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DEVELOPMENT OF RUSSIAN INNOVATION SYSTEM WITH REGARD TO INTERNATIONAL PRACTICES

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Abstract

The article deals with global and national aspects of innovation economy development. At the current stage, leading economies are implementing an innovation knowledge-based model of economic development. Research has a significant impact on development of production forces, quality parameters of the economic growth of national economies and global economy as a whole due to restricted economic resources and increasing needs. Development of innovation areas can determine the level of competitiveness of national economies and businesses.

Long-term isolation of the Russian economy from progressive areas of the world technological development caused significant technology gaps between Russian and foreign companies. It has a negative impact on positions of Russia in the world market of knowledge-intensive products. At present, a share of Russian products in the world volume of knowledge-intensive civilian products is 0.3% which does not correspond to current technological capabilities of Russian businesses.

The current economic strategy of Russia aims to develop an innovation economic model based on deep transformation of the economy and transition to intensive economic development. The model helps Russia strengthen its positions in the world market of knowledge intensive products with value added and use its technological capabilities. Development of the innovation economic model will have a positive impact on social relations. It can boost employment, increase income of the population, and develop human resources.

Keywords: Innovation economic model, innovation policy, innovation development, transformation of the economy, innovation development strategy, variations of innovation development.

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1. Introduction

Technological inferiority is a typical feature of the Soviet and Russian economies. Market transformations of the Russian economy had a negative effect on the level of technological development, but they helped reduce the amount of old production facilities.

The economic crisis of the first half of the 1990s caused a number of social and economic problems, most of which remain unsolved. The main task of the government regulation was to eliminate crisis phenomena and ensure sustainable development of the national economy. The innovation area was in a state of crisis aggravated by brain drains. The innovation area became the focus of interest in the end of the 1990s due to the stabilization of the Russian economy.

An innovation economic model is a system of relations between the government, businesses and researchers within the framework of the national innovation system. Development of this system is a key task of the current economic policy of Russia.

A program document determining key areas of innovation development in Russia is the Strategy of Innovation Development of the Russian Federation for the period up to 2020. It reflects main problems of innovation development, identifies perspective lines of development of the national innovation system. The main purpose of the Strategy is transformation of Russia into a world economic leader. (The strategy of innovative development of the Russian Federation for the period up to 2020).

2. Problem Statement

The key research problem is analysis of the innovation policy of Russia with regard to global innovation processes and assessment of perspective lines of innovation development of the Russian economy.

3. Research Questions

The article analyzes the following issues:

- global aspects of innovation development in the second half of the 20th century;
- general and specific characteristics of innovation development of Russia;
- international statistical data on innovation development trends;
- challenges and perspectives of innovation development of the Russian economy.

4. Purpose of the Study

The article aims to identify perspective lines of innovation development of the Russian economy in order to ensure sustainable and balanced economic growth.

5. Research Methods

The article uses the following methods: general research methods (historical, comparative, system-based, logical, prognostic) and complex economic analysis.

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6. Findings

One can distinguish between several stages of innovation development determined by international labor division and changes in international competition correlations (Freeman, 2002).

The first stage is innovation development of the defense industry of developed countries involving the government as a purchaser of military innovation products which aimed to improve defense capabilities on the threshold of the Second World War.

After the end of the Second World War, leading countries focused on development of civilian industries and activation of innovation activities in these industries. In the 1950s, in Western European countries, expenses for development of civilian technologies increased by 20% per year. Significant intellectual resources were used in civilian economic sectors. It increased competitive capacities of national industries and helped strengthen world market positions. Using owned or purchased technologies, basic industries producing standardized products were developing consistent with tasks of post-war economic reconstruction (Hekkert, 2007).

Development of civilian industries in Western European countries changed the competitive environment in the world market of knowledge-intensive consumer goods. As a result, the USA lost their leading positions. Fast innovation development of civilian industries, formation of new approaches to market management were typical of the end of the first stage. It contributed to new forms of international labor division (Hekkert & Negro, 2009).

