Directions of region innovation infrastructure development in the context of increasing the high-tech production

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Abstract. The paper discusses the problems of interaction of high-tech military-industrial enterprises with regional innovation infrastructure facilities and development institutions that determine the need for a regional innovation infrastructure that supports and stimulates innovative projects to increase high-tech civilian production using the innovative potential of these enterprises. The importance of innovation potential of military-industrial complex commercialization as the most important factor in the innovative development of the country is shown. The role and place of the regional innovation infrastructure in solving the task of increasing the high-tech civilian production by enterprises of the defence-industrial complex have been determined, and the need to support large-scale enterprises with regional innovation infrastructure facilities and development institutions has been substantiated. The purpose of the study is to substantiate the directions of development of the regional innovation infrastructure in the context of increasing high-tech civilian production of defence enterprises. The study used the methods of the survey, system and comparative analysis, which allowed ensuring the validity of the results and conclusions of the study.

1. Introduction
Currently, in order to develop the defence-industrial complex (hereinafter referred to the DIC) and maintain its financial stability in the face of declining state defence orders, along with ensuring the country's defence capability, the President of the Russian Federation has set the goal for the defence-industrial complex to increase the share of high-tech civilian and dual-use products not less than 50% [1].

According to the Defence Industry Development Program for the period until 2025 [2] approved in late 2017, the state’s priorities in the development of the defence industry, along with the implementation of state armaments programs, are innovative development of research and production potential, increasing the competitiveness of products, taking into account the implementation of the National initiatives defining priority directions for the development of high-tech industries. In this regard, the importance of defence enterprises in the innovative development of the country is increasing on the basis of increasing high-tech civilian production, which should be based on using not only the accumulated results of scientific and technological activities, but also all the resources they have that make up their economic and, in particular, innovation potential, as well as unique competencies that create conditions for leadership in the field of high technologies.

Solving the task of increasing high-tech civilian production, defence enterprises should take into account the peculiarities of production and the nature of sales of high-tech products, technologies,
services, first of all, trends and prospects for the development of global sales markets. The key areas for the development of the global market for space products and services with the greatest growth prospects by 2025 are: geographic information and navigation services (an increase of 6.7 times), automatic space vehicles (an increase of 1.3 times), system ground equipment (an increase 1.2 times), satellite communications (an increase of 1.8 times), remote sensing of the earth (an increase of 1.7 times) and others [3].

Along with this, Russian trends in the development of science and technology are aimed at the development of economic sectors that create guaranteed domestic demand for innovations, and, consequently, at research and development (medicine, agrocomplex, transport, energy, construction, etc.), as well as at expanding and accelerating the use of research and development results in economics, including by transferring them between the civil and military spheres [4].

Thus, taking into account modern trends and conditions for innovative development, defence industry enterprises are faced with the task of increasing the production of modern competitive high-tech civilian products, oriented, as a rule, to international sales markets, as well as increasing its share in total production. Solving this task determines the need for the effective use of unique competencies and existing innovation potential in the production of high-tech civilian goods [5], which give the defence industry enterprises the potential to adapt to market conditions. In this regard, the main task for solving the task set by the President of the Russian Federation, as well as ensuring economic stability, preserving financial stability and further development of defence enterprises, is the commercialization of the results of scientific and technological activities related to the production of high-tech civil products and other elements of the innovation potential of defence enterprises [6].

2. The role of the regional innovation infrastructure in solving the task of increasing high-tech civil production of defense enterprises

Unlike foreign countries, for example, the United States, where the share of civilian products ranges from 5–15% to 39–69% (on the SIPRI Arms Industry Database), the Russian military-industrial complex has the most important feature, which consists in the primary specialization of defence enterprises in defence production (60 - 98% (on the SIPRI Arms Industry Database)). This leads to a lack of experience in the work of defence enterprises in the high-tech civilian product markets and, as a result, their lack of development of the necessary competencies and mechanisms related to the commercialization of the results of scientific and technical activities.

