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A MIXED TYPE METHOD FOR ASSESSING REGIONAL INNOVATION POTENTIAL (EXAMPLE OF TATARSTAN)

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Abstract

The foreign experience of innovative activity of regions shows that, the creation of regional investment and innovative formations is in full swing in foreign countries, which are the core of the overall European success in policies aimed at creating, implementing and promoting new technological ideas materialized in a product. The assessment of investment and innovative activity of regions in foreign countries is provided by the compound innovation index IUS 24, which includes 24 indicators. An analysis of the approaches of domestic economists showed that they all use approximately the same set of absolute and relative indicators with different approaches to calculating the integral indicator. Currently, there are various simple and comprehensive approaches to assess regional innovation potential. The analysis of the applied methods showed that both domestic and foreign practice uses a wide range of indicators to assess innovation potential of both a single country and its regions. At the same time, there are disagreements even among experts, for example, which socio-economic indicators should be considered key ones to ensure innovation, how they are formed, etc. The study substantiates the feasibility of applying a mixed approach to assess regional innovation potential, provides an approximate system of key indicators of innovation efficiency at the micro level, as well as a system of absolute and relative indicators for assessing regional innovation potential, and offers an integral indicator of a comprehensive assessment of regional innovative activity. The proposed methodology allows selecting priority areas and measures to enhance regional innovation potential.

Keywords: Innovative activity, scorecard, regional innovation potential, enhance innovation potential, innovation efficiency.

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1. Introduction

A review of scientific publications on assessment of regional innovation potential and innovative activity showed that, we have many scientific works in these areas, but there is no methodology and theoretical basis and no clear systems of indicators for assessing innovation potential of individual companies and region. As a result, issues of clarifying methodological foundations of innovative development of the Russian economy, corresponding to the state of its development and considering the dynamism and depth of the changes occurring in it recently, are becoming increasingly relevant.

2. Problem Statement

The authors of the study propose a system of indicators to assess regional innovation potential Rudich (2018), Tsydypova (2017), Bolshakov, Abramov, Alekhin, Zagorodnikov, and Tkachev (2018). It should be noted that this system of indicators should assess regional innovation potential from two positions: firstly, from the point of view of creating conditions to enhance innovation potential; secondly, in terms of assessing their efficiency. To solve this problem, it is advisable to use absolute, relative and compound indicators of innovative activity.

In the course of the study, the following issues were considered:

1) To develop a system of key indicators of innovation efficiency at the micro level based on the analysis of foreign and domestic methods for assessing regional innovation potential;

2) To develop a system of absolute and relative indicators of regional innovation potential based on a SWOT analysis of the Republic of Tatarstan as a socio-economic system;

3) To develop of a compound indicator of comfortable innovative development and an indicator of a comprehensive integrated assessment of innovative activity of the regional economy.

3. Research Questions

In the course of the study, the following issues were considered:

1) To develop a system of key indicators of innovation efficiency at the micro level based on the analysis of foreign and domestic methods for assessing regional innovation potential;

2) To develop a system of absolute and relative indicators of regional innovation potential based on a SWOT analysis of the Republic of Tatarstan as a socio-economic system;

3) To develop of a compound indicator of comfortable innovative development and an indicator of a comprehensive integrated assessment of regional innovative activity.

4. Purpose of the Study

The purpose of the study is to justify the mixed approach to assess regional innovation potential. The current approaches are based on the use of both absolute and relative indicators, including integral ones. However, at the same time, the issues of comfortable innovative development in certain regions is not sufficiently analyzed. The solution to this problem is to use the expert method and identify the strengths and weaknesses of the region, its capabilities and potential threats.

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5. Research Methods

The authors used general scientific and specific research methods. So, when studying theoretical foundations, foreign experience in assessing innovative activity, methods of scientific abstraction, analysis and synthesis, induction and deduction were used. The authors used the indicator method todevelop a system of indicators, and they used the method of expert review to assess factors that are not amenable to statistical assessment.

6. Findings

Currently, there is a problem of insufficient consideration for innovation efficiency, primarily at the level of individual companies (Kolmykova, Emelyanov, & Merzlyakova, 2017). To solve this problem, Table 01 proposes an approximate system of key indicators of innovation efficiency at the micro level, the main advantage and requirement of which is their quantitative measurability and comparability. In addition, the system of indicators includes indicators for assessing the company's activity in the field of energy conservation and environmental friendliness.

