

Method for managing the implementation of innovations within regional scientific and industrial complexes based on a differentiated approach depending on the degree of their completion

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Abstract. The development of information and communication technologies, socio-economic systems subjects specialization, high risk of innovation, large costs of all stages for one subject, determine the need to combine the efforts of individual socio-economic subjects of the regions in the framework of cooperation and joint implementation of innovative projects. Accounting the current level of innovative development and technological support to the production regions, we can conclude about the need to develop their own technological base, scientific and industrial ties between the separate entities in the region, and between regions, as well as the efforts to strengthen the international ties in order to exploit advanced international developments and practices. The existing personnel, material, technical and information reserve of the Russian regions can be realized through closer cooperation of industrial enterprises and research organizations of the region by forming stable links for interaction and exchange of experience and knowledge between research and industrial enterprises, which will serve as a basis for catalyzing the development of innovative processes in the region and thereby strengthening their competitiveness. The article describes the proposed method for managing the implementation of open innovation ideas and proposals within regional scientific and industrial complexes, based on a differentiated approach to innovation management, depending on the degree of their completion.

1 Introduction

Integration processes in most developed countries are the main driving force of the economy. Thanks to them there is a qualitatively different from the natural accumulation of financial, information and intellectual resources necessary to ensure long-term sustainable development of the economic unit. Extensive sources of economic growth cannot produce the desired effect, which determines the place of basic points of development in national

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socio-economic systems for integration structures with an innovative component. That is why the issue of cooperation between enterprises in the framework of economic modernization on an innovative basis is particular relevance. Technological progress and increased intensity of global competition significantly reduce product life cycles, and also force enterprises to constantly improve the efficiency of their business processes, often specializing in a particular type of product or service. In addition, the concept of open innovation economy is becoming increasingly popular. The active use of information and communication technologies allows to transfer many processes to a virtual space, which reduces time, financial and material costs, and makes it possible to easily and flexibly organize stable remote connections. It is also necessary to note the high-risk nature of most innovation stages, which also determines the need to combine the efforts of several the socio-economic system subjects to reduce costs and distribute risks.

This suggests that in the near future, innovative and technological renewal of most industries, the development of competitive entrepreneurship and sustainable development of the environment will be carried out through the integration of research institutions, industrial enterprises and other resource-accumulating organizations. Thus, the formation of scientific and industrial cooperation becomes a priority process that can ensure sustainable growth of industries and regions of the Russian Federation.

At the same time achieving a marked reference points and trends in the business environment determine the need for a study of the nature of scientific-industrial cooperation as an important factor of innovative region development and development of methods and assessing the level of this cooperation tools, as the presence and degree of development can make a significant contribution to the value of innovation potential of a particular region.

2 Materials and Methods

Ensuring the adoption of the most effective management decisions in terms of using limited resources, specialization within only one of the innovation activity stages causes an increased need for such a form of innovative processes implementation as scientific and industrial cooperation, which provides for cooperation not only in the field of production, but also in the field of research and development, aimed at mutual technical improvement based on the most modern achievements of science and technology. Many scientists (H. Chesbrough, G. Mensch, A.V. Suvorova, R. Nelson, A. I. Kuznetsova) note the advantages of this form for the innovative development of the subjects. Such as: minimizing the own costs of each subject in the cooperation due to their partial, rather than full participation in the process, ensuring a synergistic effect, opportunities to strengthen their position in the market, reducing the duration of individual stages of the products or services life cycle by distributing production among highly specialized specialists, distributing responsibility for the probability of risk realization among all participants and thereby reducing costs from losses, expanding the range of useful properties of emerging innovations by ensuring the interdisciplinarity of R&d, accelerating the distribution of innovative proposals between partners through the use of a single information exchange system [6, 9,10, 19,20].

