Assessing the factors of regional innovation environment on the basis of institutional approach

Galina Snigiriv1, Julia Davydova1, Larisa Domracheva1

1Vyatka State University, Moskovskaya str., 36, Kirov, 610000, Russia

E-mail: larisinalara@mail.ru

Abstract. The article deals with a new method of assessing the factors of the regional innovation environment. The method is based on the assessment of three fundamental factors: legal, infrastructure, economic. The theoretical significance of the study is due to the contribution to the development of methods for assessing the factors of development of the innovative environment of the regions on the basis of the index method, taking into account the expert opinions of innovators. The purpose of the study is to develop a mechanism for regulating the development of regional innovation environment on the basis of the author's method-Index APPROX. The research methodology consists of economic and statistical methods, methods of expert assessments, correlation and regression analysis and index method. The result of the research is formed organizational and economic mechanism of regulation of regional innovation environment development on the basis of the method-Index PRIM, taking into account the assessment of innovators, in order to increase the level of regional innovation potential as a factor of socio-economic development of the Russian Federation. On the basis of this mechanism, the author's algorithm of managerial decision-making in order to improve the management of innovative potential of Russian regions is proposed.

1. Introduction
Currently, for innovative, qualitatively new development of the state, it is necessary to create and maintain an environment conducive to the creation and implementation of innovations to increase the level of innovative potential of the region. In connection with the economic sanctions imposed by Western countries, Russia is obliged to independently develop and implement innovations in the main areas of the economy and public life. For innovative, qualitatively new development, the state needs to form and maintain an environment conducive to the creation of innovations. This, in turn, is a natural consequence of the ongoing transition from an economy based on classical factors of production (labor, land, capital) to an economy based on knowledge and innovation [4,17].

I would like to mention that the concept of the innovative environment (innovationmilieu) was considered in the framework of institutional economic theory, where the institution refers to the rules of the game in society or, to put it more formally, human-generated bounding box, which organize behavior between people. The institutional environment in the national innovation system is a set of interrelated and interdependent legislative, political, economic, legal and socio-cultural institutions that determine the incentives for innovation.

Taking into account the institutional approach and the concepts studied, the author proposes to divide the factors of the innovation environment into internal and external. In our view, this
combination is a fundamental condition for effective innovation. The authors combined a set of external (exogenous) factors of the innovation environment into two groups:

1) direct factors directly affect the work of the innovator (laws and institutions of state regulation, suppliers of raw materials, equipment, energy, components, consumers of products, competitors, both existing and potential engaged in the production of similar products and substitutes; trade, financial, transport and other intermediaries);
2) indirect factors indirectly affect the work of the innovator (state of the economy, scientific and technological progress, political, demographic, natural and cultural factors).

The regions of the country are called to actively develop their innovative potential, create the necessary conditions for the development and implementation of innovations, in this regard, research on the assessment and management of innovative potential of the territory (regions) of Russia is currently particularly relevant.

At the present stage of development of economic science, there are different approaches to the definition of resources as factors for assessing the effective use of innovative potential. At the same time, different categories are used: "production potential", "resource potential", "economic potential", "provision with objective conditions of production" [5,19].

In this regard, the objective of this study is to develop a mechanism for regulating the development of regional innovation environment on the basis of improving the methodological provisions for the assessment of its factors in order to increase the level of innovation potential of the regions of Russia. All existing methods of assessing the factors of the innovation environment of the regions used in the research are based on statistical indicators and do not take into account the "human factor" as a system of parameters for the analysis of direct participants of innovative processes (innovators) from the standpoint of the conditions created for their successful functioning [10,16].

The new method takes into account the views of innovators and on the basis of their assessments, will improve the quality of management decisions in the field of innovative development strategies of the Russian Federation, which can become the basis of the process of modernization of the Russian economy at the present stage.

2. Materials and Methods
Most foreign and domestic methods evaluate the factors and conditions of the innovation environment in the region through statistical indicators. Existing interpretations of insufficient reveal the definition of factors of the innovative environment of the region from the point of view of the principle of their Trinity [7,15].

Approbation of results on an assessment of factors of the innovative environment took place on three regions: the Kirov region, the Irkutsk region and Krasnodar Krai. It should be noted that each structure of factor groups takes into account regional peculiarities. The authors identify the following groups of factors of innovation environment in the Kirov region (Figure 1).

