DETERMINATION AND REALIZATION OF SCIENTIFIC AND TECHNOLOGICAL PRIORITIES OF RUSSIA IN THE CONTEXT OF GLOBALIZATION

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Abstract. Stable, sustainable and progressive development of Russian economy, its integration in global innovation process is the main goal of Russian economic policy, which reflects both national economics and the whole society. While global competition becomes tougher, general goals related to long-term planning and forecasting as well as strategic goals related to technologies, industries, spheres of activity of high priority became main key factors of intensification of innovation process and increase of its effectiveness. Hence, major role in economic and innovation development belongs to the choice of foreground directions of scientific and technological development of countries, regions, companies, other actors of national innovation system of Russia in the context of the triad "forecast-plan-program". Time frames of the research (2006-2016) is relatively representative period during which the biggest number of decisions were taken and documents signed related to determination and realization of scientific and technological priorities of Russia. The article has the following structure: 1) review and comparative analysis of official documents reflecting scientific and technological priorities of Russia; 2) development of a classification of scientific and technological priorities; 3) Topicality of Foresight of commercialization of results of technological development in Russia; 4) forecast, analysis and measurement of efficiency of government policy concerning scientific and technological priorities. Results of this research may become a basis of enhancement of scientific and technological policy of Russia in the context of globalization.

Keywords: globalization, scientific and technological priorities, forecast, plan program, Foresight, innovation, innovation policy.

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1. Introduction

Achievement of strategic goals of socio-economical development of Russia and intensification of participation of the country in global processes requires simultanious solution of a set of interconnected problems. The most difficult task is to increase the competitiveness of processing industries while maintenaning the acceptable level of national security.

The purpose of this research is to review current state of the area of scientific and technological priorities of Russia, to track its evolution during last 10 years period and to evaluate efficiency of innovation policy of Russia using examples of strategic plans and state programs.

Key researches in this area are related to such problems as: the problem of justification and achievement of results of scientific and technological forecasting (Belousov & Frolov, 2008, Komkov, 2009, Kokoshin & Bartenev, 2015); development of industry-related forecasts (Chertok, 2009, Troshin & Fedorova, 2015, Giglavy et al., 2013, Keisner et al., 2016); a forecast of science branches development (Boychenko, 2009); foresight as an instrument of design of possible development scenarios (Bussey, 2013; Brummer et al., 2010; Komkov et al., 2016); models of entrepreneurship development in global environment in the context of different countries (Gajanová, 2015), national industrial initiatives. Some researches analyze a need for achievement of discontinuity of innovation process in the context of sustainable development (Janošková**,** Kráľ, 2015) and tendencies of development of global technology markets including those based on achievements of life sciences (Hejduková, 2015). In addition, within the framework of this research there are forecast-based researches regarding prospective directions of cooperation between EU and Russia and other CIS countries in the area of development of innovation processes and innovation policy (Fakhrutdinova et al, 2016; Korostyshevskaya & Urazgaliev, 2016).

2. Classification of scientific and technological priorities of Russia

Analysis of official documents related to scientific and technological priorities of Russia alowed to distinguish such kind of priorities as traditional, new, thematical, political, declarative and real priorities.

Traditional scientific and technological priorities are represented by special priorities and triade priorities (forecast, plan, program).

The number of documents reflecting special priorities includes:

(1) Priority directions of development of science, technology and technics in Russia and the List of critical technologies of Russia (presidential decree № Пр-842 dated May 21, 2006).
(2) Priority directions of development of science, technology and technics in Russia and the List of critical technologies of Russia № 899 dated July 7, 2011 based on the presidential decree № 623 dated December 16, 2015.

At the moment among directions of its priorities Russia has 8 directions of science, technology and technics development: new and the newest technologies (3 directions), traditional basic technologies (3 directions), technologies ensuring national security (2 directions) and 26 critical technologies.