Table 01. Recommended system of key indicators of the company's innovation efficiency

Indicators	Values
Performance indicators	
Reducing the cost of production (work, services) without quality deterioration and reducing environmental friendliness	At least 10% to achieve industry-average values of leading foreign companies
Reducing the energy intensity of production	At least 5% per year to achieve industry-average values of leading foreign companies
Labor productivity growth	Not less than 5% annually to achieve industry-average values of leading foreign companies
R&D financial and performance indicators	
Volume of R&D own financial resources (as a percentage of revenue)	The company sets its critical values itself
Number of registered patents and other intangible assets accepted on the balance sheet as a result of R&D	
Number of new technologies and products introduced as a result of R&D	
Technological leadership indicators	
Number of patents received for the last three years	The company sets its critical values itself
Number of proprietary products for the past three years	
Quality of innovation portfolio (the ratio of new technological and product innovations with improving projects aimed at products development on the market)	
Efficiency	
Share of new products in revenue from the sale of innovation products (not older than 3 years)	The company sets its critical values itself
Level of profitability of innovations (the ratio of revenue from the sale of innovation products to the cost of their production)	At least 15-20%
Efficiency of the company's innovation management system	
Number of innovative proposals and projects received from employees	The company sets its critical values itself
Amount of motivational payments to employees for innovative activity	
Duration of the innovation process cycle from consideration of the application to implementation and entry into the market	
Interaction with R&D and innovationexternal sources	
Number of innovative proposals received from outside	The company sets its critical values itself
Share of sales from third-party development	

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Thus, the indicators given in Table 01 are designed to assess the level of innovation potential at the micro level. At the same time, the use of these indicators to assess innovation potential will be hampered by the lack of official statistical information on individual indicators (for example, the level of energy intensity of production in certain regions, the amount of motivational payments, etc.). Summarizing the results of previous studies Fedotova (2016), Karasev, Beloshitsky, Trostyansky, Krivtsova, and Valerievna (2018) we concluded that it is more advisable to assess regional innovation potential based on the following components:

- Intra-regional potential, assessing by the level of the regional socio-economic development;
- Resource potential, including personnel and production and financial potential;
- Innovation efficiency.

Moreover, each component should be assessed based on the strengths and weaknesses of the region, its capabilities and potential threats (Kozhukhivska, Parubok, Petrenko, Podzihun, & Udovenko, 2017; Shaimardanova, 2018).Thus, the results of our SWOT analysis of the Republic of Tatarstan as a socio-economic system (Romanova, Donichev, & Barinov, 2017) showed that, along with a favorable geographical and geopolitical position, stable economic growth, high cultural and qualification potential, the presence of a developed scientific and educational complex and targeted regional development programs and support of innovative activity, there are also such tools of regional innovation potential as innovative activity, development and introduction of innovations, the institution of intellectual property, motivation, financing and stimulation of innovation. The authors represent the recommended system of absolute indicators for assessing regional innovation potential (see Table 02).

Table 02. System of absolute indicators of regional innovation potential

Group	Indicators	Source of information
Intraregional potential		
Socio-economic potential	Population of the area, million	Rosstat
	Area, million m^2	Rosstat
	Gross regional product per capita, million rubles	Rosstat
	Cash income per capita, rubles	Rosstat
Resource potential		
Personnel potential	Number of personnel engaged in research and development, people	Rosstat
	Number of doctors, candidates of sciences, graduate students, applicants, people	Rosstat
	Number of organizations having graduate school, units	Rosstat
	Costs of staff training and advanced professional training related to innovation, thousand rubles	Rosstat
	Number of research institutes	Rosstat
	Number of state, municipal and non-state higher educational institutions, units	Rosstat
	Number of students studying in universities, thousand people	Rosstat
Production and financial potential	Capital investment, million rubles	Rosstat
	Costs of updating fixed capital and intangible assets, million rubles	Rosstat
	Costs of technological innovation, million rubles	Rosstat
	Volume of innovative products, goods, services, million rubles	Rosstat
	Number of advanced manufacturing technologies used, units	Rosstat
	Number of completed own innovations, units	Rosstat
	Number of acquired innovations, units	Rosstat
	Number of R&D performed, units	Rosstat
Innovation efficiency		
	Revenue from the sale of products, works, services, thousand rubles	Rosstat
	Output of innovative products, million rubles	Rosstat
	Level of labor productivity, thousand rubles	Rosstat

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Innovation outcomes	Increase in the number of small innovative enterprises, units	Rosstat
	Finance result of profitable enterprises, million rubles	Rosstat
	Finance result of unprofitable enterprises, million rubles	Rosstat
	Number of patents and certificates received, units	Rospatent
	Cost reduction, thousand rubles	Rosstat
	Reducing the burden on the environment, thousand rubles	Rosstat

Source: authors based on section «Science and innovation», Rosstat (Federal State Statistic Service, 2018)

This system of quantitative indicators is of practical importance from the point of view of analyzing the dynamics of these indicators, as well as for conducting a comparative analysis of individual components of innovation potential with other regions.

The above system of indicators has different units of measurement and therefore cannot be used to summarize the features of regional innovation potential. In this regard, in order to bring the indicators to a comparable form and calculate the integral indicator, it is more expedient to use a system of relative indicators of innovation potential (see Table 03).

