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The Foresight Approach to Researching Innovative Activity in High-tech Businesses

Abstract

The current stage of Russia's development has compelled its authorities, business community and researchers alike to show interest in Foresight research for solving complex problems. These problems include attempts to evaluate innovation that could have a strong impact on the country's economy in the short and long term and on a macro-, meso- and micro level. This study analyses the use of foresight methods in public administration and the most dynamically developing sector of the economy, technology. It also proposes a foresight approach to researching innovation.

Keywords: foresight, innovative activity, high-tech business, business demography.

JEL Classification: C82, O21, O33.

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1. Introduction

Foresight is today used as a system tool for forming the future, allowing one to take into account possible changes in all the spheres of public activity: science and technology, economy, social interactions, and culture. The approaches that can be applied in foresight projects are always updated while new methodologies are constantly emerging. Which of them is wisest to choose depends on numerous factors, including time and resource restrictions and access to information, to name a few.

“Critical Technologies” is one type of foresight method, and is most often used in France, the US and Czech Republic, among other countries. Its forecast perspective is five-ten years (*Foresight* 2018). In 2004–2005, two basic criteria were used in Russian research on choosing national science and technology priorities (*On Approving...* 2018) – bolstering Russia’s national security, which would help accelerate GDP growth and higher competitiveness of the Russian economy. These were further developed into more detailed criteria. However, when making the final choice of technologies, the most important innovative products can be created using critical technologies.

The RF Government Resolution of 25.08.2008 N 1243-r (2018) previously approved a list of such technologies. The document was prepared for the purposes of implementing the law “On Procedures for Foreign Investments in the Business Entities of Strategic Importance for Russian National Defense and State Security” (Federal Law of April 29, 2008... 2018). Dmitry Medvedev held a session on June 9, 2015 in Innopolis (the Republic of Tatarstan). It resulted in the following decisions (record of June 9, 2015 No 3) (*On Developing...* 2018): to define as the main approach to the development and implementation of the National Technological Initiative (hereinafter referred to as NTI) the orientation towards the formation of new global markets with significant growth prospects and to provide the needs of mass consumers; to define a system of road maps as the basic tool for implementing the NTI.

The NTI Matrix (Peskov 2018) was elaborated to determine the logic of participants’ cooperation in the process of developing high-tech business within the framework of the NTI. The four spheres of the NTI are the key elements of the matrix: “Markets”, “Technologies”, “Talents”, and “Services”. Within the framework of the NTI matrix, the position of NTI “Universities” is defined as the point of concentration of innovative resources. Beyond that scope, there are the “World” areas that determine the interaction of the NTI with the external environment, and “Society”, on which support and perception of the NTI ideology depend (*The Key Hypotheses...* 2018).

When we speak of developing the branches of a new technological mode, we cannot but refer to high technology. “High” technologies often include technologies keep human participation to a minimum. In 1984, the OECD initially released, and in 2009 revised, a classification of branches for high technology, medium-technology of high and low levels, and low technology. Its main criterion was R&D expenses (Mezentseva 2018).

One way to look at the high-tech branch of the economy is that it is where more perfect products are created, on the basis of accumulated knowledge, developments and experience. In order to create them, the highest quality, well-known materials and the best production methodologies are used. R&D and STEM expense (science, technology, engineering, mathematics) specialists are employed to create such products. Five high-technology types of economic activity, with the assigned code 30.00.01, are distinguished in Russian statistical agencies (economists more often call them high-tech branches). At present, the following types of production are classified as high-tech industries:

- pharmaceuticals,
- office and computer facilities,
- electronic components, equipment for radio, television and communications,
- medical goods,
- devices for measuring, controlling, managing and testing means,
- optical instruments, photo- and film equipment,
- clocks and watches,
- aircraft, including space craft.

In many countries, the share of state R&D spending is the key criterion in classifying a branch as high-tech. However, some countries, such as Germany, define their own value of the criterion because technological development of the country’s branches was initially higher.

In 2012, the RF Ministry of Industry and Trade issued an order *On Approving the Criteria of Referring Goods, Works and Services to Innovative Products and (or) High-technology Products in the Branches, Included in the Established Field of Activity of the Russian Federation Ministry of Industry and Trade* (2018). This order served as the basis for classifying products as high technology ones, and, by extension, the branches producing them. Still, the main and basic criterion for referring to high-technology branches is having a high level of technological development, determined by the ratio of R&D expenses to GDP or gross value added.

2. The Components of this Research

In view of the above, the purpose of the present study is twofold: To justify the use of a Foresight system in Russia, and to develop a foresight approach for use in high-tech business research and in the innovative development of Russia's economy.

The country's industrial enterprises have failed to innovate or to produce products that can compete with their foreign counterparts.