The results of the analysis of industrial enterprises confirm that those, which interacting with universities and scientific organizations, show higher indicators. In addition, the level of scientific and industrial cooperation and thus the potential for creating joint innovative projects determines the choice of a strategy for socio-economic development of the territory. In 2019, more than 52% of innovative enterprises participated in joint research and development projects in the Russian Federation as a whole, but only 15% of them worked with universities and research organizations [1, 2]. In international practice, according to the OCED data, the share of such interaction is 27% [12]. The implementation of technological innovations that are fundamentally important for industrial enterprises is

carried out mainly on their own. Their share in the total volume is 43.6%. At the same time, there is a very small share of cooperation with elements of innovation infrastructure – consulting and information organizations (11.1%). It should also be noted that such cooperation is mainly applied and one-time. Most of the interactions were carried out not on a permanent basis, but within the framework of a single project (77%). The highest rates of cooperation are typical for the extractive and manufacturing sectors, as well as for activities related to the use of information technologies. Most joint innovation projects are implemented in the domestic market with the participation of domestic partners. The advantages of such integration which gives the managers of these enterprises survey are determined by the effects of resources pooling, the ability to attract credit funds on favorable terms from financial institutions, the economies of scale in R&d, using unique material and production base, the implementation of a unified marketing strategy. The level of patent activity is also significantly lower than the world values, while many researchers define patent and licensing activity as one of the indicators of innovation activity. The greatest patent activity is typical for large enterprises and corporations. Analysis of statistical data on the number of patent applications in Russia shows that they account for 67.2% of intellectual activity registered [3].

Thus, in the world practice, scientific and industrial interaction between subjects of socio-economic systems is a long-established practice. In turn, in the Russian Federation, the forms of combining the efforts of individual business units to implement joint economic activities are rather poorly developed, not systematically, and the indicators of innovation activity in the regions are rather negatively affected.

The role of scientific and industrial cooperation in creating new forms of knowledge is noted in many works of domestic and foreign scientists-economists S.B. Avdasheva, R. Whittington, R. Osborn, C.C. Baughn, J. Hagedoorn, Q.X. Luo, I.V. Kuzmin [4, 5, 15, 18, 21, 24], including the analytical materials of the Interdepartmental analytical center, HIGHER school of Economics, Center for strategic research. However, despite the significant number of works on innovative development existence, they mostly cover issues of inter-organizational interaction at the enterprise level. For example, Y. Lee, J. Stejskal, B. Merickova, V. Prokop, G. George, S.A. Zahra, D.R. Wood, V.A. Rebyazina, M.M. Smirnova [7, 14, 17, 23], describing such benefits of cooperation for industrial enterprises as access to advanced research results, the ability to "keep up" with scientific and technological progress and at the same time reduce their risks and optimize costs. The role of scientific and industrial cooperation, the tools for its analysis and evaluation, as well as the opportunities and advantages it provides for regional development are practically not covered. While the territory of implementation such interaction has a direct impact on its result, and also contributes to the development of the region itself, significantly in its innovative component. H. Etzkowitz and L. Leilsdorf triple helix model [13] defines the interaction of business, science and the state as the main source of innovation. At the same time, some authors Yu. Simachev, M.Kuzyk [8] note that state measures often lead not to the creation of new ones, but to the "capitalization" of existing, long-established ties and partnerships.

The need to develop scientific and technical cooperation is noted in the strategy of Russian Federation and regions innovative development, in many industry development strategies, the Federal project "Development of scientific and scientific-industrial cooperation", etc. The creation of programs between industry and higher education institutions for training, retraining, practice for students, joint research and development, including provide for the establishment of a network of exchange of scientific and technical and marketing information, organization of control system of research works at the universities with the perspective of the needs of industrial enterprises and industries is celebrated in many legal acts and state programs as a priority.

In addition, for a balanced socio-economic development of the region, it is necessary to involve medium and small enterprises in the innovation process, the importance and inseparability of which for innovative development is noted by P. Koudelkova, P.Svobodova, A. Pierre, A.-S. Fernandez [11,16,22]. The development of scientific and industrial cooperation should also contribute to the involvement of medium and small enterprises.

