Russia behind the leading countries in the development of advanced technologies that are the basis element of the new industrial revolution.

According to Rosstat, following the results of 2016, the number of developed advanced production technologies in Russia was 1,534 units, of which the number of new ones for Russia was to 1,342 units, and the number of principally new ones was 192 units. At the same time, the number of advanced manufacturing technologies used in Russia as a whole was significantly higher - 232,338 units. These data correlate with the fact that machines and tools are mainly imported to Russia. According to the Federal Customs Service, they represent most of Russian imports - 50.2% in 2016 (Knyaginina et al., 2017)

In this context, in Russia, there is a considerable delay in developing new industries and markets. Despite the gradual revival of the Russian economy, there is still a low share of high-tech industries in GDP. In 2016, according to Rosstat, this share was only 22.4% of the total output of the country. In addition, Russia lags behind the leaders of the new technological revolution in numbers of registered patents in automation and robotics. The annual spending on research and development in Russia is about 1.1% of GDP, while in countries of leaders of the new technological revolution it is about 3.0-4.0% of GDP (Knyaginina et al., 2017).

Russia also lags behind the leaders of the new technological revolution in such key parameters as digitalization (Hermann, Pentek, & Otto, 2016). From 2011 to 2015, the volume of Russia's digital economy has increased from 2.0 to 3.2 trillion roubles or from 2.6% to 3.9% of GDP. However, in the US, China and EU countries, this figure is 2-3 times higher (10.9%, 10.0% and 8.2%). In terms of the level of digitization of private companies, Russia also lags behind the leading countries. The volume of Russian private companies' investment in digitization is only 2.2% of GDP, while in the US it is 5%, in Western Europe 3.9%, and in Brazil 3.6%. In 2016, the digitization index of the Russian economy and society was 0.47, while the EU average was 0.54. According to the Eurasian Economic Commission, the potential of Russian digital platforms is mainly focused on information and communication technologies, e-commerce, services and finance (Chaudhari, Parker, & Van Alstain, 2017). On the other hand, in certain parameters of the digitization of the society, Russia overtakes some leaders of the new technological (see figure 1 and 2).

According to experts, Russia has all the preconditions to triple the digital economy by 2025: a solid scientific base, a quality higher vocational education system and created capacity of the internal market for digital solutions. These facts promise that at the beginning of the Fourth Industrial Revolution, which is based on digital technology, Russia uses its unique chance to realize its potential and become one of the world leaders in the digital revolution.

Fig. 1: The average number of devices connected to the internet in selected countries (units per person)

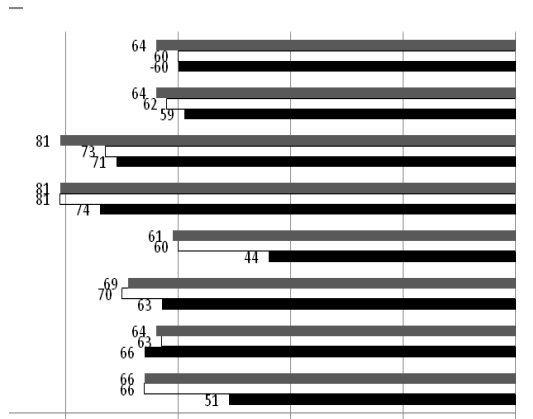
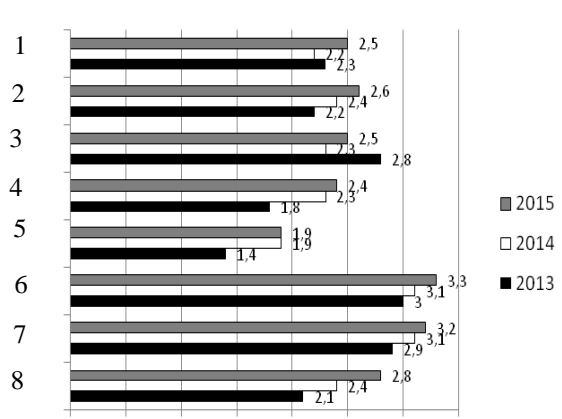


Fig. 2: Percentage of people daily using internet access in selected countries (%)



