**Artículo de investigación**

# Condition and Prospects of Innovation-Driven, Scientific and Technological Development of the Regional Industry in Russia

Состояние и Перспективы Инновационного и Научно-Технологического Развития Региональной Промышленности России

Estado y perspectivas de desarrollo innovador y científico-tecnológico de la industria regional de Rusia

Recibido: 1 de mayo de 2019. Aceptado: 8 de junio de 2019

Written by:
**Mikhail Yakovlevich Veselovsky**[85]
ORCID ID: 0000-0002-1078-3235
https://elibrary.ru/author_items.asp?authorid=287841
**Marina Alexeevna Izmailova**[86]
ORCID ID: 0000-0001-7558-9639
https://elibrary.ru/author_items.asp?authorid=330964
**Igor Viktorovich Balynin**[87]
ORCID ID: 0000-0002-5107-0784
https://elibrary.ru/author_items.asp?authorid=713998
**Natalia Sergeevna Sergienko**[88]
ORCID ID: 0000-0001-9042-8454
https://elibrary.ru/author_items.asp?authorid=550093

**Abstract**

Results of the analysis of innovation-driven, scientific and technological development of Russian regions are provided in the article, which allow to identify regional leaders in this area, estimate their potential for the country's economic growth, and understand possibilities of the regions lagging behind in innovation-driven, scientific and technological development for their establishment as new landmarks of scientific and technological progress. Content of the scientific approach to assessing the level of innovation-driven growth of the Russian economy sectors is described in detail based on characteristics of the four innovative archetypes of sectors: performance, engineering, scientific, and consumer. The unevenness of the sectoral development is shown both within one innovation archetype and in the whole sector, based on the calculation of the relative market share index for the Russian economy sectors. Description of the specifics and success factors of the innovation process for each of the innovative archetypes of

**Аннотация**

В статье приводятся результаты анализа инновационного и научно-технологического развития российских регионов, дающего возможность выявить в этой сфере региональных лидеров и оценить их потенциал для экономического роста страны, а также осмыслить возможности отстающих в инновационно-научно-технологическом развитии регионов в становлении их в качестве новых точек научно-технического прогресса. Обстоятельно раскрывается содержание научного подхода к оценке уровня инновационного развития отраслей российской экономики на основе характеристик четырех инновационных архетипов отраслей – эффективности, инженерного, научного, потребительского. На основе расчета индекса относительной рыночной доли отраслей российской экономики показана неравномерность отраслевого развития как в границах одного инновационного архетипа, так и в целом по

[85] University of technology, Gagarin street, 42, Korolev, Moscow region, 141070, Russia
[86] Federal State-Funded Educational Institution of Higher Education Financial University under the Government of the Russian Federation, Leningradsky prospect, 49, Moscow, 125993, Russia.
[87] Federal State-Funded Educational Institution of Higher Education Financial University under the Government of the Russian Federation, Leningradsky prospect, 49, Moscow, 125993, Russia.
[88] Federal State-Funded Educational Institution of Higher Education Financial University under the Government of the Russian Federation, Leningradsky prospect, 49, Moscow, 125993, Russia.

sectors is provided. It is emphasized that the criticality ranking for success factors associated with the demand for innovation and the innovation proposals is defined by the archetype of innovations, each requiring a special approach from the state and private business. Results of a comparative analysis of possible scenarios for the innovation-driven growth of the national economy and their forecast results are provided, with due consideration for the leading trends in economic development in the national and global markets. The necessity of the scientific and technological modernization of the Russian economy towards the model of innovation-driven growth is substantiated. Conclusions are made about the inevitability of Russia's transition to a new technological paradigm, which requires the formation of a new scientific, innovation-driven and industrial policy focused on innovation and technological renewal of the entire economic landscape, making the economy truly innovative.

**Keywords:** innovations, innovation-driven growth, scientific and technological development, innovative archetypes of sectors, development scenarios, regions, industry.

отраслям. Приводится описание специфики и факторов успеха инновационного процесса для каждого из инновационных архетипов отраслей. Подчеркивается, что степень критичности факторов успеха, связанных со спросом на инновации и с предложением инноваций, определяется архетипом инноваций, для каждого из которых требуется особый подход со стороны государства и частного бизнеса. Представлены результаты сравнительного анализа возможных сценариев инновационного развития национальной экономики и их прогнозных результатов с учетом ведущих трендов экономического развития на национальном и глобальном рынках. Обосновывается необходимость научно-технологической модернизации российской экономики на пути к модели инновационного развития. Делается вывод о неизбежности перехода России к новому технологическому укладу, требующему формирования новой научной, инновационной и промышленной политики, ориентированной на инновационно-технологическое обновление всего хозяйственного ландшафта, придающего экономике действительно инновационный характер.

**Ключевые слова:** инновации, инновационное развитие, научно-технологическое развитие, инновационные архетипы отраслей, сценарии развития, регионы, промышленность.