The innovative nature of high-tech civilian products, high semi-fixed costs of defence enterprises, the capital intensity and complexity of the cooperative ties of its creation, as well as the need to sell such products on national and international markets, require establishing contacts with foreign partners and attracting serious investments. Along with this, defence industry enterprises are not able to independently implement the functions related to the output and sale of high-tech products on national and international markets, since their main activity is related to the fulfilment of the state defence order. In addition, due to the existing internal restrictions and targeted budget financing, defence companies do not have free financial resources, the ability to attract additional extra-budgetary funds and invest them into the creation and development of civilian industries, which determines the need to receive the state support for defence enterprises and other entities innovation activities involved in the implementation of innovation projects, and attract additional private investment.

Lack of competence, as well as lack of experience of DIC in the markets for civilian products, actualizes the problem of ensuring the sustainable competitive advantage in modern market conditions, which can be achieved by involving not only the innovative potential of the enterprises of the MIC itself into the commercial circulation, but also other parties of innovative activity [7], as the region of the location of the enterprises of the military-industrial complex, and national and international levels with competence and experience work in relevant markets (national, international).

The most important subjects of innovation activity with the necessary competencies for the implementation of innovative projects based on the commercialization of the results of scientific and technical activities and the innovation potential of defence enterprises are the objects of innovation
infrastructure, primarily located in the region where defence enterprises are located. In this regard, compensation for missing competencies related to the commercialization of the innovation potential of defence enterprises is provided through the involvement of the innovation infrastructure, the implementation of innovative projects related to the commercialization of the innovation potential of defence enterprises.

Considering that the regions are primarily interested in the development of the economy on the basis of the commercialization of the innovation potential of defence industry enterprises located on their territory, as well as a high level of economic, human and production potential of the territories, the regions should become the centre of the country’s innovative development and solve the problems of the formation of a regional innovation infrastructure providing support and stimulation of innovative projects to increase the high-tech civilian production based on the use of the innovation potential of defence enterprises [8].

Thus, the regional infrastructure innovation objects take the leading role in solving the task set by the President of the Russian Federation. The establishment of partnerships between defence enterprises and the subjects of innovation activities of the national, and international levels, as well as the performance of the functions of technological broker, is to ensure the integration into national and international infrastructure; promotion and initialization of R&D commercialization projects, including the innovative potential of defence enterprises; establishing relationships with potential investors, national and international clients; market development of high-tech products [8].

3. Problems of cooperation of innovative enterprises with innovation infrastructure facilities and development institutions

Analysis of the problems of interaction between innovative enterprises and innovation infrastructure facilities and development institutions was carried out on the basis of a study by the Analytical Centre under the Government of the Russian Federation. The study was devoted to the interaction of elements of the innovation infrastructure [9].

The results of the study suggest that regional innovation infrastructure facilities, development institutions and regional executive authorities play a key role in organizing and supporting innovation activities, however, today, they do not solve the problem of developing high-tech civilian production. Along with this, the main share of this product in the gross regional product belongs to large business enterprises and companies with state participation, which requires the support of the above-mentioned subjects of innovation activity.

The survey results showed that technology parks are most popular and actually used by innovative companies among the objects of innovation infrastructure, which provide economic, financial support and promote the introduction of scientific and technical developments in industry, promotion of goods in the market. Technology parks have the highest frequency of requests for financial and non-financial support and the highest number of refusals to provide support among the objects of innovation infrastructure (6.3%) [9].

The mechanism of financial and non-financial support of collective use centres at educational institutions takes the second place. They provide precision expensive scientific and technological equipment for collective use; services of innovative territorial clusters and technological platforms. Innovative territorial clusters take the second place after technology parks in the number of refusals to receive support. It should be noted that there is a high demand in the services of technological parts and centres for collective use [9], as well as in financial support for innovation activities.

Among non-financial support instruments, the greatest need was identified in supporting exports (19.1% of large and 37.8% of small surveyed enterprises [9]) and promotion of innovative products to foreign markets, representing a significant problem for innovative activities. Other problems of innovative small and large business companies that require the involvement of innovative infrastructure facilities and development institutions are as follows:

- the lack of demand for innovative products, services;
difficulties in obtaining state funding;
- the lack of tax incentive tools;
- weak horizontal links between the participants of innovation activity along the entire chain (from idea to market entry) to support an innovation product, which leads to an increase in innovation risks [9].