1- France 2 – Germany 3 – South Korea 4 – Japan 5 – China
6 – United Kingdom 7 – United States 8 – Russian Federation

Source: Google Consumer Barometer

The economic effect of the digitalization of the national economy will increase the country's GDP. The volume of the Russian digital economy could rise three times from 3.2 trillion roubles in 2015 to 9.6 trillion roubles by 2025 (at 2015 prices), and the share of the digital economy in Russian GDP could increase from 3.9% to 8-10%, which is 19-34% of the overall GDP growth. The main drivers of Russian GDP growth by 2025 are as follows:

- The optimization of production and logistics operations and routes.
- The increase of the effectiveness of the labour market by using modern technologies for effective recruitment, and the creation of new job opportunities.
- The increase of the effectiveness of the research and development, the development of high-tech products and fast prototype technologies, and the improvement of the quality control.
- The optimization of the utilization of all available resources.

In general, speaking about digitization, the Russian economy has high potential, but the introduction of new technologies is very slow (Gorokhova & Sekerin, 2016). The processes of digitization affect mainly the service sector, not the industry sector (Knyaginina et al., 2017).

2.2 Risks of the technological backwardness of the Russian economy in the global world

Russia faces global challenges related to the development of new markets, technologies and products. These processes are accompanied by a number of risks whose ignorance may threaten the technological development in Russia. Risk of the technological backwardness of the Russian economy in the global world can be divided into three categories.

The first category includes risks related to the structural characteristics of the current economic system in Russia:

- The risk of increasing structural imbalances in the national economy related to the decreasing exports of raw materials.
- The risk of maintaining a high dependence of the national economy on imports. According to the Ministry of Industry and Trade of Russia, in 2015, the level of import dependence in the automotive industry was 44%, in the shipbuilding industry 55%, in agricultural machinery 56%, in oil and gas engineering 60%, in light industry 70%, in medical industry 80%, and in aircraft industry 92%.
- The risk of shortage of own resources and technologies.

The second category includes risks related to the development of human capital and the modernization of the labour market:

- Risks related to the transformation of demographic characteristics of the population and, as a result, drastic changes in the labour market and social and health sector. The main risk is related to the aging of the population, which leads to the lack of workforce and to the slowdown in the growth of the economy.
- Risks related to the inability to transform the potential of the human capital and the results of the research and development into technological innovations.

The third category includes risks related to the absence of an effective system of managing the modernization of the national economy:

- The risk of the inability of legislation to respond to changes related to the technological modernization and digitization of key industries and critical infrastructures.
- The risk of the inability to effectively manage research and development activities and prevent the outflow of qualified people.

Some risks also relate to an effort to make radical changes and to quickly apply new technologies (Sawhney, Wolcott, & Arroniz, 2006). The implementation of the policy of technological development is difficult to align with current priorities focused on raising the standard of living of the population and supporting social services. At the same time, it should be noted that without full transformation of the technological infrastructure, it will not be possible to increase economic growth in Russia.

Fulfilling these risks could threaten Russia's competitiveness on both the world and the internal markets. Obstacles to the technological development in Russia include insufficient demand for results of the research and development, insufficient integration of global technology trends or a lack of modern scientific and industrial facilities.

2.3 Priorities and possible scenarios of the technological development of the Russian economy

One of the top priorities over the next ten to fifteen years in Russia should be a productive integration into the new technological revolution and a change in the traditional structure of the Russian economy - oil, gas and other raw materials extraction, chemical industry, metallurgy, engineering and other manufacturing, trade, finance, agriculture. Traditional sectors of the Russian economy will be forced to solve fundamental problems in the next ten to fifteen years: 1) maintaining competitive positions in national and world markets; 2) increasing productivity and speeding up modernization; 3) introducing new manufacturing technologies; 4) changing existing business models; 5) developing innovations.

The transition of the Russian economy to the new technological level will require a number of different measures - technological modernization of traditional industries, development of new high-tech industries and markets, reorganization of research and development institutions, development of human capital and transformation of the labour market or digitization of the economy. The realization of these measures is possible in two development scenarios that can be called "evolutionary" and "revolutionary".