However, the scientific and industrial cooperation as an important factor of innovative development of the region, remain largely unrecorded, including in connection with the objective difficulties of its evaluation and analysis due to the lack of a unified concept of this category, the large number of qualitative parameters and high level of subjectivity in their calculation. Thus, it is necessary to look for methods and tools for assessing the level of this cooperation, since its presence and degree of development can make a significant contribution to the value of the innovation potential in a particular region.

3 Results and Discussion

Nowadays, with the declared accelerated innovative development of the country's industrial and economic complex, the real integration of science and industrial sector, especially at the regional level, is rather slow, contradictory and inconsistent. As a result, the formation of a regional innovation system that contributes to increase efficiency of interaction between science and industry is an urgent task designed to ensure the innovative component of the region's development.

It is obvious that systematic search, transformation and promotion of innovative ideas should be carried out centrally within the region, in order to systematize and unify this process, as well as to achieve a synergistic effect. This functional role can be implemented by creating a single coordination center that carries out the process of developing innovation activities along the innovation chain from the idea to mass production (hereinafter – the Center), which will allow all interested participants to track the development of the innovation process when monitoring the implementation of a project.

While selecting innovative ideas in the innovation space of the region, the Center should filter out those that are not suitable for implementation at the moment. The selection or "filtering" of innovative ideas located in the innovation space of the region can be carried out on the basis of the following criteria:

- the degree of readiness of the idea for implementation, which implies the presence or absence of valid presents as the innovation project;
- the degree of final innovative product compliance with the needs of potential consumers;
- availability of enterprises and investors in the region who are able, i.e. have the necessary resources, and are interested in implementing these ideas;
- the presence of a predicted reasonable positive effect on the social environment of the regional industrial and economic complex.

After selection the center can transfer the idea for implementation to an existing enterprise, or create a new small organization to launch innovative production. As a rule, small innovative enterprises are created to launch an innovative development or technology, the commercialization project of which is characterized by a high degree of risk and will require a significant restructuring of the large enterprise business processes and corresponding investments. If innovation is successful in a small one, the scale of innovative production can be expanded.

During filtration innovative ideas with real innovation resources of the region, staff of the Center can independently, or with assistance from outside experts, refine some of them to achieve a more useful effect from their realization to the regional economy and social

sphere. In addition, with the help of the center's specialists, developers get the opportunity to transform innovative ideas and proposals into commercially viable innovative projects, which is especially important in terms of attracting investors, as well as partners for the commercialization of these innovations.

For regional scientific and industrial structures, we offer a method for managing the implementation of open innovative ideas and proposals, based on differentiated approach to innovation administration, depending on the degree of their completion. From the variety of innovative ideas and suggestions, available in an information space scientific-industrial cooperation, through Centre's and their proposals elaboration and combination, we can get new ones product or process innovations. "Raw" innovative elements themselves are unable to bring any significant results and cannot be independently implemented due to the lack of developers' ability bring them to the stage of a finished innovative product or technology, or due to the uncertainty of their application. Such "raw" innovative elements can be considered as a kind of breeding ground for the regional innovation process, which, in turn, enriches it with the results of its activities. At the same time, implementing the innovation process at the regional level from different elements that make up the innovative plankton by combining them, it is possible to obtain completely different product or process innovations. The main sources of such innovative elements are the innovative activities of enterprises and universities.

It is necessary to create a virtual conference hall within the Center, which will allow organizing interaction between developers, representatives of enterprises interested in commercialization of innovations, other research structures that have resources to refine innovations, and other subjects of innovative activity in order to bring existing developments to the stage of prototype ready for commercialization. At the same time, the corresponding divisions of the regional administration can carry out corrective actions in order to minimize the impact of negative and strengthen positive factors.