**Resumen**

El artículo presenta los resultados del análisis de la innovación y el desarrollo científico y tecnológico de las regiones rusas, lo que permite identificar líderes regionales en esta área y evaluar su potencial para el crecimiento económico del país, así como para comprender las posibilidades de las regiones que se encuentran rezagadas en materia de innovación, desarrollo científico y tecnológico. Como nuevos puntos de progreso científico y tecnológico. El contenido del enfoque científico para evaluar el nivel de desarrollo innovador de las ramas de la economía rusa se describe en detalle sobre la base de las características de los cuatro arquetipos innovadores de industrias: eficiencia, ingeniería, ciencia y consumo. Sobre la base del cálculo del índice de la cuota de mercado relativa de los sectores de la economía rusa, la desigualdad del desarrollo sectorial se muestra dentro de los límites de un arquetipo de innovación y en toda la industria. Se proporciona la descripción de los aspectos específicos y los factores de éxito del proceso de innovación para cada uno de los arquetipos innovadores de las industrias. Se enfatiza que el grado de criticidad de los factores de éxito asociados con la demanda de innovación y con la propuesta de innovaciones está determinado por el arquetipo de innovaciones, cada uno de los cuales requiere un enfoque especial por parte de las empresas estatales y privadas. Se presentan los resultados de un análisis comparativo de posibles escenarios para el desarrollo innovador de la economía nacional y sus resultados de previsión, teniendo en cuenta las principales tendencias del desarrollo económico en los mercados nacional y mundial. Se justifica la necesidad de la modernización científica y tecnológica de la economía rusa en el camino hacia el modelo de desarrollo innovador. Se concluye sobre la inevitabilidad de la transición de Rusia a un nuevo orden tecnológico, que requiere la formación de una nueva política científica, innovadora e industrial, centrada en la innovación y la renovación tecnológica de todo el panorama económico, dando a la economía un carácter verdaderamente innovador.

**Palabras clave:** innovaciones, desarrollo innovador, desarrollo científico y tecnológico, arquetipos innovadores de industrias, escenarios de desarrollo, regiones, industria.

**Introduction**

It is obvious that innovative processes involving industry, financial sector, and scientific educational environment are an efficient tool for general modernization in the context of a globalizing economy. Acceleration and expansion of innovative transformations inevitably necessitate abandoning obsolete products and technologies of activity, which are barriers to the progressive development of mankind. In this context, it is very important that all economic agents realize the importance of innovative transformations and strengthening of their innovative activity.

The purpose of this article is to analyze the condition of innovation-driven, scientific and technological development of Russian regions as a key factor in the country's economic growth. Special attention is paid to the issues of modeling innovative archetypes of economic sectors, where sources of innovation are identified in each of them, as well as to the results of a comparative analysis of success factors and prospects for innovation activities of Russian enterprises.

**Literature review**

The study is based on the main scientific-based approaches of foreign and domestic scientists, who communicate their scientific views on socioeconomic, innovation, and regional development in the context of large-scale scientific and technological progress. The study is based on the following: a concept of national innovative systems (Freeman, Soete, 1997) asa network of institutions in public and private sectors, operation and interaction of which generate, transform, and transfer new technologies; a theory of innovations (Schumpeter, 1995), which addresses the combinatorics of development transformations and provides a full description of the innovation process; process approach to understanding the essence of innovation as an idea implementation process and its transformation into a finished result (Glazyev, 2015); HR concept (Salleh, Goh, 2002); a theory of new regionalism (Hettne, 1999), which considers regional development through the lens of the globalization problem; and theory of territorial development (Markusen, 1987) in relation to the sustainable development of regions.

**Results**

Innovation-driven, scientific and technological development of Russian regions

Innovations and scientific and technological progress are among the key factors for the country's economic development in the modern society and, ultimately, for the growth of its citizens' well-being. Russia with its large industrial base and powerful scientific and technical potential is still inferior to world leaders in some high-tech fields at the moment. This can be proved by an extremely low proportion of organizations implementing technological innovations in the total number of organizations in the Russian Federation – it has been less than 9 % in the recent years (for comparison, this figure is often more than 40 % in developed European countries). The low development of innovative and high-tech industries affects the competitiveness and efficiency of the domestic economy and intensifies the country's dependence on imports of high-tech and innovative products and services.

At the same time, there has been a noticeable trend for the intensive development of the science and innovation sectors in Russia recently. However, there should be a steady demand for the development and implementation of advanced scientific, technical and technological solutions, which is very insignificant today due to the raw materials orientation of the Russian economy.

Although quite unevenly, scientific research, development of new technologies, and production of high-tech goods somehow take place in each region of the Russian Federation. This is due to the specifics of the regional economy and historical reasons. This is evidenced by the results of "Index of Scientific and Technological Development of Regions of the Russian Federation – Results of 2017" (Index of Scientific and Technological Development of Regions of the Russian Federation – Results of 2017, 2018) in accordance with which the corresponding rating of the regions is compiled. The analysis is based on indicators providing a comprehensive description of the state of the scientific and technological field in the constituent entities of the Russian Federation: the

availability and quality of the material and technical base as the foundation of scientific and technological progress; qualitative composition of human resources involved in the scientific and technological process; scale and efficiency of scientific and technological activities.

Analysis of the research results indicates that compared to the previous year, the top ten leaders did not change in 2017; according to 2017 results, their share in the all-Russian volume of innovative products shipped, innovative works and services performed, amounted to 55 %.

The top three leaders remain Moscow, St. Petersburg, and the Republic of Tatarstan. The share of these regions of the Russian Federation in the all-Russian volume of shipped innovative products, works, and services in 2017 amounted to about 24 %. The leading positions of Moscow and St. Petersburg naturally result from the historically established high level of development of the scientific and technological field, availability of the leading fundamental and applied research institutions, universities, and high-tech industries.

