Conceptual foundations of a systematic approach in the formation of the regional innovative potential

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Abstract. The article examines the conceptual foundations of a systematic approach in the formation of the innovative potential of the region. As a result of the systematic approach, a canonical model of the innovation system has been formed, which is based on the stages of the innovation process. For the development of the regional innovative potential, a model of innovation system management is presented. The reasons that hinder the formation of the regional innovation system were identified, they were ranked using the Delphi method. The factors hindering the development of the innovative potential of the region are identified. Recommendations are given as directions for further development of the innovative potential of the region.

1 Introduction

Innovative development is the basis of socio-economic progress in the modern world. A significant development and strengthening of the competitiveness of enterprises in the region is the introduction of diversification of innovation activities, namely, theoretical results of scientific research and development in the practical plane - in the form of serial innovative products, at the same time, various practical activities, or services, so that they are presented on the market as completely new goods or improved products. Using unique methods of manufacturing goods in production, absolutely new methodological tools for the performance of works and services. The world practice of regional development demonstrates differences in the levels of socio-economic and innovative formation of territories, the gaps may be different. As a result, the vulnerability of the territories appears. In this regard, there is a need for a comprehensive analysis of the systemic approach in the formation of the innovative potential of the region.

2 Materials and Methods

The theoretical significance of the work: consists in identifying the features of the development of the current stage of regional socio-economic development. New approaches

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to the development of the innovative processes theory are proposed to improve socio-economic development, the population life quality, and the competitiveness of the region.

Practical significance: consists in a comprehensive analysis of the spatial and economic relations of the region that arise during the formation of innovative potential, in the context of ranking the reasons that hinder the formation of the innovation system of the region under study.

The purpose of the work is to study the conceptual foundations of a systematic approach in the formation of the regional innovative potential, considering the revealed development patterns, which will allow it to be more fully realized in the new conditions of the spatial organization of the economy.

Research methods. The article uses the following methodological tools: methods of economic and statistical analysis of absolute and relative indicators characterizing the efficiency and intensity of dynamics, a systematic approach for regional systems, the method of mathematical and statistical processing, the Delphi method.

For several decades, a single universal and universally recognized concept of an innovation system has not been formed in economic theory. But after analyzing a number of definitions of the "innovation system" concept, we can conclude that the object we are studying is part of the economic system and consists of a set of subsystems and elements that would transform an idea into an innovative product. A distinctive feature of the innovation system, from other systems, is that it is based on the production of knowledge useful for the modernization and updating of the production system, products, services, and processes.

Having analyzed the models of innovative development, it should be noted that there is no one sufficiently satisfactory model, therefore, when forming a model of innovative development, it is necessary to proceed from the state or region characteristics, the macroeconomic policy pursued, the state of scientific, technical, and industrial potential, etc. According to Rastvortseva S.N., who states that support for the innovative development of regions should be carried out in those high technology sectors, for the emergence and development of which there are already necessary prerequisites [1].

Bessonova E.V. analyzes the consequences of the crisis, offers a methodology for supporting enterprises in the region with the use of new technologies [2].

Innovative systems are one of the new objects of economic science research. According to Y. Shupmeter, the use of innovations is based on the result of a technological breakthrough [5]. His followers, K. Freeman and B. Lundval developed these ideas in the 80s of the last century. K. Freeman and B.Lundvall analyzed the implementation of the innovation process at the micro level. Emphasizing that innovation is an interactive process, that is, the result of joint efforts [4]. It should be noted that when implementing a new product, companies are in constant interaction with various organizations, in particular with suppliers, users, research institutes and, undoubtedly, this affects the final product. Lundvall B. argued that the above actions cause interaction and communication. Namely, the quality of relations between the organizations involved in the innovation process affects the viability of the entire innovation potential.