Critical technologies (CT) is related to development of new areas of the sixth technological framework prevail: nanotechnology, biotechnology, IT. Traditional basic technologies are subordinate and ecology and national security are at the third place. Technologies related to development of high-tech processing industries are given minimal attention. The latest list of CTs as of 2015 contains only two technologies of this type: technologies of aerospace and transport equipment of the new generation and technologies of electronic component bases and energy-efficient light devices.

Triade priorities include:

(1) Forecasting documents such as the Forecast of Scientific and Technological Development of Russia until 2020") adopted on September 27, 2013;

(2) documents related to strategic planning: the Concept of Long-term Socio-economic Development of Russia until 2020, the Strategy of Innovation Development of Russia until 2020 adopted on December 8, 2011;
(3) programming documents including state programs funded from the budget (direction "Innovation Development and Modernization of the Economy") and Russian Government Program for Science and Technology Development for 2013-2020.

The forecast of scientific and technological development of Russia until 2030 includes seven thematic directions: IT and communication, biotechnology, medicine and healthcare, new materials and nanotechnology, rational nature management, transport and space systems, energy efficiency and energy saving.

The Concept determines traditional hi-tech industries as drivers of innovation development of the economy which could become a starting point for solution of a problem of creation of modern scientific and technological base and modernization of the economy. New areas such as biotechnology and nanotechnology are not affected by the document.

If one compare these priorities with their list, available in Forecast 2030, then they are fundamentally different. In Forecast 2030 the emphasis is put on new technologies of manufacturing industries associated with the development of a high-tech complex of Russia.

Strategy of Innovation Development has other priorities, new technologies dominate here, there is no electronics and shipbuilding, and there are a number of other areas of activity based on advanced production technologies. Priorities are formulated in the thematic areas, somewhat vague and they are closer to the list in Forecast 2030.

In the State Program for Development of Science and Technology for 2013-2020, the thematic nature of priorities is preserved, they practically coincide with Forecast-2030.

Starting in 2014, the government is trying to establish a new agenda and find new ways of defining priorities in the context of the deployment of global innovation processes in the context of „markets of the future" and „big challenges".

The National Technological Initiative is a long-term program of public-private partnership for the development of new promising markets based on high-tech solutions that will determine the development of the world and Russian economy in the next 10-15 years. The specific result of these priorities should be the emergence of Russian companies among global leaders in the future markets in 2030-2035.

Until 2014 scientific and technological priorities were not connected to potential markets which high-tech business usually take into account and the connection „priority - global market" was absent. Now we are talking about the formation of a stable demand for Russian products in the „markets of the future". Such markets today either are absent in the world, or are not yet sufficiently developed.

By this moment, the Council for Economic Modernization and Innovative Development of Russia have approved six roadmaps, except for FoodNet; 11 projects that are implemented within the framework of these roadmaps will receive support from the Agency for Strategic Initiatives for Promotion of New Projects. Now the roadmaps related to on the development of seven promising markets are underway.

Typology of NTI roadmaps is twofold. On the one hand, they are associated with the creation of new markets, and, on the other hand, they are associated with promising

technologies: digital design and modeling, new materials, additive technologies, telecommunications (Dengov & Tulyakova, 2015), etc.

Another government initiative is the Strategy of the scientific and technological development of the Russian Federation until 2035, where scientific and technological priorities are formulated in the context of the so-called “big challenges”. These challenges for Russia are presented by the risk of lagging behind the world rates of technological development; the risk of loss of efficiency of traditional energy; problems of preservation of the environment; the need to ensure food security, both in terms of quantity and quality of food; changing situation in the labor market, social sphere and healthcare; the risk of spreading epidemics; the emergence of new security threats to Russian society, which have a complex interrelated nature. (Decree of the President of the Russian Federation “On the Strategy for the Scientific and Technological Development of the Russian Federation until 2035” of December 1, 2016, No. 642).