The Republic of Tatarstan is on the deserved third place in the index as one of the scientific centers and an intensively developing innovation zone of the country. The Kamsky innovation cluster makes a significant contribution to the growth of the innovation component of the republic. The sectoral specialization of the cluster is oil and gas processing, petrochemistry, and automotive industry. The cluster includes petrochemical, oil refining enterprises (Nizhnekamsk), automotive and vehicle assembly components production (NaberezhnyeChelny), as well as a research and educational complex represented by universities, industry-specific and research centers. Following the 2017 results, the Republic of Tatarstan ranks first in the country in terms of the volume of innovative goods shipped, works and services performed, and second by the share of organizations that carried out technological, organizational, and marketing innovations in the total number of organizations (the indicator value is over 22 %).

The top five leaders in the index of scientific and technological development also include the Nizhny Novgorod and Moscow regions. More than 90 organizations are involved in research and development in the Nizhny Novgorod region, including three institutes of the Russian Academy of Sciences, more than 60 branch research institutions, including the Russian Federal Nuclear Center under the All-Russian Research Institute of Experimental Physics. Besides, a modern infrastructure has been created in the region, which allows the existing high-tech industrial productions of the engineering, chemistry, and defense industries to successfully operate and ensure the growth of new companies. High-tech manufacturing in the aircraft building and space industry, defense industry, pharmaceutical and chemical industries are developed in the Moscow region, and there are a number of innovative regional clusters.

The top ten leaders in the index of scientific and technological development also include the Samara, Sverdlovsk, Tula, Tomsk and Perm regions. Compared to 2016, the top ten leaders did not change, but there was one shift: the Moscow region went up by one line, having forced the Samara region from the fifth position.

The regions where research and high-tech industries are poorly developed due to historical and geographical reasons are at the end of the ranking. The Republic of Ingushetia, the Nenets Autonomous Region, the Republic of Kalmykia, the Republic of Altai and the Chechen Republic are in the last lines.

The Krasnodar region and the Arkhangelsk region demonstrated the most rapid growth in ranking, compared to 2016. These regions went up in the index of scientific and technological development ranking by 14 and 12 lines, respectively. In particular, the share of organizations implementing technological innovations increased, the number of granted patents grew, the share of innovative products increased in the total volume of goods shipped, the share of high-tech and science-intensive industries in GRP increased, the share of expenditures on technological innovations increased in the total volume of goods shipped, the innovative activity of organizations intensified, and the volume of innovative goods produced increased in the Krasnodar region. The improvement in the position of the Arkhangelsk region was largely due to an increase in the share of innovative products in the total volume of goods shipped, GRP volume generated by high-tech and science-intensive industries per capita, an increase in the share of researchers under the age of 39 in the total number of researchers, and the share of expenditures on technological innovations in the total volume of goods shipped and innovative goods produced. Besides, the Kaliningrad region and the Republic of Crimea improved their positions by more than five lines – eight lines and six lines up, respectively.

The Republic of Buryatia lost most significantly in the index of scientific and technological development. Compared to last year, the region lost 13 positions and ranked 54th. The republic suffered an inhibition of innovative activity of organizations, a decrease in the share of organizations implementing technological innovations, the share of innovative goods in the total volume of goods shipped, the share of machinery and equipment under five years of age in the total value of machinery and equipment in organizations involved in R&D, the share of expenditures on technological innovations in the total volume of goods shipped, and the share of high-tech industries in gross regional product decreased. Aside from the Republic of Buryatia, the positions of the Sakhalin region, the Astrakhan region, the Komi Republic, the Altai region, and the Vologda region have suffered the most significantly. These regions lost more than five lines each, compared to last year.

Experts predict no significant changes in the composition of leaders and outsiders in the science and technology development index. This is due to the fact that acceleration of the scientific and technological development is a rather lengthy and labor-intensive process that requires the creation of an appropriate infrastructure and a scientific base, as well as highly qualified specialists (Shelomentsev et al., 2016). Besides, it is obvious that securing the demand for innovations within the country is a key factor in the successful formation and implementation of advanced scientific and technical solutions and new technologies, but requires significant changes in the general economy of the country. At the same time, the specifics of the Russian regions must be taken into account, as they often vary by the historically established features of development, dimension of the economy, and financial capabilities.

The review of another rating – the innovation development ranking of the Russian regions – revealed that the majority of Russian regions made up the group of medium and medium-weak innovators (29 and 23, respectively), only 26 regions were in the group of strong and medium-strong innovators (9 and 17, respectively), and seven were in the group of weak innovators (Rating of innovative Russian regions: version 2017, 2018) (Figure 1).