The problems listed above indicate an insufficient level of interaction between innovative enterprises and innovation infrastructure facilities and development institutions, one of the reasons for which is the lack of necessary mechanisms for motivating innovation infrastructure facilities. State support to the subjects of innovation activity is fragmented, not taking into account all participants in the implementation of an innovative project.

At the same time, in accordance with the Federal Law “On the Development of Small and Medium-Sized Businesses in the Russian Federation” and the Order of the Ministry of Economic Development of Russia “On Approval of Requirements for the Implementation of Measures by the Subjects of the Russian Federation, budgets which provides subsidies for state support of small and medium-sized businesses and requirements for organizations that form the infrastructure to support small and medium-sized businesses "objects of innovation infrastructure are supporting only small and medium-sized businesses, as already noted, the main engine of innovation-based economy is a big business and companies with state participation [9]. In addition, the financing of innovation infrastructure is carried out from the federal budget, which reduces their interest in including regional innovation, as evidenced by the weak correlation calculated by the authors (correlation coefficient $r = 0.17$) between the quantitative security of innovatively developed regions of innovation infrastructure and products of high-tech and knowledge-intensive industries in the gross regional product of these regions. At the same time, the share of high-tech industries in the gross regional product of the regions under consideration is determined by the number of innovation infrastructure facilities by only 2% (the coefficient of determination $r^2 = 0.02$).

Legislative restrictions on the support infrastructure of small and medium-sized businesses performed by innovation infrastructure objects do not allow them to be involved in the process of increasing the production of high-tech civil products by defence enterprises and other large businesses in the region, which requires changes in legislation to expand the support functions for large businesses by individual innovation infrastructure facilities.

Attracting additional funding and tax incentives are considered the main measures of state support for innovation by innovative enterprises [9] and require the involvement of regional executive bodies and innovation infrastructure facilities, as well as federal and regional development institutions. The Federal Law “On Strategic Planning in the Russian Federation” provides the need to develop interaction between regional and federal authorities in order to ensure consistency in the solution of their tasks.

One of the public policy instruments that stimulates innovation processes and infrastructure development includes institutions (Vnesheconombank, the Fund for the Promotion of Small Enterprises in the Scientific and Technical Sphere (Innovation Assistance Fund), RUSNANO Group, JSC Russian Venture Company, Industry Development Fund, Russian Export Centre Group, Skolkovo Foundation and others). They play a role of a catalyst for private investment, create the conditions for the formation of infrastructure that provides enterprises with access to the necessary financial and information resources, and also provide support through the financing of business projects, infrastructure support and co-financing of R&D. In the constituent entities of the Russian Federation, the functions of supporting small and medium-sized businesses, stimulating the development of innovations are implemented by regional development institutions created in the form of support funds, regional venture funds, and business incubators.

Considering the high significance of the development of high-tech civilian production for the regions where defence industry enterprises are located, regional executive authorities and development institutions should be the initiators of attracting state incentives to participants in the implementation
of innovative projects, as well as private investment in innovative activities. However, the survey results testify to the passivity of regional authorities in organizing support for innovation activities [9].

Analysis of the experience of the functioning of the innovation infrastructure of the Republic of Tatarstan, Kaluga and Samara regions has led to the conclusion that the regional objects of the innovation infrastructure have a significant impact on the innovative development of the regions and the use of their potential in solving tasks, in particular in solving issues of attracting private investment support, promotion of innovative products in foreign and domestic markets, etc. The current positive experience of these regions demonstrates the possibility and need to support and stimulate regional executive bodies, development institutions and innovation infrastructure facilities of the region in cooperation with relevant national level development institutions proposed to implement innovative projects to increase the production of high-tech civilian products, which is confirmed by regional level of effective private brokerage. Thus, the interaction of regional executive authorities, development institutions and innovation infrastructure objects demonstrates the region’s connection with innovation infrastructure facilities and other innovation subjects at the national and international levels, defining the place and role of the region in solving the problem of increasing the production of high-tech civil products in commercialization projects, innovation potential of defence enterprises.