It is not enough just to develop individual elements of innovation potential. It is necessary to develop mechanisms of interaction of its elements [4]. Having analyzed the structure of the research object from the standpoint of domestic authors, a single structure has not been identified. But a stable set of "mandatory" structural elements of the innovation system can be defined: the system of knowledge and technology generation, education, innovation infrastructure, business sector, government support, financial sector. It should be noted that analyzing the systems under study both at the federal level and at the regional level, we came to the conclusion that the structures of innovative systems, basically, are no different. In our opinion, to build an innovation system, the level can be ignored. The initial narrow interpretation of the innovation system assumed a focus on science and technology as the

main factors determining the environment in which firms operate, as well as influencing their strategy. B. Lundvall introduced a broader approach, arguing that the innovation system includes all elements of the socio-economic system, and the level of technology and innovation development is determined by the national characteristics of the historical development of the country.

To define the concept of the regional innovative potential, we used various sources, from dictionaries to articles in periodicals. As a result of the inventory, various interpretations of the "innovation system" concept have been collected

In economic dictionaries and encyclopedias, the definition is not fixed, except for the free encyclopedia "Wikipedia". In it, the definition is presented in general terms, without any specific characteristics. Also, the definition can be found in monographs, articles, books, where the author's own views on definitions are put forward [6,7,8,9]. Most often, the object of research is presented in the form of a set of subjects or institutions that ensure technological progress [10]. The innovative potential is presented in the form of a system of technology exchange between subjects. (Figure 1).

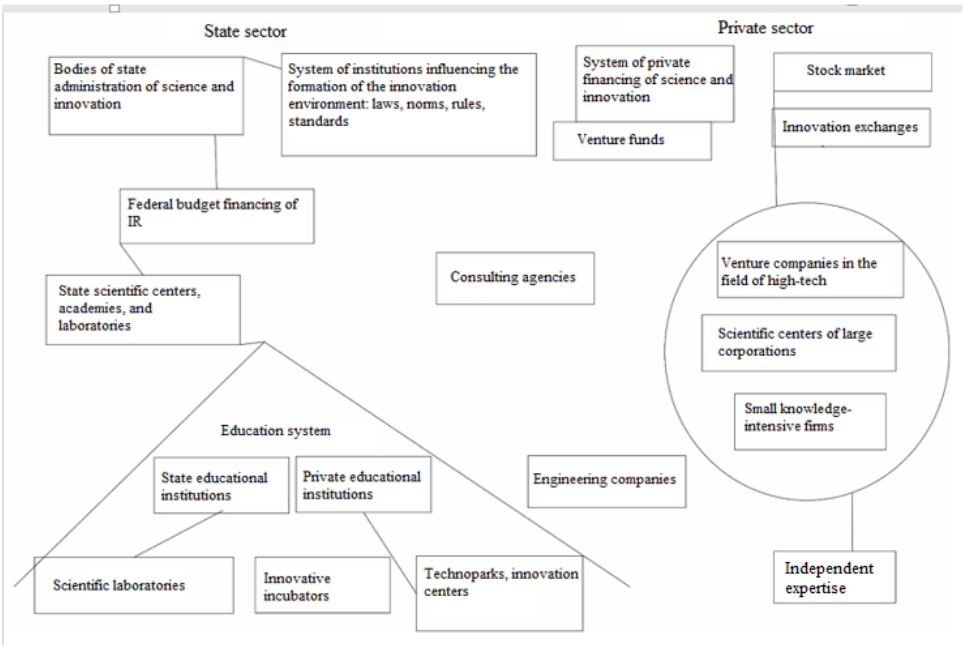

Fig. 1. Innovation system structure.

Also, the system under study, in conjunction with the potential, is presented as a direction of state policy in the field of science and technology development, or as part of the national heritage [12].

In this case, it can be grouped into three groups depending on the definition interpretation.

In the first group, the innovation system is considered as a set of economic entities whose activities are aimed at the development and dissemination of innovations with subsequent profit.