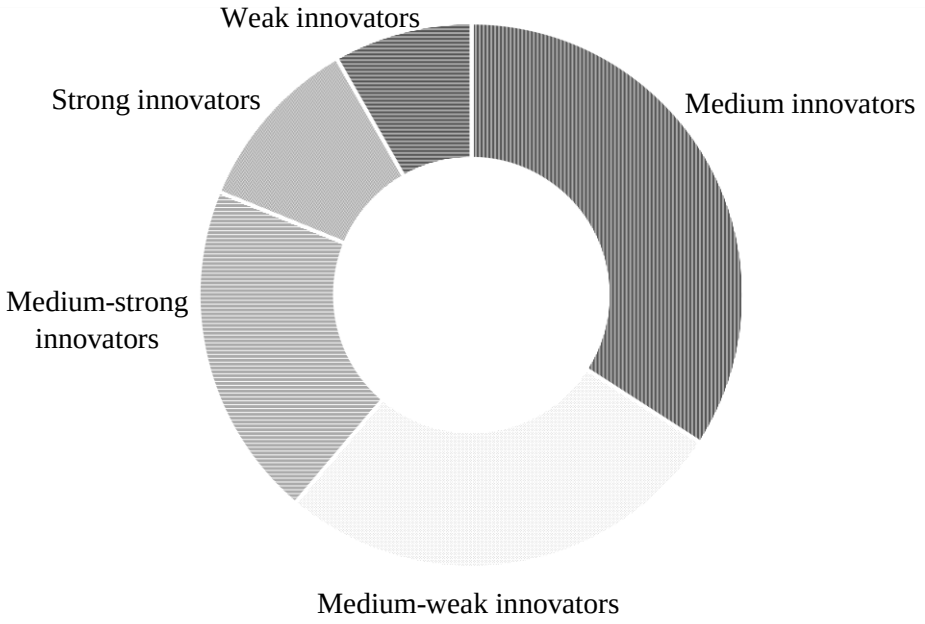


Figure 1. Distribution of Russian regions by groups of innovators

A comparative analysis of the ratings of innovations and scientific and technological development following the results of 2017 indicated a high degree of coincidence in the composition of the regions in both groups: leaders and outsiders. The three leaders of both ratings completely match in composition, but not in position: St. Petersburg is on the first place, Moscow is on the second place, and the Republic of Tatarstan is on the third place. The group of strong innovators with the index of innovation-driven growth in their regions more than 140 % of the national average is complemented by the following regions: the Tomsk, Novosibirsk,

Kaluga, Moscow, Ulyanovsk, and Samara regions. At the same time, the Ulyanovsk, Novosibirsk and Kaluga regions drop out of the top ten by the index of scientific and technological development, taking 12, 13 and 21 lines, respectively.

The weak innovators include seven regions of the Russian Federation. As before, this group includes: the Chukotka and Nenets Autonomous Regions, the Republic of Tyva and the North Caucasus region (the Republic of Ingushetia, the Chechen Republic, the Republic of Dagestan), and the Jewish Autonomous Region – this list fully corresponds to the rating of scientific and technological development.

High coupling of the ratings of scientific and technological development and the socioeconomic status of the Russian regions following the results of 2017 must also be noted, which is just another confirmation of the high correlation dependence of the general state of the economy and the living standard on the science and technology.

**Modeling of innovative archetypes of sectors**

To estimate the level of innovation-driven growth of Russian industries, the researchers (Innovations in Russia: an inexhaustible source of growth, 2018) suggest introducing a model of innovative archetypes of sectors, where they are segmented by the dominant source of innovations. Scientific developments based on research centers or companies, interaction with partners in the supply chain, inquiries from consumers, as well as efforts on improving efficiency can serve as a source of innovations (Figure 2).