The analysis conducted in the study revealed significant barriers in the interaction of innovative companies with innovation infrastructure facilities and development institutions:

- The regional innovation infrastructure facilities and regional and federal development institutions provide support to exceptionally small and medium-sized innovative companies, with a substantial need for supporting large business enterprises, primarily defence enterprises;
- There is a gap between the expectations of innovative enterprises of large business and the quality of services provided in the regions by the objects of innovation infrastructure (promotion of high-tech civilian products, technologies, services to national and international markets, demand stimulation, development of sales markets, attraction of investments);
- The regions do not take into account the significance of the task set by the President of the Russian Federation and the need to solve it with the active support of regional innovation infrastructure facilities and development institutions;
- The formation of a regional innovation infrastructure in the regions is carried out without taking into account the features of innovation projects proposed for implementation.

The need to solve the above problems identified the main directions for the development of regional innovation infrastructure, allowing support and encouragement of innovative projects for defence industry to increase high-tech civilian production.

In order to increase the validity of the findings and further detail the identified barriers to the development of high-tech civilian products of defence enterprises, the authors now plan to conduct a survey of both leading defence enterprises and executive authorities, development institutions and innovation infrastructure facilities in innovative regions of Russia.

4. Directions for the development of innovation infrastructure in the region

The results of the analysis allowed us to identify and justify the following areas of development of regional innovation infrastructure:

- Organization of support by the innovation infrastructure of the region, along with small and medium-sized businesses, the implementation of innovative projects of large business enterprises, first of all, innovative projects for the production of high-tech civil products of defence enterprises.
• Ensuring the maximum compliance of the innovation infrastructure of the region with the composition of innovative commercialization projects proposed for implementation, ensuring payback and financial sustainability of the innovation infrastructure.

• Ensuring the integrated implementation of innovative projects in the region through coordinated interaction of participants in the implementation of innovative projects based on a network approach, including through the involvement of innovation infrastructure facilities and subjects of innovation activities at the national and international levels.

• Providing state incentives to all participants of the network interaction in the process of implementing innovative projects.

• Ensuring the integration of the innovation infrastructure of the region with the innovation infrastructure of the national and international levels.

• Phased reduction of budget financing of innovation infrastructure facilities in order to stimulate (motivate) their interaction with the subjects of innovation activity in the region and increase commercial efficiency.

5. Conclusion
The analysis made it possible to substantiate the need and the directions proposed by the authors for the development of a regional innovation infrastructure that provides support and encouragement for innovative projects to increase the production of high-tech civilian products based on the commercialization of the innovation potential of defence enterprises.

References
[1] Presidential address to the Federal Assembly of 12.01.2016 Available from http://www.consultant.ru/document/cons_doc_LAW_207978/

[2] The development of the defense industry: A new program is being developed for 2018-2025 Available from: https://vpk.name/news/174097_razvitie_opk_razrabatyvaetsya_novaya_programma_na_20182025_godyi.html

[3] Zhiganov A 2017 Global accessible market for space products and services Conf Space as business, Moscow, 12 December 2017

[4] Resolution of the Government of the Russian Federation of April 15, 2014 No. 301 On approval of the state program of the Russian Federation: Development of science and technologies for 2013–2020 Available from: http://www.consultant.ru/document/cons_doc_LAW_162175/

[5] Erygin Yu V and Borisova E V 2018 Tools for the formation of the innovation infrastructure of the region for the commercialization of the innovation potential of enterprises of the military-industrial complex (Krasnoyarsk: SibSAU)

[6] Erygin Yu V and Borisova E V 2017 Centers for the commercialization of the innovation potential of defense enterprises as a form of integration of regional innovation infrastructure into the infrastructure of the national and international levels Science 9(5)

[7] Erygin Yu V and Borisova E V 2017 Construction of network interaction in the framework of projects for the commercialization of the innovation potential of enterprises of the military-industrial complex Science 9(6)

[8] Borisova E V 2018 Formation of the innovation infrastructure of the region in the context of increasing the production of high-tech civilian products Vestnik of Eurasian science 10(3)

[9] Analytical report 2014 On the interaction of elements of the innovation infrastructure (Moscow: Analytical Center under the Government of the Russian Federation)