3. Foresight as an instrument of scientific and technological forecasting

As the world practice has shown, the development of effective strategies for innovative economic development is a result of a constant Foresight process (Boykova & Salazkin, 2008). At the moment there are different methods of forecasting - factographic, expert, index, scenario, matrix and other methods, which are widely used in innovation science. Each one of them is aimed at solution of a specific problem and have its own advantages and shortcomings. Obviously, to determine the future strategies in space-time terms, the application of each of them separately contradicts the very logic of the theory. In this case, there is a need for a basic unified method that could combine all forecasting techniques and that may be used for analysis of complex and heterogeneous economic systems. Scenario analysis may act as such a method. In order to reduce inaccuracies it is important to develop several scenarios under different assumptions, to come up with the so-called "medium scenario" and to form a macroeconomic plan to solve existing problems on its basis. Appropriate period should be chosen for implementation of certain areas of a program. It is important that program of any source (state, university or business) includes the blocks that would be subordinate to the triad: scientific, technical, investment, institutional and socio-economic.

Therefore, foresight forecasts are a key to achieving the objectives of innovation policy and accelerating the pace of scientific and technological development of Russia, in particular, in terms of commercialization of technological developments.

Foresight makes it possible to identify and track existing and emerging technological trends and predict a whole range of events. Foresight not only predicts future technological trends, but also searches for promising, yet undiscovered opportunities for the development of future technologies as well as opportunities missed in the past and analyses risk (Razgulyaev et al., 2014).

Foresight system is important for advanced development of universities, as well as for national fundamental science in the context of global competition.

4. Effectiveness of the innovation policy of Russia in the field of scientific and technological priorities

To estimate the effectiveness of Russia's innovation policy, official documents of strategic planning and programming have been analyzed. The results of the analysis are presented in Tables 1-3.

Table 1: effectiveness of the innovation policy of Russia in the context of strategic planning

Document	Tasks	Year	% of completion
The Strategy for the Development of Science and Innovations in the Russian Federation for the Period until 2015. Approved by the Interdepartmental Commission on Science and Innovation Policy of the Ministry of Education and Science on February 15, 2006 (Minutes No. 1)	1. Domestic expenditure on research and development as% of GDP - 2%;	2010 г.	56% of completion (1,13 % GDP);
	2. The number of patent applications for 10 thousand people - 4;		50% of completion (2);
	3. The share of innovative products in total sales - 15%.		32% of completion (4,9 %).
	1. Domestic expenditure on research and development as% of GDP - 2,5%;	2015 г.	0,45% of completion (1,13 % GDP);
	2. The share of innovative products in total sales - 12%;		36% of completion 4,4%;
	3. The number of patent applications for 10 thousand people 5,5.		29% of completion (1,6 in 2014)
The Strategy of Innovative Development of the Russian Federation for the Period to 2020. Approved by the Order of the Government of the Russian Federation No. 2227-p dated 08.12.2011.	1. The share of organizations implementing technological innovations in the total number of organizations – 9,6%;	2013 г.	93% of completion (8,9 %);
	2. Share of innovative goods, works, services, in total exports of goods, works, services of industrial firms – 8.2%;		167 % of completion (13.7%);
	3. The share of products (works, services) that are new to the world market, in the total volume of industrial production - 0,04 in 2013		0 % of completion
	4. Coefficient of inventive activity - 2,1;		95% of completion (2 in 2013);
	5. Domestic expenditure on research and development (in% of GDP)- 1,5 in 2013		70% of completion (1,05 in 2013)

Source: compiled and calculated by the authors based on: http://fcp.economy.gov.ru/cgi-bin/cis/fcp.cgi/Fcp/ViewFcp/View/2007/240; http://inno-exp.ru/archive/15/innov_15_2015_114-131.pdf; http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/wages/ (date of extraction - 23.10.2016)

For example, in the Strategy of innovative development of the Russian Federation for the period up to 2020, quite achievable targets were indicated for the period until 2013, but they are not met. For the period up to 2016 (the next target line), almost all targets were significantly increased. The data obtained for the year 2015 make it possible to propose that the results of the implementation of the target targets for 2016 will not be achieved fully. We pay special attention to the complete lack of results on such an indicator as “the share of goods (works, services) that are new to the world market in the total volume of industrial production” (0% of completion).