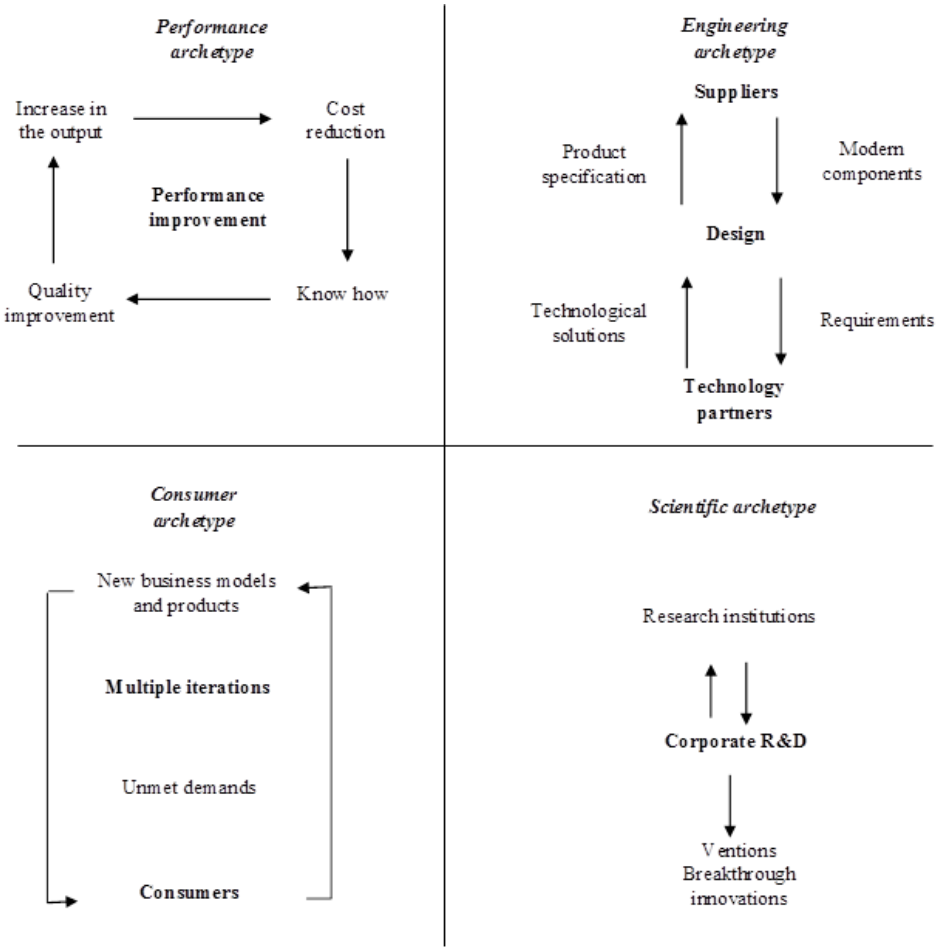


Figure 2. Archetypes of sectors by the prevailing type of innovation

It is fair to assume that the level of innovation in the country cannot be objectively assessed using only such indicators as the number of patents issued or articles published, because the development of innovations is determined by many factors (Schumpeter, 1995) and the importance of each of them is determined by the sectoral archetype. For example, the success of

scientific innovations is largely determined by the R&D expenditure volume, while large consumer markets or the speed of innovation introduction and dissemination are much more important for consumer innovations.

All sectors can be divided into four archetypes, based on the dominant source of innovation: scientific, engineering, consumer, and performance archetypes. Sectors belonging to the same archetype are described by common specifics – for example, a similar level of investment in R&D or the importance of infrastructural factors, which allows to detect patterns of the emergence and development of innovations. Such generalized approach allows to develop efficient recommendations for specific industries, because the peculiarities of the development of innovations peculiar to one archetype can be secondary for another.
The model of the sector archetypes can be regarded as a useful and universal tool taking the specifics of certain sectors of the economy into account, which can be used both at the level of national economy management and at the level of company management to develop strategies of innovation-driven growth (Freeman, Soete, 1997). Performance-oriented innovations are particularly relevant to capital-intensive and labor-intensive sectors, such as mining, oil and gas, wood processing, textiles, iron and steel, and agriculture, where investments in infrastructure, manufacturing, and equipment make up about a third of revenue with low marketing costs. The innovation process for a certain archetype is defined by the depth of understanding of production processes and products, which is capable of reducing costs while maintaining or improving quality. This assumes the introduction of innovative approaches to product development, supply chain, and manufacturing management. Availability of the developed ecosystem of partnerships that promotes efficient interaction among suppliers, manufacturers, and customers is also very important (Santo, 2005).

The engineering-driven innovations involve the design and creation of new products using the integration of technology with partners through a supply chain (Twiss, 2002). For example, the engineering archetype sectors include mechanical engineering, electric power industry, and construction. The level of R&D expenditure in these industries ranges from 3 % to 10 % of revenue, and the product life cycle is 5 – 10 years. Companies need professionally trained personnel and a business environment that provides reliable protection of intellectual property to achieve success: engineering innovations are often protected by patents. Availability of developed industrial clusters, as well as policies that promote greater access to global sources of technology, knowledge and high-quality personnel, also have positive impact on the development and introduction of innovations (Salleh, Goh, 2002).

Consumer-oriented innovations enable to satisfy their needs by ensuring supply of new products and services and the creation of alternative business models. Telecommunications, banks, trade, IT, transport, education, entertainment, food and textile industry are examples of sectors of this archetype. These sectors are described by high marketing costs – 3 to 7 % of revenue – and a relatively short period of product development. Since products and services in these sectors are largely focused on local needs and regulations, national companies here often have advantages over global players in developing and implementing innovations. The process of developing and introducing innovations in the industries of the consumer archetype is determined by the unmet demands of consumers, undeveloped markets and niches (Markusen, 1987). Access to large consumer markets and ability to quickly scale up innovations and improve products after they are introduced to the market are important in this case. High domestic demand for innovation, free access to capital, and legislation aimed at supporting entrepreneurship positively influence the activities of companies.

Research-driven innovations involve the development of new products based on the basic scientific research commercialization (Sawhneyet al., 2006). Some sectors, such as pharmaceuticals or petrochemicals, can spend 15 % to 30 % of their revenues on R&D. The process of developing and introducing innovations in these industries can include basic research and is described by a long cycle: it may take a decade or two from the time of the initial research to commercialization. This type of innovation often involves cooperation of companies and academic research centers both nationally and internationally. The long-term efforts required by scientific innovation necessitate a supportive environment. This includes tax policies that encourage long-term investments in R&D (providing companies with incentives, etc.), as well as strict measures to protect intellectual property to ensure that companies gain profits from sales of new products based on their inventions. Universities that conduct basic scientific research, train specialists, and provide conditions for scientific cooperation and exchange play a central role in

the development of this type of innovations and promote the emergence of new companies (Khoroshavina et al., 2018). As a rule, countries that provide state funding of basic research and science education succeed in scientific innovations. International competition, including for highly qualified personnel, plays an important role for the sectors of this archetype. In turn, the patented scientific developments and competencies of employees provide creators with a competitive advantage in the global market.