![Trinity of factors of innovation environment development](image-url)

**Figure 1.** Factors of innovation environment development (compiled by the author).
1. Legal norms regulating innovative activity (PR) (Subindex of RPA) includes the list of the main legislative acts and normative legal documents in the sphere of science and innovative activity: the Law on industrial policy; the Law on taxation of organizations and enterprises; the Law on regulation of investment activity; the Law on science and scientific and technical policy; the Law on development of small and medium enterprises; the Law on development of innovative activity; the Law on protection of intellectual property; Long-term strategy of socio-economic development of the region; Program to support and develop small businesses; Program to improve the investment climate and attract investment and new technologies in the economy of the region.

2. Infrastructure objects of support and development of innovations (I) (sub-Index OII) include a set of structures that provide the conditions necessary for the implementation of innovation and the functioning of innovative processes: Center of scientific and technical information; Center of research projects; Business incubator; Technopark; Center of innovative development of entrepreneurship; Technology transfer center; Information and innovation center; Center of exhibition and fair activities; Center of outsourcing services; Fund for support of small and medium enterprises

3. Methods of support of innovative activity (M) (Subindex IPID) – a set of measures of state regulation (administrative and economic) aimed at the development of innovative activity in the territory:
   Subsidizing part of the interest rates on loans attracted by subjects of ID; Subsidizing part of leasing payments under lease agreements of subjects of ID; Provision of budget investments to subjects of ID; Provision of tax benefits; Provision of investment tax credit; Participation in exhibitions and fairs; Venture investment of innovative projects of small businesses; Grant support for certain categories of citizens who want to organize their own business; Information and consulting support of subjects of ID; Preferential use of property located in the regional (municipal) property.

On the basis of grouped factors, the authors have formed a new approach to the assessment of factors of the regional innovation environment using the method-Index APPROX.

The proposed institutional components (factors) of the innovation environment of the region coexist, complement and condition each other. Taking into account the above, we offer a refined definition of the factors of the innovative environment of the region – a set of conditions for the development of innovative activity of the region on the basis of legal norms (PR), infrastructure (S) and methods of support (M), in terms of assessing the degree of their awareness, importance and effectiveness for innovators in a competitive market environment[6]. A well-developed institutional environment is a prerequisite for the formation of a favorable environment for the development of innovations, so one of the main tasks at the present stage is the creation of conditions and factors for their most effective implementation.

The research allowed to identify the main stages of the analysis and evaluation of factors of the innovative environment of the region using the method-Index NOTE [2,12]. At the first stage of the study, the initial data for the study, the statistical analysis of the level of development of the innovative potential of the region, the generalization of information on the above factors are being prepared. The second stage involves the development of questionnaires, which allows to assess the awareness, importance and effectiveness of the factors listed in the innovation environment of the region. At the third stage, a survey of respondents (innovators) – key participants (stakeholders) of the innovation process in the region is organized. The homogeneity of the participants’ assessments, as well as the reliability of the study, is largely confirmed by the calculation of the coefficient of variation in the method presented by the author. The fourth stage is the processing of information, construction of summary tables, charts and calculations of subindexes (NPA, OII, IPID). The connection of subindexes with indicators of innovative potential of regions on the basis of the correlation analysis is defined.

Taking into account theoretical studies, the author developed a methodology for assessing the factors of the innovation environment, which allowed to take into account the assessment of innovators in the regions of Russia [3]. Research in this area allowed to determine a new approach to
the assessment of the innovative potential of the region, which is called the method-Index APPROX. The construction of the method-the Index of PRIM and subindexes, which are its basis, is based on the following five principles: a) focus on the opinions of innovators in the region; b) the Trinity of important factors of the innovation environment in the region normative legal acts, the objects of innovation infrastructure, methods of support of innovative activity; C) the homogeneity of estimates and judgements the innovators on the factors of innovative environment of the region; d) the consistency of the method-the index of the PRIM with the use of statistical, economic-mathematical methods and the method of expert evaluations; d) the embeddedness of the method-the PRIM Index in the decision-making process for the development of the innovative environment in order to enhance innovation potential of the region.