Utilization of resource-saving technologies was typical of the second stage of innovation development. Changes in the technological paradigm resulted from the first world energy (oil) crisis of 1973, which caused a significant increase in oil prices. In particular, oil prices increased from 2.5 $ per barrel (1972) up to 10.8 $ (1974). The second oil crisis of 1979-1980 increased oil prices up to 37 $ per barrel. Both crises put an end to the era of cheap energy resources.

The crises caused modernization of the economies of oil-importing countries. A key area of economic development was implementation of resource-saving technologies. Knowledge-intensive industries, particularly, electronics, began to take off. Machine building industries in which one of the key competitiveness factors is cost effectiveness underwent significant changes (Edquist, 2010).

The result of the second stage is implementation of recourse-saving technologies and fast development of knowledge-intensive products with high value added. It involved transition from extensive to intensive economic production using resource-saving technologies (Lundvall, 2002).

Production of non-standardized products was typical of the third stage of innovation development. Some developing countries (Republic of Korea, China, Malaysia, Indonesia, etc.) developed standardized production using cheap labor resources as a competitive advantage. It intensified the international competition in such industries as metallurgy, shipbuilding, electronics. This intensification put developed countries on the back foot and forced them to develop innovation products.

Production modernization and renovation, flexibility and mobility in development and promotion of new products are key criteria for successful business development (Freeman, 2002). The shift of a gravity center to non-price parameters of products decreases the significance of a scale advantage. The competitive edge of companies often depends on their abilities to implement new goods using fundamental and applied research results (Niosi, Saviotti, Bellon, & Crow, 1993).

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One can identify several features of innovation development of Russia determined by the nature of social and economic models implemented at different stages. The pre-war economy of the Soviet Union was based on a mobilization model involving maximum investment of resources in the defense industry at the expense of other ones.

In the post-war period, economic growth rates were very high (about 6%). The technological system solved complex large-scale tasks (e.g., development of the aerospace industry).

However, by the beginning of the 1970s, with its high militarization level, the economy of the Soviet Union stopped following global trends. In the 1980s, the defense share of GDP was about 25%. The rearming program had a negative effect on the economic efficiency.

Lacking market competition caused non-utilization of resource-saving technologies and new cheaper materials, which increased the level of resource intensity of the Soviet economy. This policy caused a technological gap in the area of development and implementation of artificial materials between Russia and other countries (Ivanova, 2010).

The focus of the Soviet economy on needs of the defense industry determined the national economic system and relations between industries. A state plan was a basis for production and distribution. As far as innovation activities could sabotage scheduled tasks, it was impossible to implement innovation projects. Thus, the socialist system was an obstacle to innovation development, except for in the defense industry.

As a result of hypertrophic development of the Soviet economy, consumer demand which influenced technological policies and competitive capacities of foreign businesses was disregarded.

In the socialist economy, a significant gap between researches and their application existed. Under the command economy, it was impossible to implement a well-known motto “Let us turn science into a production force” due to the lack of cooperation between different research institutes which often led to the duplication of researches, increase in the amount of research institutes, research associates, research expenses and decrease in their efficiency.

At the same time, the USSR had significant intellectual resources for implementation of the innovation development model. In the 1980s, more than five million people studied in Soviet universities. More than 830 thousand engineers and researches engaged in development of new technologies.

In the 1990s, in the market reformation period, Russia experienced a serious crisis of the national innovation system which caused dramatic reduction in financing of researches and brain drains.

Reanimation of the innovation area was based on the market forms of innovation activities. However, a significant structural disbalance, poor government support and innovation efforts of businesses are typical of the current state of the national innovation system.

The international statistics has a lot of data on technological and innovation development. They can be used to compare advantages and resources of different countries.

One of the widely-used indices reflecting competitive advantages of countries is the Global Competitiveness Index (GCI) developed by experts of the World Economic Forum.

The different aspects of competitiveness are captured in 12 pillars, which compose the Global Competitiveness Index: institutions, appropriate infrastructure, a stable macroeconomic framework, good health and primary education, higher education and training, efficient goods markets, efficient labor markets, developed financial markets, a technological level, its market size, business sophistication, innovation.