An analysis of the sectoral structure in various countries confirms the existence of one or two archetypes of sectors prevailing for a particular country. For example, China or Germany purposefully develop engineering and high-tech industries, and the success of sectors of this archetype is noticeable there, while the US and Brazil have succeeded in developing sectors of the consumer archetype (Hermann et al., 2016). However, despite general trends, more or less developed sectors can co-exist within one archetype in any country, and national regulators need to decide which sectors deserve attention in the first place. Both in Russia and globally, the development of industries even within one archetype is rather uneven, which is demonstrated by the Index of the relative market share of industries (calculated as the ratio of the share of Russian companies in the sector to Russia's contribution to the world GDP) (Figure3).

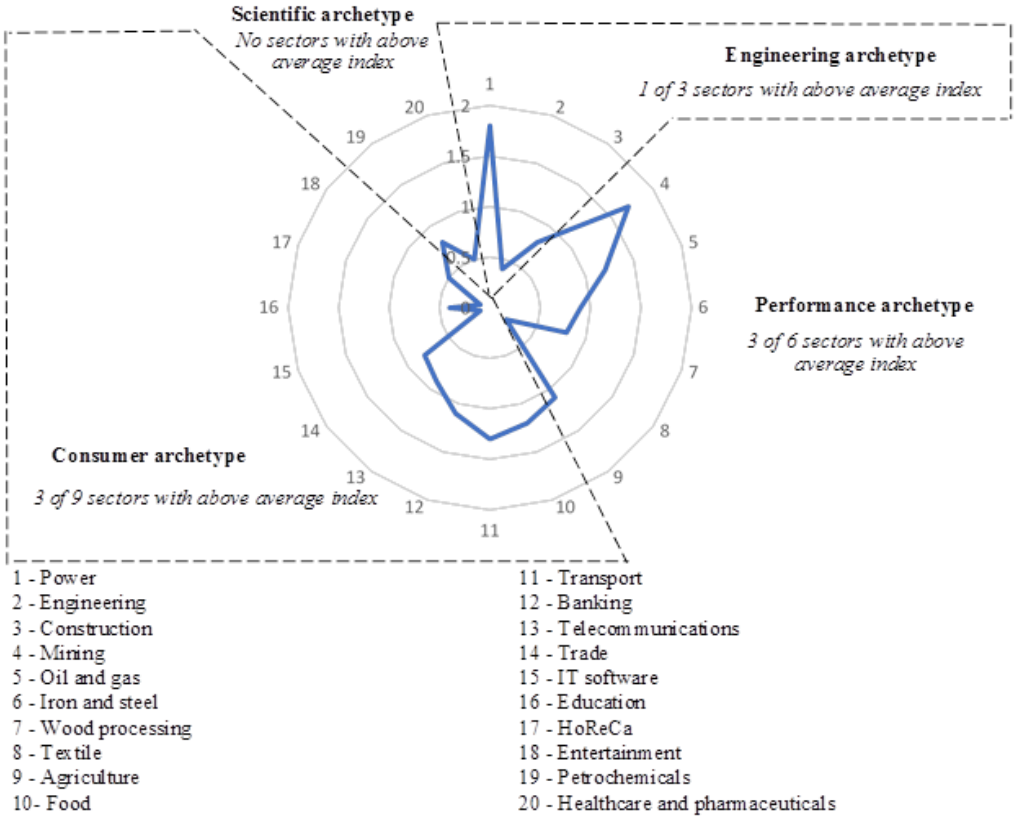


Figure 3. Index of relative market share of sectors, 2017

The most large-scale industries belonging to the performance archetype include oil and gas, mining and agriculture, which secure Russia's significant contribution to the global sectoral GDP. Other sectors of this archetype, such as iron and steel and wood processing industry, are somewhat inferior to them in their relative size on a global scale. Sectors of the consumer archetype include the banking sector, transport, and the food industry, which have reached a high level of development, as well as electric power industry in the sectors of the engineering archetype. The nature of the innovation process has significant impact on competition. Sustainable performance indicators are closely related to the presence of patented innovative developments for sectors belonging to the engineering and scientific archetypes. For example, it has been proved that the performance indicators of companies that have made

successful discoveries measured by the number of high-quality patents are higher than those of competitors with weaker knowledge in the field of proprietary medication production. As a rule, successful companies in such sectors are difficult to displace from the market, which makes the task of catching up with the leaders even more difficult for Russian manufacturers.

Patentable knowledge is not the main factor for success in the sectors of the consumer and performance archetypes. For example, there is no dependence of profit or revenue on the quality of knowledge or patents in the production of smartphones and solar panels. Profitability in this case is largely determined not by the very invention but by the speed of commercialization and the scalability of innovations, where the largest shares of industry profits are most often obtained by the companies that are the first to convey new ideas or technologies to the consumer (Koners, Goffin, 2007). In the development of sectors of this archetype, Russian producers have significant growth potential due to the large market volumes. Choosing areas for the innovations development, Russia should build up competences in sectors with strong competitive advantages first of all, as well as focus on developing promising selective areas with a strong human potential for the sector development and a significant demand for innovation from the state. Such sectors include petrochemicals and medicine, for example.

The above approach corresponds to the long-term forecast of the development of Russia, prepared by the Ministry of Economic Development (Forecast of socioeconomic development through to 2020, 2017), under which the country can claim to be a leader in aerospace engineering, atomic and hydrogen energy, nanotechnology, production of composite materials, development of biomedical technologies, some areas of rationalizing environmental management and protection, as well as some other areas.