It should be noted that in general, innovations adoption or transfer is the process of innovative products and technologies producing for their further commercialization, taking into account the interests of all parties involved. At the same time there are a lot of scientists whom understand the diffusion of innovations as the process of spreading an already formed and mastered innovation through communication channels in time and space between participants in the socio-economic system, with the aim of introducing the idea being spread into economic and industrial practice.

The main functional elements of this subsystem that contribute to the spread of open innovations include: innovation marketing; collection and analysis of innovation data; innovations transformation to adapt and further transfer and subsequent implementation; commercialization and transfer of innovations; dissemination of innovations and innovation cooperation (see fig.1). In this process, the system of transfer and distribution of innovations will be considered as one of the key subsystems of the innovation infrastructure, the need for which increases significantly in the conditions of enterprises reorientation from using only their own innovative developments to commercialization of open innovations.

Within the described functions of the Center, it is necessary to note its role in managing the system, promoting the dissemination of innovative practices and commercialization of the most promising ones. In addition to focusing on the innovative development of individual units and the region as a whole, the Center's activities will help to solve related socio-economic problems of regional development. Such as, for example, the growth of high-performance jobs, reducing unemployment, and so on. In the modern digital economy, the virtual information space created around the center and stimulating inclusion in individual subjects is of great importance. The formation of such an information environment, which is also a "knowledge base" and provides opportunities for joint use of

equipment, providing a material and technical base for R&d and training, will help to stimulate and activate innovation processes within industrial enterprises themselves, including. In this case, the Center acts as an accumulator of the needs and requests of various subjects of the region's environment and, being in constant contact with them, will find opportunities for optimal redistribution of all types of resources between participants. In addition, the center's informational and educational activities related to marketing analysis of the micro and macro business environment, as well as static information, including those that are not publicly available, will allow participants in the region to form a complete picture of the current situation, assess risks in a timely manner, see promising niches and track the dynamics of changes in the main markets. This, as well as the possibility of sharing equipment for testing and training, will reduce the costs of participants in scientific and industrial cooperation. It is worth noting the opportunities to get qualified assistance and support in the development of an innovative idea, its justification, risk assessment, search for investors, advertising, patenting and promotion to the market.

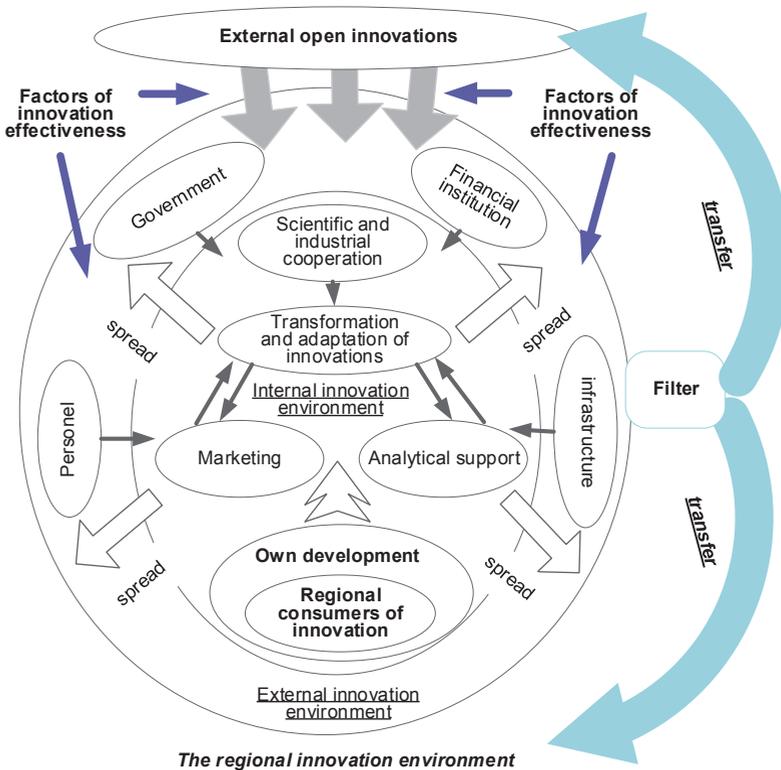


Fig. 1. Functional structure of innovations transfer and distribution system in the regional scientific and industrial complex