A system of information supporting innovation and the high-tech sphere has been formed. It includes statistical methodology for measuring innovations, and follows OECD and Eurostat recommendations.

Another important tool for collecting basic statistical information on innovative activity is federal statistical bi-annual auditing and No 2-MP-innovation "Information on Technological Innovations of Small Enterprises". Small enterprises (excluding micro-enterprises) serve as the account unit of examination for companies involved in mining, manufacturing and the production and distribution of electricity, gas and water. The organisations use forms No 4-innovation and No 2-MP-innovation to report data which enables them to be evaluated in terms of their progress on becoming more innovative.

3. Research Results

At present, the potential for development of the high-technology complex in Russia is confined to nuclear technologies, the manufacture of weapons and military equipment, liquid rocket engines, and rocket and space products. At the same time, market demand has pushed the low-energy intensive branches of industrial production to develop in Russia, and to bring out high technology and science-based products. However, these economic branches develop much more slowly, which has transformed the Russian economy structurally in favour of less power-intensive sectors and branches.

Innovative enterprises, working towards greater energy efficiency, fulfill important strategic functions and promote results in priority areas of science and technology. In this regard, emphasis has been placed on developing innovative business and supporting and stimulating strategic initiatives related to implementing major energy projects.

In order to evaluate the basic development trends in innovation in Russia's economy in generally, consider Federal State Statistics Service data on the activity of innovative enterprises across Russia (Table 1) (*Official Web-site...* 2018).

Table 1. Basic Indicators of Innovative Activity in the Russian Federation, 2012–2017

Indicators	2012	2013	2014	2015	2016	2017
Innovative activity of organisations (% of organisations that introduced innovations to the total number of organisations considered)	9.5	10.4	10.3	10.1	9.9	9.3
Growth rate of innovative activity at organisations (as a % of the previous year)	–	109.5	99.0	98.1	98.0	93.9
Shipped own-produced goods, work and services performed by own efforts (bln rubles)	25,795	33,407	35,944	38,335	41,233	45,525
Percentage of innovative goods, work and services in the total volume (in %)	4.8	6.3	8.0	9.2	8.7	8.4
Cost of innovative goods shipped, work performed and services rendered (bln rubles)	1,238	2,105	2,876	3,527	3,587	3,824
Growth rate of innovative goods shipped, work performed and services rendered (as a % to the previous year)	–	170.0	136.6	122.6	101.7	106.6

Source: Russian Federal State Statistics Service.

As Table 1 shows, in 2017 the percentage of Russian enterprises that undertook technological, organisational and marketing innovations to the total number of organisations decreased by 6.1% to 9.3% from 9.9% in 2016. This is the lowest figure to have been achieved since 2012.

4. Conclusion

The data presented lead to the following conclusions.

1. Innovation is slow in the Russian economy. The share of innovative industrial enterprises (9.3%) is several times lower than in the developed countries of Europe, as is the share of innovative products (8.4%).

2. In Russia, small enterprises are the innovators. Given that innovative enterprises comprise 9.3% of the total number of enterprises, and that the percentage of products produced by those enterprises to the total volume of products is 8.4%, once can only conclude that many small Russian enterprises are innovating. It is for economic reasons that small enterprises are more interested in innovative activity and its reflection in statistical reporting. After all, they do receive subsidies for innovating. Large corporations, on the other hand, already possess the financial might to fund innovative activity.

Taking the above into account, the foresight approach is recommended for researching innovative activities in high-tech business (Figure 1). The approach is aimed at:

- developing a system for tracking the statistics on science and technology, innovation, education and vocational training, Russia’s information society and high-tech business,

- providing up-to-date and comprehensive statistical information that can be compared with the status of other countries internationally on society, the public authorities and business at macro, meso- and micro-levels,

- analysing and forecasting trends in science and technology, innovation, education, information technologies, developing critical technologies and the NTI,

- elaborating recommendations on economic, scientific and educational, innovative policy and the transition to the NTI,

- promoting international cooperation in R&D.

Choosing an adequate set of tools for this approach that can be applied in a particular study is not a straightforward task.

The set of tools used in the Foresight approach is constantly expanding and covers dozens of methods today – both qualitative (interviews, literature reviews, morphological analysis, “correspondence trees”, scenarios, role-playing games) and quantitative (cross-impact analysis, extrapolation, modelling, analysis and forecasting of method indicators). Synthetic methods include Delphi, roadmaps, critical technologies, multi-criteria analysis, patent analysis, game modelling.