The evolutionary development (technological adaptation) means deep modernization and technological optimization of existing industries. This type of development is characterized by a number of measures on the level of state policy: application of reverse engineering and state support when entering new markets, solving problems of product certification and standardization of emerging markets, cooperation of Russian businesses with foreign partners, efforts to break through the world markets. When implementing this development scenario, the structure of the Russian economy will not change fundamentally over the next ten to fifteen years.

The revolutionary development (technological breakthrough) means a process of advanced development based on the creation of new technological industries (Schuh, Potente, Wesch-Ponte, Weber, & Prote, 2014). This scenario assumes that the concepts of all new markets are not yet known (Westerman, Bonnet, & McAfee, 2014). In this context, for Russia, it does not make sense to try to break through the markets that are already developing, but try to break through the completely new markets (Schuh, Potente, Wesch-Ponte, Weber, & Prote, 2014). When implementing this development scenario, the structure of the Russian economy can change significantly over the next ten to fifteen years. This scenario also assumes the important role of the state in helping Russian businesses develop a new global market. The best form of this scenario of the technological development in Russia is the creation of a new technological structure consolidating the scientific and technological potential of Russian regions and being able to minimize crisis factors in the Russian economy through the introduction of high technologies reducing dependence on the energy sector and contributing to the development of the Russian economy (see figure 3).

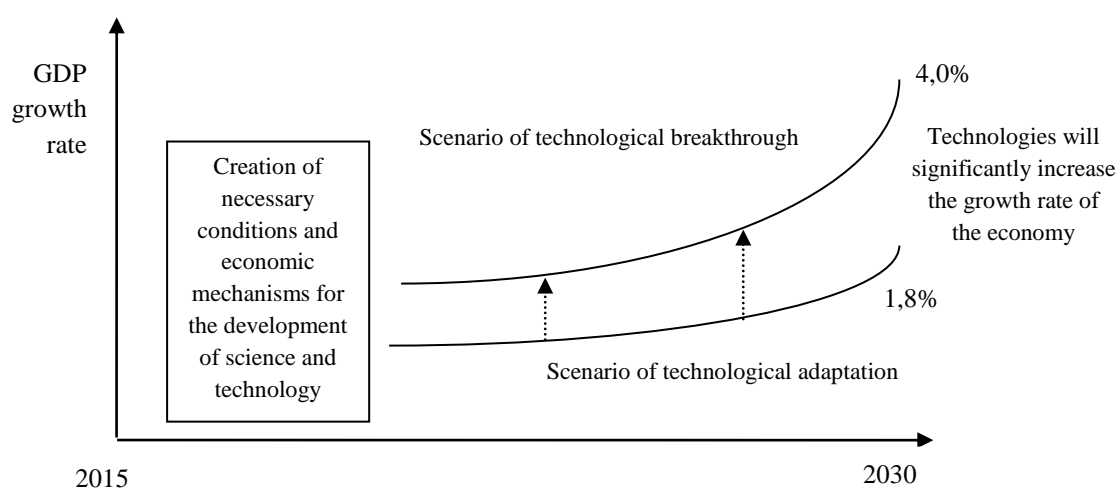
An important feature of scientific and technological development is that none of the possible scenarios are likely to be realized in a "clean form". The most realistic is the development in which, over a certain period, the conditions corresponding to one or the other scenario will prevail, which will depend mainly on the quality of the scientific, technical and innovation policy. The realization of possible scenarios will depend on factors of Russia's scientific and technological development, including:

- The focus on increasing global competitiveness, including increasing effectiveness of the research and development and its human, material and technical base.
- The stimulation of demand for scientific and technological results, including the creation of a business environment suitable for innovation activities.

- The development of mechanisms for prioritizing research and development focused on addressing the most important socio-economic and environmental challenges, ensuring national security and sustainable growth.
- The improvement of the quality of scientific, technical and innovation policies and the development of mechanisms for assessing the effectiveness of their implementation.

The implementation of these measures will create the right conditions for a technological breakthrough in the Russian economy, which can give the country the status of an exporter of ideas and high-tech technologies.

Fig. 3: Average annual GDP growth rate of Russia, depending on the scenarios of scientific and technological development



Source: (Veselovsky & Kirova, 2017)

Conclusion

Technological development of Russia towards the digital economy is a big challenge and its successful realization is connected with solving complex problems - creating a unified national system of standards for the digital economy, developing model architectures for highly automated and robotic intelligent digital production, creating a suitable digital infrastructure, introducing special education programs.