**Success factors and prospects for innovation activities of Russian enterprises**

Analysis of the success factors of innovation activities indicates that the degree of their criticality is determined by the archetype of innovations, and each of the archetypes requires a different approach from the state and private businesses. Success factors can be divided into two groups: factors related to the demand for innovations, and factors determining the proposal of innovations. The first group includes both domestic demand from the company (resulting from increased competition in the industry, for example) and external demand from the state or end users. Factors of the second group are financing, availability of competences and technologies, infrastructure and culture of innovation development (Table 1).

Table 1. Success factors for innovation activities

| Succes factor | Description | Innovation source | | | |
|---|---|---|---|---|---|
| | | Performance innovations | Engineering innovations | Consumer Innovations | Scientific innovations |
| 1. Factors of demand for innovations | Domestic demand: the need to reduce costs due to increased market competition<br>External demand: capacious market with unmet demands; demand from the state or other significant customer | + | + | + | + |
| 2. Factors of innovation proposal | | | | | |
| 2.1 Financing | Domestic financing: R&D and payroll funds<br>External financing: banks and loan capital; state grant funds; venture funds, angel investors | + | | | + |
| 2.2 Competences | Domestic competencies and resources: in R&D, technology, marketing, and commercialization | | + | | + |

| | | | | |
|---|---|---|---|---|
| and technologies | External resources and labor market: universities, research institutions, access to best practices, ability to attract external competencies and technologies | | | |
| 2.3 Infrastructure | Domestic: systems and processes of innovation development<br>External: state institutions and support, innovations ecosystem in the country (property rights and legal system; openness of borders, availability of platforms for interactions between contracting companies and competence centers; ease of running business (tax regime, red tape level, business support measures, including start-up entrepreneurs); protection and certification systems | | + | + | + |
| 2.4 Culture | Internal culture of a particular company and the external culture of the entire ecosystem of the sector: willingness to change; risk taking, ambitious; long-term planning | + | | + | |

The above success factors can be implemented if there is a state policy aimed at encouraging demand for innovations and creating an environment for their generation. Such a policy at the stage of the digital economy formation can bring the country into the mainstream of the technological development of civilization (Glazyev, 2017). However, strategic documents disclosing conceptual approaches to the innovation-driven growth of Russia provide for the possibility of three scenarios unfolding for the innovation-driven growth of the country: the inertial scenario directs the economy to the purchase of imported technologies and equipment, reduction of government spending on the scientific and educational sector and innovation activity, which is accompanied by stagnation of payroll growth in the public sector; the catching-up development scenario assumes the economy modernization through the introduction of imported technologies and increasing the competitiveness of labor and capital in the international market by raising investments; government finances are invested in infrastructure projects and ensuring the payroll growth in the public sector; and the lead development scenario covering basic research and leading scientific and technological sectors will allow to modernize these areas, start exporting noncommodity products and achieve significant economic growth rates, which will generally ensure the competitiveness of the domestic economy. A noticeable increase in government spending on the development of human capital, research and innovation fields, and commercialization of the results of scientific and technical research (Strategy for the innovation-driven growth of the Russian Federation for the period through to 2020, 2011) are expected.

Analysis of the above scenarios with due consideration for the current situation in Russia and in the world, described by geopolitical and economic instability, reveals that the scenario of the lead development of Russia is considered the most adequate, as it includes some promising directions (Russia on the way to a modern dynamic and efficient economy, 2013): increasing capacity of industrial and technological potential, primarily through the development of the existing and the creation of new high-tech industries; transition to nonprimary specialization of the economy – inter alia, through the creation of high-tech processing plants for the production of competitive goods; implementation of import substitution programs with the support of domestic producers, increasing the efficiency of exports with the reducing imports, and motivating the growth of domestic consumer demand for domestic products; increasing energy and resource efficiency, efficiency of property management, development of infrastructure capable of minimizing transaction costs in all sectors of the economy; creating advanced development zones, where mega- and infrastructure projects can be implemented; raising internal and external investments based on sound decisions for the implementation of significant investment projects – inter alia, on the principles of public-private partnership; creating incentives for innovative activity of enterprises, reducing the polarization of regions through the development of a system of regional strategic management, and increasing the potential of subsidized

regions; improving the sustainability of the financial system, building flexible tariff, customs and tax policies, budgetary financial support for small and medium businesses; and providing guarantees of social protection of the population, solving demographic problems, etc.

The following conditions for achieving the desired results should be considered (Glazyev, 2015):

creating favorable conditions for the development of entrepreneurship and incentives of innovations in the country, attraction of professionals with creative thinking and aimed at creating innovative products in science and high-tech sectors;increasing the innovation and investment attractiveness of the country and strengthening its competitive positions on this basis;creating and developing economic environment that forms the demand for innovation; and successful implementation of innovation policy in the regions and throughout the country. In the context of risk and turbulent environment, a full range of measures that can help the Russian economy transit to an innovative path of development should be implemented based on informed managerial decisions.