Foresight includes the following activity levels:

- theoretical (determined by customer or user type, the type of foresight and principles, classification and classification criteria according to the types of approaches and research methods),

- present (an evaluation of the results of the research methods applied, work with cards through communication channels using information technologies, participants’ statements, and moderation),

- the future (predictive methods, concentrating on predicting the future behaviour of objects and subjects in order to make optimal decisions, working with perspectives in the form of accumulating various data in databanks, forecasting studies),

- planning (initiation of pilot projects, strategic analysis and presentation of results at meetings, determining priorities and developing decisions),

- networking (tools aimed at creating dialogue and enhancing participation among foresight participants – journalists, working groups and the like),

- purpose and method of use (government programmes, timely information, financial support and regulation mechanisms, reports, research notes, evaluating options, innovative projects, programmes),

- trends (key technologies and formats developing in the industry through 2030).

Customer, user	Government, business, population, market, consumers, innovative structures, government bodies, managing science and innovations, corporations, firms, companies								
	Technological foresight	Foresight of market possibilities		Socio-economic foresight		Foresight of innovation policy	System foresight		
Foresight principles	Shaping the future	Participation	Justification	Interdisciplinary	Coordination	Pragmatic nature			
Classification by type of approach			Classification by type of methods			Classification by source of knowledge			
Research	Normative	Predictive	Qualitative	Quantitative	Mixed	Cognitive-appellative methods	Statistical and econometric methods	Forecasting	Class of scripts. Class of modelling. Class of estimates

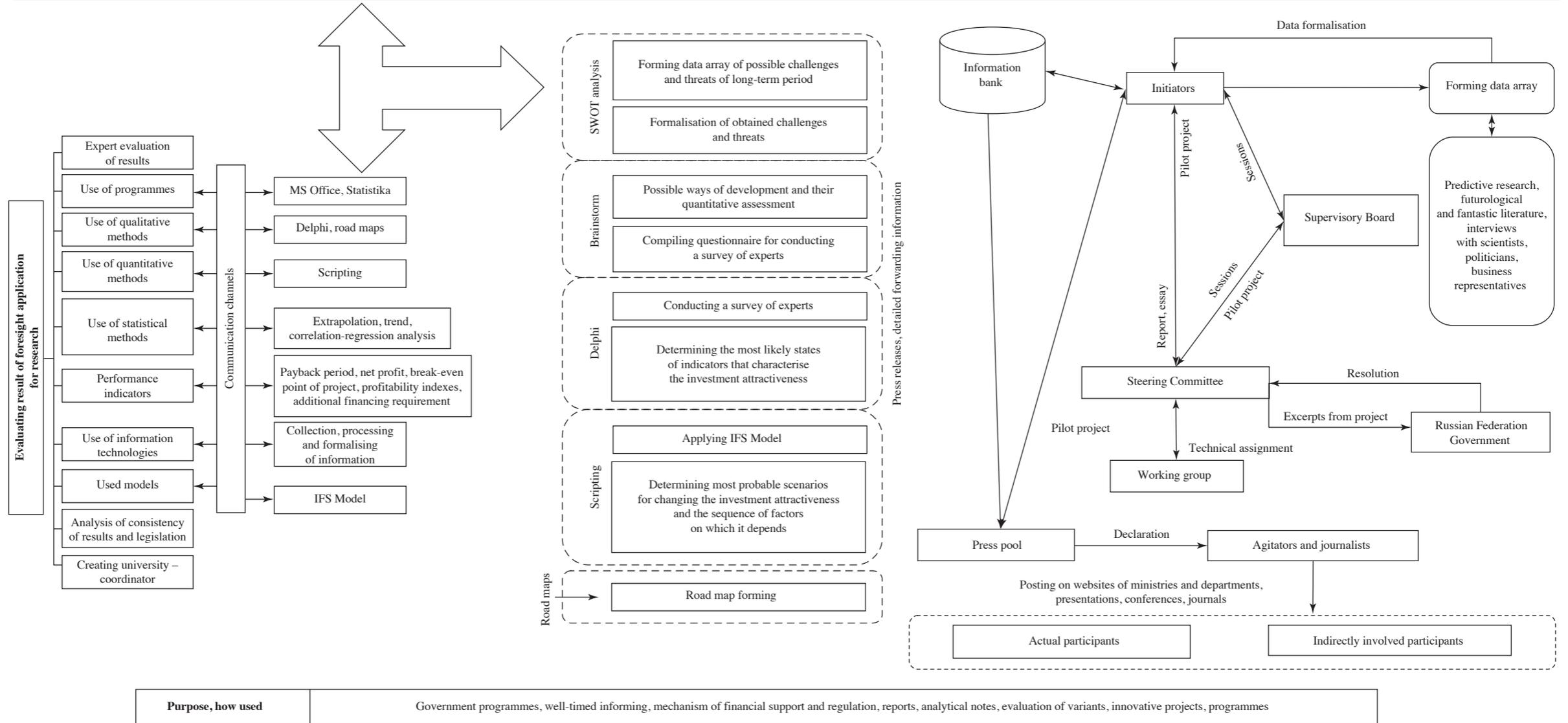


Fig. 1. Scheme of the Foresight Approach to Research Innovative Activity in High-tech Business
Source: the authors.