The distinctive features of centralized information support of the innovation process will be:

- implementation of consulting and information support of the project at all stages, from the development of a business plan to innovative products release;
- review, evaluation and subsequent discussion carried out by professionals in the relevant fields of activity;

- reducing the possibility of lobbying projects using administrative resources, while at the same time increasing the ability of regulatory authorities to monitor the conduct of innovative enterprises and organizations;
- reducing the time required to find and obtain financial resources, while the coordination Center may partially co-finance promising innovative developments if it has the authority and resources;
- increasing the degree of small innovative projects adaptation to the environment due to the possibility of better access to relevant information in the field of innovative production.

An important aspect of the activity of the regional Center will be the formation and maintenance of the efficiency and stability of the network of information relationships of each element of the scientific and industrial Association of the region's subjects with representatives of the environment inside and outside it. Interaction between such Centers, designed to support innovation activities in other regions, will make it possible to fully utilize the creative potential of the existing scientific and industrial complex in the region, and increase project funding.

In conclusion, it should be stated that in the current economic and industrial production conditions open innovations, which are at different stages of their life cycle, are one of the main factors of the regional scientific and industrial complexes environment development. On the basis of centralized open innovations management, including their selection and distribution with implementation in production practice, it is possible to build a management system that produces an additional number of commercially viable innovative products, technologies and developments in the economic space of the region, including those with qualitatively new consumer properties. At the same time, special attention should be paid to information support of open innovations in the process of their dissemination.

4 Conclusions

Thus, the development of information and communication technologies, specialization of socio-economic systems subjects, high risk of innovation, high cost of all stages implementation for one subject, determine the need to combine the efforts of individual regional socio-economic subjects in the framework of cooperation and joint implementation of innovative projects. Given the current level of innovative development and technological support to the industrial production of the regions, we can conclude about the need to develop their own technological base, scientific and industrial ties between the separate entities in the region, and between regions, as well as the efforts to strengthen the international ties in order to exploit advanced international developments and practices. This policy has brought significant results to the leading innovative development countries. The existing personnel, material, technical and information reserve of the Russian regions can be realized through closer cooperation of industrial enterprises and research organizations of the region by forming stable links for interaction and exchange of experience and knowledge between research and industry production enterprises, which will serve as a basis for catalyzing the development of innovative processes in the region and thereby strengthening their competitiveness. The proposals for managing the infrastructure to support the innovation process considered in the article will allow creating conditions for exponential growth of regional innovation-oriented economy in a rapidly changing external environment.

Ensuring high rates of innovation sphere development of regional and sectoral economic complexes is possible in the case of creating effective innovation infrastructures aimed at activating innovation activities in the regions, including by accelerating and optimizing the transfer of innovative ideas for commercialization. The importance of

developing innovation transfer procedures is also determined by the fact that in the conditions of resource constraints that have increased due to the development of the global economic crisis, a significant part of enterprises cannot implement the full cycle of the innovation process on their own. In this situation, it is possible to reorient enterprises from using their own innovative developments to commercializing innovative ideas borrowed from the external environment. This, in turn, requires effective procedures for the transfer and dissemination of innovation at the regional level. Such work, on the other hand, requires the existence of an effective subsystem that ensures the diffusion of innovation between regional actors. It is necessary to consider the system of transfer and dissemination of innovative experience within the framework of scientific and industrial complexes as one of the key subsystems of regional innovation infrastructure. Its important role is determined by changing environmental conditions, the specialization dictated by it, open principles of work, continuous acceleration of sales deadlines and reduction of all types of costs with constant growth in the quality of manufactured goods and services.

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