**Discussion**

The applied importance of the research of innovation-driven, scientific and technological development of Russian regions is associated with the need to understand the current trends and possible scenarios of innovation-driven growth of Russia and its regions, the choice of the most priority and adequate option to the Russian conditions, as well as obtaining an objective assessment of chances of an innovative breakthrough of the country into the global technological space. The main tool for solving the task of Russia's entry into the top five global technological powers should be innovative modernization of the industry, financial, scientific, educational and social fields, based on the ability to generate and quickly transform modern knowledge into innovative products and technologies, take timely decisions in the production complex, and arrange the economy management at a qualitatively new level. At the same time, a new wave of modernization requires an influx and improvement of the investment quality, an increase in the number of participants in investment activities, a range of industries for investment, and a list of investment products (Leuz C., Nanda D., Wysocki P.D. 2003), which constitute state priorities today.

**Conclusions**

The conducted study convincingly indicates that the Russia's transition to a path of innovation-driven growth requires large-scale implementation of scientific, technical, and technological innovations, which are invariable attributes of an innovative economy that affirms the development vector from the embodied to primarily mental human work, which drastically modernizes the technical basis of production. The globalizing of the economy in the 21st century, increasing competition, shaping hypercompetitive environment, transnational business, erasing boundaries of information space, increasing innovation activity, public access to the modern information and communication technology, and transforming role of human resources typical for the post-industrial economy fundamentally change the basis and content of economic activity and bring it to a new level. This, in turn, requires a search for new mechanisms for the economy operation in the context of new innovation challenges.

**References**

Forecast of socioeconomic development through to 2020. Ministry of Economic Development of the Russian Federation, August 30, 2017. Retrieved April 28, 2019 from http://economy.gov.ru/wps/wcm/connect/54b630f2-8bff-4b50-8e28-342199e57eea/170830.pdf?MOD=AJPERES&CACHEID=54b630f2-8bff-4b50-8e28-342199e57eea.

Freeman C., Soete L. (1997). The Economics of Industrial Innovation, 3d. ed. London, Pinter, 345.

Glazyev S. (2017). Ekonomikabudushchego. Yest li u Rossiishans? [Economy of the future. Does Russia have a chance?]. Moscow, Knizhnyi Mir, 640.

GlazyevS.Yu. (2015). O neotlozhnykhmerakhpoukrepleniyuekonomicheskoybezopasnostiRossiiivyvodurossiyskoyekonomikinatrayektoriyuoperezhayushchegorazvitiya [About urgent measures to strengthen the economic security of Russia and withdrawal of the Russian economy to the priority development path]. Report. Moscow, Institute of Economic Strategies, Russian Biographical Institute, 60.

Hermann M., Pentek T., Otto B. (2016). Design Principles for Industrie 4.0 Scenarios. The 49th Hawaii International Conference on System Sciences, 3928-3937.

Hettne B. (1999). Globalization and the New Regionalism: The Second Great Transformation.

In: Globalism and the New Regionalism. The New Regionalism. Palgrave Macmillan, London.
Index of scientific and technological development of the regions of the Russian Federation – results of 2017. Retrieved April 28, 2019 from http://riarating.ru/infografika/20181017/630109152.html.
Innovatsii v Rossii – neischerpayemyyistochnikrosta [Innovations in Russia: inexhaustible source of growth]. McKinsey Innovation Practice Development Center July 2018.
Retrieved April 28, 2019 from https://www.mckinsey.com/~/media/McKinsey/Locations/Europe %20and %20Middle %20East/Russia/Our %20Insights/Innovations %20in %20Russia/Innovations-in-Russia_web_lq-1.ashx
Khoroshavina N.S., Sharkova A.V., Vasilyeva O.N., Borisova O.V., Sokolov K.O. (2018). The Classification Matrix of Sources of New Knowledge as a Tool for Planning a Company's Innovation Activity. Espacios, 39 (41), 10.
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.
Leuz C., Nanda D., Wysocki P.D. (2003). Earnings management and investor protection: An international comparison. Journal of Financial Economics, 69(3), 505–527.
Markusen A. (1987). Regions: Economics and Politics of Territory. Rowman and Littlefield Publishes, 304.
Rating of innovative regions of Russia: 2017 version. Retrieved April 28, 2019 from http://i-regions.org/images/files/airr17.pdf
Russia on the way to a modern, dynamic and efficient economy. (2013). Ed. by academicians Nekipelov A.D., Ivanter V.V., GlazyevS.Yu. Moscow, 93. – Retrieved April 28, 2019 from: http://www.ras.ru/FStorage/download.aspx?id=8723ae9d-383c-4404-b602-e17eab2c5b88 http://www.glazev.ru/econom_polit/269/.
Salleh Y., Goh W.K. (2002). Managing Human Resources Toward Achieving Knowledge Management. Journal of Knowledge Management, 6 (5), 457-468.
Santo B. (2005). Innovation as a Tool for Economic Development: a Tutorial. Transl. in Hungarian. Moscow, Progress, 376.
Sawhney M., Wolcott R.C., Arroniz I. (2006). The 12 different ways for companies to innovate. MIT Sloan Management Review, 47 (3), 75-81.
Schumpeter J. (1995). The Theory of Economic Development. Moscow, Economics, 594.
Shelomentsev A., Doroshenko S., Kozlova O., Mingaleva Z. (2016). Barriers in regional development in Russia. International Journal of Applied Business and Economic Research, 14 (9), 5891-5900.
Strategy of innovation-driven growth of the Russian Federation through to 2020. (December 8, 2011). Approved by the Decree of the government of the Russian Federation No. 2227-r.
Twiss B.C. (2002). Managing Technological Innovation, 7th edition. London, Pitman Publishing, 309.