The paper shows the current state of technological development of the Russian economy in the context of the new industrial revolution and the risk of the technological backwardness of the Russian economy in the global world. It was found that ignoring these risks could lead to stagnation in the technological development of the Russian economy.

Therefore, the priorities and possible scenarios of the technological development of the Russian economy were defined. It was shown that none of possible scenarios would be realized in a "clean form" and that the realization of possible scenario will depend on factors of scientific and technological development of Russia.

References

- Betelin, V. B. (2018). Challenges and Opportunities in Forming a Digital Economy in Russia. *Herald of the Russian Academy of Sciences*, 88(1), 1-6.
- Gorokhova, A. E., & Sekerin, V. D. (2016). Growth of the Russian Industrial Companies Efficiency at Transformation of National Innovative System. In T. Loster & T. Pavelka (Eds.), *The 10th International Days of Statistics and Economics*, (pp. 494-503). Retrieved from https://msed.vse.cz/msed_2016/article/113-Gorokhova-Anna-paper.pdf.
- Hermann, M., Pentek, T., & Otto, B. (2016). Design Principles for Industrie 4.0 Scenarios. *The 49th Hawaii International Conference on System Sciences*, (pp. 3928-3937).
- Chaudari, S. P., Parker, D., & Van Alstain, M. (2017). *Revoliutsiya platform. Kak setevye rynki meniaiut ekonomiku i kak zastavit ikh rabotat na vas*. Moscow: Mann Ivanov i Ferber.
- Idrisov, G. I., Knyagin, V. N., Kudrin, A. L., & Rozhkova, E. S. (2018). New Technological Revolution: Challenges and Opportunities for Russia. *Voprosy Ekonomiki*, 4, 5-25.
- Knyagin, V. N. et al. (2017). *Novaya tekhnologicheskaya revoliutsiya*. Moscow: Tsentr strategicheskikh razrabotok.
- Koners U., & Goffin K. (2007). Manager's Perceptions of Learning in New Product Development. *International Journal of Operations and Production Management*. 27(1), 49-68.
- Li, G. P., Hou, Y., & Wu, A. (2017). Fourth Industrial Revolution: Technological Drivers, Impacts and Coping Methods. *Chinese Geographical Science*, 27(4), 626-637.
- Sawhney, M., Wolcott R. C., & Arroniz I. (2006). The 12 Different Ways for Companies to Innovate. *MIT Sloan Management Review*, 47(3), 75-81.
- Sekerin, V. D., & Gorokhova, A. E. (2016). Assessment Technique of Innovative Production Competitiveness. In T. Loster & T. Pavelka (Eds.), *The 10th International Days of Statistics and Economics*, (pp. 1627-1636). Retrieved from https://msed.vse.cz/msed_2016/article/123-Sekerin-Vladimir-paper.pdf.
- Seth, N., Geshmukh, S. G., & Vrat, P. (2005). Service Quality Model: A Review. *International Journal of Quality and Reliability Management*. 9(22), 913-949.
- Schuh, G., Potente, T., Wesch-Ponte, C., Weber, A. R., & Prote, J. P. (2014). Collaboration Mechanisms to Increase Productivity in the Context of Industrie 4.0. *Procedia CIRP*, 19, 51-56.

Šikýř, M. (2015). Best Practice Approach to Human Resource Management. In Loster, T., Pavelka, T. (Eds.), In T. Loster & T. Pavelka (Eds.), *The 9th International Days of Statistics and Economics*, (pp. 1405-1414). Retrieved from https://msed.vse.cz/msed_2015/article/63-Sikyr-Martin-paper.pdf

Veselovsky, M. Y., & Kirova, I. V. (Eds.). (2017). *Sovershenstvovanie mekhanizmov povysheniia innovatsionnoi aktivnosti promyshlennykh predpriatii*. Moscow: Izdatelstvo Nauchnyi consultant.

Westerman, G., Bonnet, D., & McAfee, A. (2014). *Leading Digital: Turning Technology into Business Transformation*. New York: Harvard Business Review Press.

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