In the second group, the innovation system is considered as a complex of the private and public sectors, including the education system, financing from various sources, etc. These definitions emphasize mainly the interrelation of subjects, leaving in the shadow the driving forces of innovation processes [13,14,15,16,17,18].

From the third point of view, the innovation system is considered as part of the economic system that ensures the integration of innovative processes into the economy development.

In this case, a necessary condition is the formation of a favorable atmosphere for the creation of innovations [19].

3 Results

Having considered the innovation system, the following conclusion can be drawn: for several decades, a single universal and universally recognized concept of the system under study has not been formed in economic theory.

In the region under consideration, innovation policy is being implemented and innovative potential is being formed. Regional innovation policy, aimed at the local market development. It is based on assistance to entrepreneurs, building a competitive environment, expanding the product range, promoting finished products for export. Focusing attention, we emphasize that the strategy of the region has been developed to build a high-quality innovation system. Analyzing the development of the industrial potential of the region, it should be noted that, largely due to the unique minerals, it is developing successfully. Also, in the developed strategy, attention was paid to the economy of the region in the long term, it was necessary to create a new "vector" of development, namely, the creation of industrial enterprises with the use of innovations: the creation of high-precision, complex mechanical engineering, instrumentation engineering of a new generation. The above indicates that a qualitatively new innovation system of the region is being formed.

Table 1 shows the number of organizations that have created and used advanced production technologies

Table 1. The number of organizations that have created and used advanced production technologies in the region.

Indicators	2019	2020	2021
Quantity of organizations, created leading technologies, including:	4	4	8
New in the country	2	3	4
Conceptually new	2	1	3
Technologies with mechanical patents	-	1	4
Quantity of organizations, using leading technologies	59	67	76

We emphasize that activities in this sector are developing. For most indicators, the dynamics is positive, but there are some exceptions. There are a sufficient number of scientific organizations in the Tyumen region, but their activity is low.

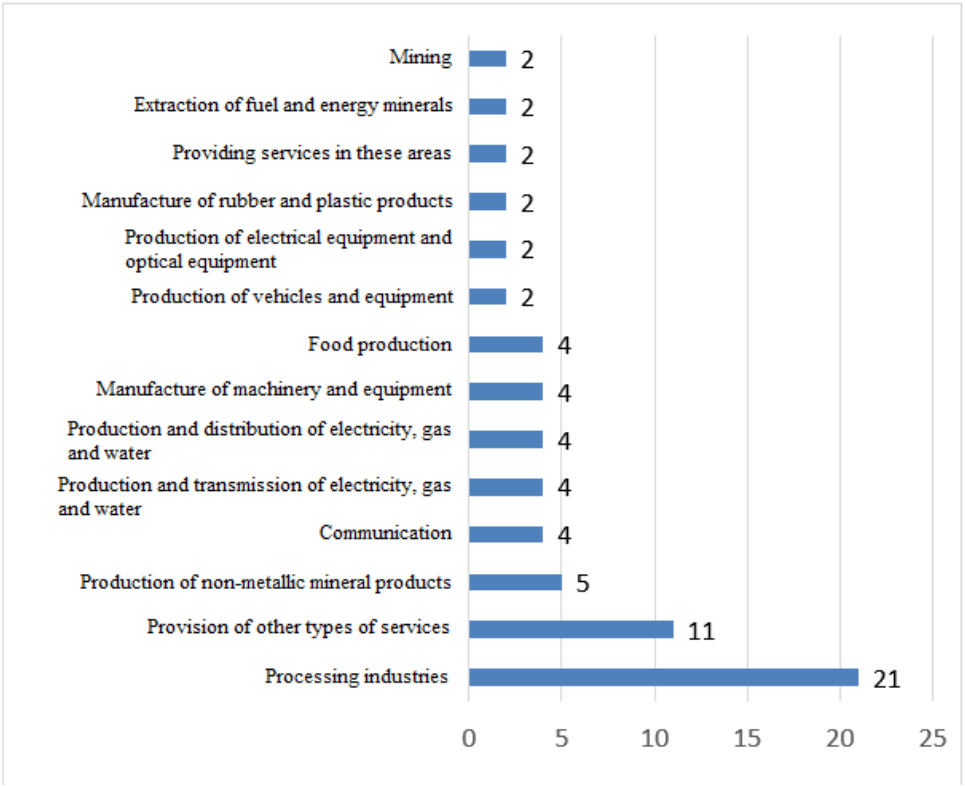

Fig. 2. Structure of innovative-active organizations by type of economic activity (2019)