Important elements of the foresight approach include:

- this approach works with a future time horizon (from the nearest to 10–15 years out) and takes into account alternative development scenarios,
- it encompasses not only possible, probable and desirable events, but also low probability ones and the influence they may exert.

The foresight approach is geared particularly to future events. Foresight creators and participants do not just individually assess the probabilities and risks of the occurrence of certain conditions, as, for example, in the Delphi method. Rather, they take an active position and jointly design their current and future activities in order to enhance positive trends, increase the likelihood of desired events, and extinguish negative, undesirable trends.

The approach is a scalable tool that enables one to explore a consistent vision of the future for single-project teams or on a scale involving national or international organisations.

Bibliography

- Federal Law of April 29, 2008 N 57-FZ “On Procedures for Foreign Investments in the Business Entities of Strategic Importance for Russian National Defense and State Security” (as amended and supplemented) (2018), <http://base.garant.ru/12160212/> (accessed: 20.05.2018).
- Foresight* (2018), <http://fb.ru/article/147529/forsayt---eto-novyy-metod-postroeniya-buduschego-osobnosti-forsayta> (accessed: 20.05.2018).
- Mezentseva O. (2015), *Development of High-technology Production in Russia and in the World*, “Fundamental Research”, no. 7.
- Official Web-site of the Federal State Statistics Service* (2018), A www.gks.ru (accessed: 20.05.2018).
- On Approving Priority Development Areas in Science, Technology and Engineering in the Russian Federation and the List of Critical Technologies in the Russian Federation* (2018), The list of critical technologies of the Russian Federation, approved by the RF Presidential Decree of 07.07.2011 No 899, <http://base.garant.ru/55171684/> (accessed: 20.05.2018).
- On Approving the Criteria of Referring Goods, Works and Services to Innovative Products and (or) High-technology Products in the Branches, Included in the Established Field of Activity of the Russian Federation Ministry of Industry and Trade* (2018), The order of the Russian Federation Ministry of Industry and Trade (Minpromtorg of Russia) of November 1, 2012 N 1618, Moscow, <http://base.garant.ru/70338860/> (accessed: 20.05.2018).
- On Developing and Implementing the National Technological Initiative. Decisions after the Session of the Presidium of the Presidential Council for Economic Modernization and Innovations of Russia of June 20, 2015* (2018), <http://government.ru/news/32424/> (accessed: 20.05.2018).
- Peskov D. (2018), *The National Technological Initiative: Goals, Basic Principles and the Achieved Results. For Discussing at the Session of the Presidium of the Presidential*

Council for Economic Modernization and Innovations of Russia, http://assets.fea.ru/uploads/fea/news/nti_files/2015_0609_nti_aims_principles_results.pdf (accessed: 20.05.2018).

The Key Hypotheses of the National Technological Initiative: Version 1 (2018), <http://russianeconomicreform.ru/wp-content/uploads/2017/01/NTI-RUSSIAN-VERSION.pdf> (accessed: 20.05.2018).

The RF Government Resolution of 25.08.2008 N 1243-r List of Technologies, Having Important Socio-Economic Significance for Russian National Defense and State Security (Critical Technologies) (2018), <http://legalacts.ru/doc/rasporjazhenie-pravitelstva-rf-ot-25082008-n-1243-r/> (accessed: 20.05.2018).

Zastosowanie podejścia foresight w badaniu aktywności innowacyjnej przedsiębiorstw zaawansowanych technologii

(Streszczenie)

Rozwój Rosji spowodował wzrost zainteresowania instytucji publicznych, środowisk biznesowych oraz naukowców zastosowaniem metod typu *foresight* w rozwiązywaniu złożonych problemów gospodarczych. Problemy te związane są z próbą prognozowania rozwoju innowacji, które mogą mieć znaczący wpływ na gospodarkę kraju w perspektywie krótko- i długoterminowej oraz na poziomie mikro, mezo i makro. W artykule przeprowadzono analizę wykorzystania metod typu *foresight* w administracji publicznej oraz w sektorze zaawansowanych technologii. Przedstawiono również autorską koncepcję *foresight* w badaniu rozwoju innowacji.

Słowa kluczowe: foresight, działalność innowacyjna, sektor zaawansowanych technologii, demografia przedsiębiorstwa.