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Table 01 shows the top counties of the 2015-2016 and 2016-2017 Global Competitiveness Reports.

Switzerland, Singapore and the United States top the GCP Rankings. The tops of the 2015-2016 and 2016-2017 rankings are similar.

Among the most competitive world economies, dominant positions belong to European countries. China and India have strengthened their positions increasing investment indices of the Asian region.

In 2016, Russia has slightly improved its ranking in the global competitiveness index up two places - to 43rd despite the economic recession. Among the factors, which had positive effects on this improvement, were education, institutions, and business sophistication. Among the weaknesses were low efficiency of public institutes, low investment potential, poor development of financial markets, distrust of investors in the financial system, internal demand decrease, economic sanctions of the USA and EU, uncertainty of price trends in the global oil market, corruption and poor efficiency of the public administration system, high tax rates.

Table 01. The 2015-2016 and 2016-2017 GCP rankings

Country	**Rank**	
	2015/2016	**2016/2017**
Switzerland	1	1
Singapore	2	2
United States	3	3
Netherlands	5	4
Germany	4	5
Sweden	9	6
Great Britain	10	7
Japan	6	8
Hon Kong	7	9
Finland	8	10
China	28	28
Russia	45	43

Russia has sufficient competitive labor resources in the innovation sphere. At the same time, innovation activities in the private economic sector and quality of public innovation policies are at the level of developing countries.

Innovation development is assessed using the Global Innovation Index (GII) developed by Cornell University (USA), Business School INSEAD (France) and the Intellectual Property Organization (WIPO).

The Global Innovation Index is based on 81 indicators of the innovation performance of countries, which are grouped as follows:

1) institutes;

2) human capital;

3) infrastructure;

4) market sophistication;

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5) business sophistication;

6) technology and knowledge outputs;

7) creative outputs.

The first five indicators form a sub-index of innovation resources. Indicators 6 and 7 form a sub-index of innovation results. The total value of the GII is calculated as the weighted average of sub-index scores.

Table 02 shows the 2017 GII rankings. In 2017, Switzerland, Sweden, Netherlands, the USA and Great Britain lead the rankings (The Global Innovation Index 2017 Report Now Available).

There are certain regularities in the GCP and GII rankings. Among the leaders of both rankings are the Western European countries and the USA. At the same time, China has strengthened its positions in both rankings.

In 2017, Russia has slightly changed its ranking in the GII from 43rd to 45th due to worsening positions of national universities in international rankings, reducing amounts of citable research works and patent applications.

Table 02. Global Innovation Index 2017 Rankings

Country	**Rank**	
	2016	**2017**
Switzerland	1	1
Sweden	2	2
Netherlands	9	3
United States	4	4
Great Britain	3	5
Denmark	8	6
Singapore	6	7
Finland	5	8
Germany	10	9
Ireland	7	10
China	25	22
Russia	43	45

Among the weaknesses of the Russian innovation system, there are (The Global Innovation Index 2017 Report Now Available):

– knowledge impact (rank 111);

– legal system (rank 94);

– regulatory quality (rank 102);

– investment performance (rank 95);

– net amount of direct foreign investment (rank 94);

– venture capital deals (rank 90;

– GDP/capita (rank 110);

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– GDP/unit of energy (rank 108).

The world's total gross expenditure on R&D in the USA is 35%, in the EU – 24%, in Japan – 12%, in China – 12%, in Russia – less than 2%. By the level of nanotechnology financing, Russia ranks 19th.

"Innovation is the engine of economic growth in an increasingly knowledge-based global economy, but more investment is needed to help boost human creativity and economic output," said WIPO Director General Francis Gurry. "Innovation can help transform the current economic upswing into longer-term growth." (Francis, 2017, p. 6).

The Russian national innovation system differs from innovation systems of leading countries due to a high share of the public sector, poor development of knowledge-intensive industries and a small share of small innovation businesses and venture capital as a financing source for innovation projects (Golichenko, 2008).