Having analyzed the main indicators of innovation activity for the period 2019-2021, calculating the growth and increase rates, we can say that there is a positive trend in the innovation sector in the south of the region.

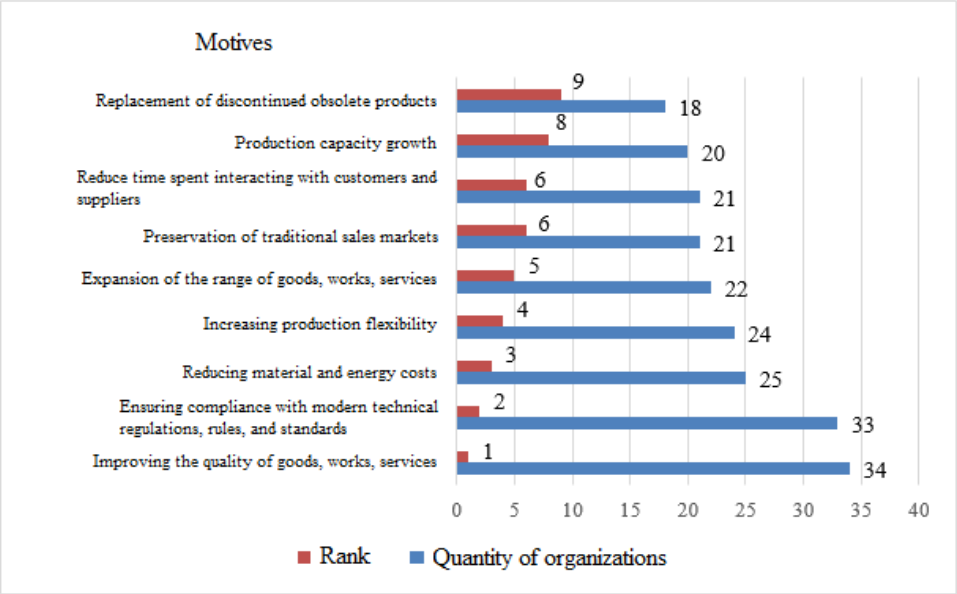

Fig. 3. The distribution of organizations that assessed the impact of the results of innovative activity on the production development as "high", 2021.

The study of the rating of factors hindering innovation, according to official statistics, demonstrates the following result: regardless of whether enterprises are engaged in innovation or not, they are most hindered by lack of funds, high cost of innovation, lack of government support, and economic risks associated with innovations (Fig. 4).