The essence of the method is that the factors: LEGAL regulation of innovative activity; And–infrastructure of innovative activity; M–methods of support of innovative activity allowed to allocate the following subindexes [1,11]:

1. The sub-index of INP allows to evaluate the awareness and perception innovators key legal acts at the level of subject of the Russian Federation;
2. The subindex of OII is intended for identification of awareness of innovators and an assessment of efficiency of objects of innovative infrastructure in the subject of the Russian Federation;
3. The subindex is Aimed at identifying the awareness of innovators and their assessment of the effectiveness of methods to support innovation in the region.

The PRIM index is calculated as the average of sub-indices of INP, AIS, MPEG. The authors used additive convolution rather than multiplicative convolution because it is most applicable for criteria (in our case, subindexes) that are homogeneous in meaning and close in scale. Weighting factors were not used because the determination of weighting factors results in a high level of uncertainty and, in addition, subindexes are of equal importance.

3. Results
In the study to assess the factors of the innovative environment of the regions using the method-Index PRIM, a target sample was used. During the interview, the Respondent, according to the questionnaire developed for each region, was asked to assess their awareness, as well as to quantify the importance and assess on a given scale the effectiveness of legal acts, infrastructure and methods of supporting innovation in the region. The research tools (in the form of a structured questionnaire) were developed taking into account the existing features in the regions with respect to the subindexes: NPA, OII and IPID [8,9]. After processing the questionnaires, the coefficients of awareness, significance and efficiency assessment were calculated with respect to innovative legal acts, objects of innovation infrastructure and methods of supporting innovation. In addition, data on the problems of development of factors of the innovation environment of the region were processed, followed by their ranking according to the degree of importance for different groups of innovators [14,18]. In the end, the obtained results allowed the author to calculate the indices of the subindexes of NPA, OII, IPID, on the basis of which the Index of PRIM for each studied region was determined.

As a result of the study, the following values of the method subindexes were obtained-the Index of the KIROV region (Figure 2).
The analysis of the values of sub-indices according to the method of the PRIM Index in the Kirov region have shown that if the coefficient of variation of less than 10%, the variability of the variation series is considered to be insignificant, from 10% to 20% refers to the average, more than 20% and less than 33% in the significant and if the coefficient of variation exceeds 33%, then this indicates heterogeneity of information and the need to exclude the largest and smallest values. The optimum value of the coefficient of variation should not exceed 33%. Calculations allow to reveal the different level of development of factors of innovative environment of each region, forming the basis of management decision-making in accordance with available resources and projected results [20]. At the same time, the factors proposed for evaluation based on the estimates of innovators in the studied region have the property of uniformity, and, therefore, the index of PRIM is sufficiently reliable in practical calculations for the analysis and evaluation of the factors of development of the innovation environment of the Kirov region.

4. Discussion

The developed methodology for assessing the factors of the regional innovation environment on the basis of the results of the study by the method-Index PRIM and can be used in the process of decision-making in the regions. Some provisions of the study can be applied in the development of programs of innovative development of the regional economy, regional development strategies. These assessments of innovators and calculations made on sub-indices can indicate to regional managers which of the factors of the innovation environment (regulatory support, objects of innovation infrastructure, methods of supporting innovation) are less developed and which are more. This will help to set priorities, allocate resources, and determine the directions of innovative development in the region [21, 22]. The results of the study can be used:
1) scientific and educational institutions for training of students, postgraduates and listeners of retraining and advanced training in the social and economic sphere on academic disciplines "Regional economy", "Institutional Economics", "Regional management and territorial planning", "Investment policy of the state", "State and municipal management", "Innovative management”, etc.;

2) employees of objects of support and support of innovative activity in the region for the analysis of opportunities and ways of its development (business incubators, research institutes, innovation centers, etc.);

3) subjects of innovative entrepreneurship in the region (entrepreneurs, young scientists);

4) local and regional authorities for the creation and development of innovation infrastructure in the region, the development of economic instruments to support innovation and regulatory documents in the field of innovation in the Russian Federation.

Acknowledgments
Research in the regions was carried out within the framework of the grant project "Conditions, factors and indicators of modernization development in the regions of Russia: research using quantitative and qualitative methods", "Instrumental approaches to assessing the modernization development of Russia: indices, regional measurements and recommendations". The project was supported at the IV Open competition of projects of non-profit non-governmental organizations of social importance in the field of research and monitoring of civil society "Problems of development of modern Russian society" in the form of a grant (Moscow), allocated by the Institute of public design in accordance with the order of the President of the Russian Federation No300–RP. Conclusions on the work, recommendations on the use of the results are given.

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