Statistical data on the amount of small innovation businesses are not always consistent with reality. According to experts, about 10% of innovation companies carry out innovation activities. By industries, small innovation companies are distributed as follows: 38% - machine building companies and smelters, 13.5% - consumer goods manufacturers, 13% - woodworking companies, 12% - food companies. Small innovation businesses work in the national market only. Less than 20% of these companies have foreign partners.

Thus, the level of small innovation business development in Russia does not correspond to global technological development (Golichenko & Samovoleva, 2012).

Low demand for innovation products is one more challenge of innovation development in Russia. Leaders of the Russian economy, large energy producers and smelters, are not interested in innovation projects. They upgrade their production facilities using foreign research results, which has a negative impact on the national market of innovation technologies, goods and services. At present, with regard to economic sanctions, limiting the access of Russian companies to modern technologies, the situation might improve (Shilov, 2011).

The great share of GDP of leading countries is innovation products, which determine the dynamics of economic growth and level of the global competitiveness of national economies. The share of Russia in the global market of knowledge-intensive products is about 0,3%, and the share of innovation products is less than 5% of GDP (The strategy of innovative development of the Russian Federation for the period up to 2020, p. 10).

To improve the situation, in 2011, the Strategy of Innovative Development of the Russian Federation for the Period up to 2020 was approved (The strategy of innovative development of the Russian Federation for the period up to 2020, p. 16-17). It aims to increase:

- the share of Russia in the global market of knowledge-intensive products and services (including nuclear power industry, airspace industry, special shipbuilding, etc.) up to 5-10%;
- the share of export of Russian knowledge-intensive goods in the world volume of export of knowledge-intensive goods up to 2 %;
- the value added of the innovation sector up to 17-18%;
- the share of innovation products in the total volume of industrial products up to 25-35%;

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- national expenditure on R&D up to 2.5-3% of GDP, of which 50% - at the expense of the public sector.

The Strategy singles out a number of priorities:

- customs, tax and anti-monopoly regulation aimed to create conditions for technological modernization of companies;
- transparent expenditure on innovation projects;
- use of international standards for assessing innovation businesses and institutions;
- maximum coordination of economic policies for solving innovation development tasks;
- development of online government's services;
- development of an efficient research results commercialization system;
- openness of the Russian economy and its integration into the global innovation processes;
- involvement of the Russian regions in innovation activities.

7. Conclusion

The strategy of innovative development of the Russian Federation for the period up to 2020 involves three options of technological development (The strategy of innovative development of the Russian Federation for the period up to 2020, p. 21-24):

1**.** Inertia technological development. This option involves the lack of scale target efforts of innovation development, focusing on macro-economic stability and low budgetary expenditure on science, innovation and investment in human resources. Innovation measures are taken as a part of general measures aimed to develop institutes and improve business climate. This strategy might lead to further deterioration of the national innovation system, increase dependency on foreign technologies.

2. A flying geese pattern and local technological competitiveness. This option involves attracting foreign technologies and foreign investment resources and local development of innovation products. However, many attracted foreign technologies are not at the height of technological development. Implementation of this strategy is troublesome as far as since 2014 many countries have put technological cooperation with Russia on hold.

3. Development of cluster knowledge-intensive industries and transformation of Russia into a large manufacturer and exporter of high-technology products. The strategy involves government measures to modernize the R&D sector, improve its performance, focusing on promising R&D areas, which can help improve Russian positions in the world market of high-technology products and services. The strategy involves the development of an integral innovation system and improvement of leading positions of Russian fundamental sciences. This scenario is less realistic as far as full-scale integration of Russian companies into the market of knowledge-intensive products is hardly probable in current conditions.

In the short-run, one can assume that the combination of the second and third strategies will be implemented. The second strategy will be implemented in most Russian industries. The second strategy should be implemented in the defense sector with subsequent transfer of research results to civilian industries. For example, the public corporation Rostekh dealing with researches for military purposes aims to increase the volume of civilian products up to 50% by 2025. A significant share of its revenue will be

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derived from fast-growing segments (civilian telecommunication equipment, new generation telecommunication networks, cyber security, organic light-emitted diode).

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