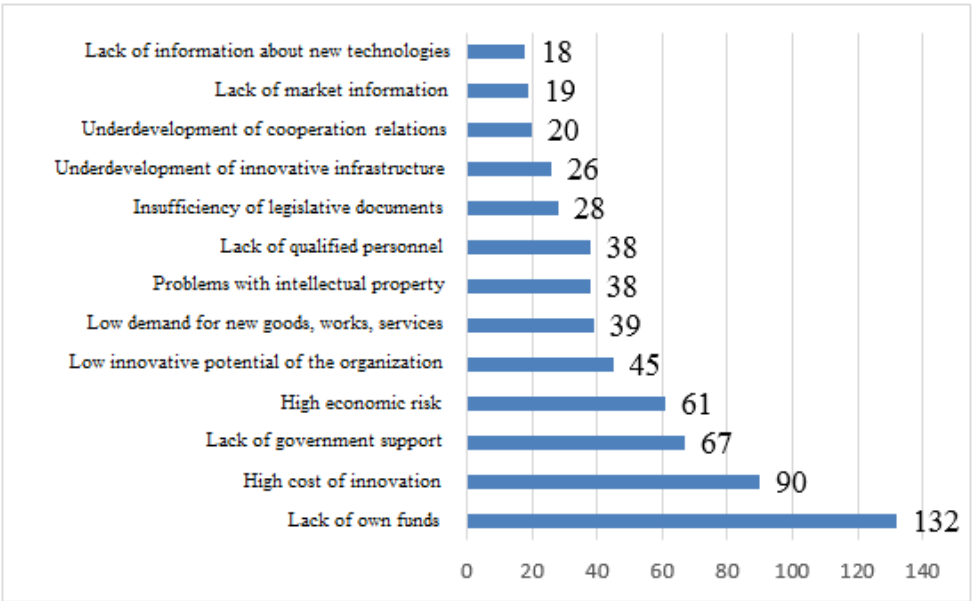

Fig. 4. Assessment by enterprises of factors hindering innovation: distribution of organizations that rated the factor as "decisive".

4 Discussion

It should be noted that factors such as infrastructure, problems with intellectual property are rarely assessed by entrepreneurs as important or decisive, although many measures of modern state innovation policy are guided by these barriers.

Having identified the problems of the innovation system formation, we decided to rank the causes using the Delphi method. The methodology is based on multiple anonymous group interviews.

This method was carried out in its pure form, but with some simplifications. Employees of enterprises participated as experts.

Further, in connection with the above problems, we have compiled a questionnaire - table with the innovation system problems.

Table 2. Inventory of the innovation system formation problems.

No.	Problems of formation
1	Institutional environment is insufficiently developed
2	Administrative barriers
3	Fragmentation of the created innovation structure
4	Lack of highly specialized personnel
5	Diversity of interests of the state, scientist, and entrepreneur
6	Poorly developed tools or agencies that would be a bridge between the research and business sectors
7	Low level of competition
8	Not enough incentives for innovation development
9	Not receptivity to innovation at either the population level or at the government level
10	Low demand for new goods, services, works
11	Lack of state funding and own funds
12	Lack of information about new technologies
13	Depreciation of fixed assets of enterprises

According to the results of the study (35%) of experts considered that the main problem of the innovation system formation is the lack of incentives for innovative development, (32%) of experts noted that the main reason is the lack of state funding and own funds. Nevertheless, having calculated the arithmetic mean, it turned out that the main reason is not the receptivity of innovations, in second place there is the lack of incentives and in third place - the lack of government funding and own funds.

The three most insignificant reasons, according to the interviewed experts: diversity of interests of subjects, low level of competition, and lack of information about new technologies.

5 Conclusion

The innovation system is open, since it functions in a certain field of the external environment, and a production system, since the purpose of the system is the production of innovative products.

As a result of the systematic approach, a canonical model of the innovation system was formed, which is based on the innovation process stages, and came to the conclusion that the structure of the innovation system should consist of the following elements: governing body, scientific sector, business sector, information, organizational, financial infrastructure. But at the same time, the peculiarities of the external environment, the environment and resource flows must be considered.

From the analysis of the regional innovation system, it can be seen that all the necessary elements and subsystems of the object under study are present, but the indicators of innovation activity are insufficient. Consequently, there are certain problems in the innovation system and therefore, it does not function in the required mode.

Using various opinions of the authors, we identified the reasons that hinder the innovation system formation, and ranked them using the Delphi method. As a result of an expert survey, it turned out that the most important reason is not the receptivity of innovations either at the population level or at the authorities level. The next most important reason is the lack of incentives for innovative development and the third most important reason is the lack of public funding and own funds.

It should be noted that factors such as administrative barriers or problems with legislation are rarely assessed by the population and entrepreneurs as important or decisive, although many measures of modern state innovation policy focus on these problems.

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