Table 2: The effectiveness of innovation policy of Russia (state programs for the development of traditional industries)

Document	Tasks	Year	% of completion

„Space program of the Russian Federation for 2006-2015“	1. Russian segment of the international space station consisting of 5 modules	Until 2010	100% (5 modules)
	2. A system of fixed space communications and television broadcasting (13 space crafts - SCs)		77% (10 SCs)
	3. System of mobile satellite communication (6 SCs)		50 % (3 SCs)
	4. A system of space meteorological monitoring (5 SCs)		20% (1 SCs)
	5. System of space environment monitoring (4 SCs)		0%
	1. Russian segment of the international space station consisting of 8 modules	Until 2015.	62% (5 modules)
	2. System of fixed space communications and broadcasting (26 SCs)		58% (15 SCs)
	3. System of mobile satellite communication (12 SCs)		75% (9 SCs)
	4. System of space meteorological monitoring (5 SCs)		20% (2 SCs out of 5)
	5. System of space environment monitoring (4 SCs)		20% (1 SCs out of 5)

Source: compiled and calculated by the authors based on: Krylov A. / Analysis of a space activity of Russia for the period 2001-2013 Available: http://mosspaceclub.ru/3part/krilov_1.pdf (date of extraction - 23.10.2016)

The development of outer space in modern conditions is a matter of national security. In 2010, only one of the five tasks was completed - the first. In 2015, none of the five tasks was fully completed. At the same time, this is the most costly program in terms of money.

The Federal Space Program of Russia for 2006-2015, approved by the Government of the Russian Federation on October 22, 2005, No. 635, was amended four times (in 2007, in 2008, in 2011 and in 2012). Because of all the changes introduced, the total amount of funding for the activities envisaged by the Program for 2006-2015 was increased from 486.8 to 876.2 billion roubles.

Table 3: Effectiveness of innovation policy (on the example of Non-Industry Development Programs)

Document	Tasks	Year	% of completion
Nanoindustry development program in the Russian Federation until 2015	1. The average age of scientific and special equipment, devices and devices - 5 years	2011 г.	100% (5 лет в 2011 г.)
	2. Number of organizations with access to various components of the nanoindustry infrastructure - 2480		100% (2483 в 2011г.)
	3. Sales of Russian nanoindustry products 150 billion roubles		100% (154 млрд. руб. в 2011 г)
	1. The volume of sales of Russian nanoindustry products is 750 billion rubles.	2015 г.	13% 100 млрд. руб.

Source: compiled and calculated by the authors based on: http://www.komitet2-8.km.duma.gov.ru/file.xp?idb=2917125&fn=material.pdf&size=2702432 (date of extraction - 23.10.2016)

In terms of sales of Russian products of nanoindustry in 2015, a purely symbolic implementation has been achieved.

Consequently, it may be argued that Russian innovation policy in the sphere of scientific and technological priorities is not efficient. This discredits it and require sufficient changes.

5. Conclusion

(1) Currently, there is a state of uncertainty in terms of scientific and technological priorities in Russia as there is no uniform list of priorities.

(2) The special priorities and priorities of the triad are not fully harmonized. As a result, the relationship between scientific and technological forecasting, planning and programming of the national economy is not traced.

(3) The existing system of scientific and technological priorities is not aimed at developing the branches of high-tech industries, with the exception of existing State programs. Special priorities contain only two critical technologies, which is clearly not sufficient according to world`s standards.

(4) All the official documents mentioned earlier are mostly declarations of intent, since they are not fully executed. The lack of realistically achievable priorities negatively affects the government policy in this area and the formulation of its goals, tasks, directions and strategies.

(5) Russian practice of scientific and technological priorities has begun to clearly discern the tendency of the formation of their political context in the form of a list of "big challenges".

(6) The most effective form of government intervention in this area should be macroeconomic planning rather than programming which is a form practiced in the post-Soviet period.

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