Table 03. System of relative indicators of regional innovation potential

Group	**Indicators**	**Individual significance value**	**Compound significance value**
Scientific and human potential	Share of R&D personnel (H1)	0,651	0,621
	Share of doctors, candidates of sciences, graduate students, doctoral students in economically active population (H2)	0,535	
	Proportion of graduate students completed a dissertation in the total number of graduates (N3)	0,475	
	Share of employees with higher education in economically active population (H4)	0,789	
	Share of university students in economically active population (H5)	0,657	
Technical potential	Share of imports of innovative technologies and products in the total exports of the region (T1)	0,792	0,639
	Share of innovation-active companies in the total number of companies in the region (T2)	0,745	
	Share of organizations that used information and communication technologies in the total number of organizations in the region (T3)	0,478	
	Coefficient of renewal of fixed assets (T4)	0,652	
	Coefficient of validity of fixed assets (T5)	0,659	
	Share of costs for info-communication technologies in GRP (T6)	0,506	
Financial and economic potential	Ratio of investment in GRP (E1)	0,744	0,613
	Ratio of costs for R & D and GRP (E2)	0,612	
	Share of innovative products in GRP (E3)	0,656	
	Share of intangible assets in GRP (E4)	0,569	
	Profitability of production (E5)	0,589	
	Share of profitable enterprises (E6)	0,509	
Comfortable development of innovation potential		0,632	

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The relative indicators are summarized in four groups. To do this, a matrix was previously formed from all indicators in the Microsoft Excel program and, using correlation analysis, the relationship between each factor (individual dependence coefficient) and the effective one (the volume of innovative products (work, services) output) was revealed. A significance value was determined for each group of indicators based on generalization followed by averaging (using the arithmetic mean formula).

Let us consider the indicator of comfortable developmentto enhance innovative activity. There is no doubt that innovation potential is higher in the region with necessary conditions created for potential participants in innovative activity. From this point of view, it is necessary to consider the level of legal regulation of this type of activity, the tools of real support for existing and potential innovators and their level of awareness, assessment of the human factor and its motivation (Glukhova & Zubarev, 2017; Hlaváček, 2017; Ilyash, Dzhadan, & Ostasz, 2018). However, it is not possible to quantify these factors quantitatively. Therefore, it is necessary to apply an expert approach.

This approach provides for systematic identification of opinions and assessments of key participants in regional innovative activity. Information is collected through a specially organized survey and questionnaire, based on generalization of the results which allow assessing:

- Quality of legal acts regulating regional innovative processes;
- Innovation infrastructure facilities;
- Regional tools to support innovation.

Then, the compound indicator of comfortable development of innovation potential (Icdip) is calculated using the arithmetic average formula.

In the course of the study, a survey was conducted of 120 current (representatives of small, medium and large businesses) and potential (senior students of technical universities) participants of innovative activity of the Republic of Tatarstan. Most respondents note the possibility of financial support from the regional authorities (48.6%) as the main factors for the development of innovation potential. So, 19.2% were in favor of financial support for participation in exhibitions and fairs, 17.9% - in favor of providing tax benefits, 11.5% of the total number of survey participants were in favor of grant support for innovative projects and providing guarantees of regional and local authorities.

Least of all participants were in favor of providing budget investments (4.9%), access to venture lending (4.6%) and preferential use of municipal property (5.1%). These indicators mean that it is impossible to receive this kind of support from the regional and local authorities, and this kind of tools of state support for innovation, especially in terms of providing innovators with free production facilities that are available in each municipality, are not used sufficiently.

Depending on the significance level of each indicator, the authors assigned them an individual (by expert means), and then a compound significance value calculated using the geometric mean formula. This formula is justified by the presence of individual significance indices in the initial information (Table 04).

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Table 04. Recommended scale for assigning individual significance values

Indicator share, %	Individual value
Up to 5%	0,2
From 5 to 10	0,3
From 10 to 15	0,4
From 15 to 18	0,6
Over 18	0,7

The compound value of comfortable innovative development in the Republic of Tatarstan amounted to:

$$\text{Icdip} = \sqrt[5]{0,2 * 0,3 * 0,4 * 0,6 * 0,7} = 0,632$$

7. Conclusion

The methods used in domestic practice, even though they were developed considering many years of experience of developed countries, have certain disadvantages that often limit the conditions for their practical application. We can distinguish those methods that consider only statistical indicators or only expert evaluation. In our opinion, a mixed approach should be used to assess innovation potential. So, to assess innovation potential at the micro level, it is more appropriate to use a system of absolute and relative quantitative indicators. An expert approach is more acceptable to assess comfortable development to enhance innovation efficiency.

The use of official statistics allows an objective assessment of most indicators characterizing regional innovative activity. The expert approach to assess factors that have a significant impact, but are not amenable to statistical assessment, will allow considering assessments and opinions of direct participants in innovation process and effective tools and conditions for the development of innovative activity. This approach will cover all the components of innovation potential. The proposed method is unique since it is easy to calculate its indicators, which allow us to assess the value of regional innovation potential, analyze the current situation, identify the main trends and determine priority development directions.

In addition, the use of the indicators proposed in modern domestic ratings of Russian regions will provide the distribution of the constituent entities of the Russian Federation that is more adequate to the challenges of post-industrial transformation and the emerging innovative economy, the added value of which is created through the creative activity of workers.

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