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METHODOLOGICAL ASPECTS OF ASSESSING THE INNOVATIVE DEVELOPMENT OF REGIONS

Abstract. The technique of assessing the innovative potential of the regions is considering. The basic methods for assessing innovative potential are proposed, these methods have been tested in relation to the scientific and technological complex of economic zones. The proposed methods have advantages in comparison with expert and statistical methods of assessment, allowing minimizing the error in the estimates obtained. The article considers and analyzes local and international methodological approaches to assessing regional innovative development. The study identifies general trends and methodological approaches to assessing the innovative development of the region, also calculates the innovation index for each region for a comparative assessment of the innovative potential of Azerbaijan. The methodology used in this work was improved taking into account the national and specific features of Azerbaijan, statistical indicators in this area, the collection and processing of information and the innovative potential of the regions. As a result of the study, recommendations on the role of regions in the development of the economy and regional competitiveness were made. The scientific and practical value of the results lies in the possibility of their application in combination with the analysis of official statistics in the process of improving the state scientific, technical and innovation policy in the direction of more intensive use of scientific knowledge and achievements in the interests of modernizing the economy of Azerbaijan. The proposed approach is able to ensure the information integration of all subjects of scientific organizations and carry out comprehensive studies of production, innovation and economic management processes in the framework of the development of science.

Keywords: regional innovations, assessment, methodology, innovative potential.

INTRODUCTION

Nowadays, on the basis of innovation, there is growing interest in the socio-economic development of the regions. In the context of technological restructuring of the world economy, the development and technological modification of the economy are of particular relevance. In this case, the path of innovation involves multilateral development of regions and the formation of new zones of accelerated development. Improving the innovative potential of the region is also an important issue for European countries. They adopt an appropriate action plan in this area [1].

Today, there are many approaches to assessing the innovative development of a region: differentiation by subject and objects, assessment of the institutional environment, goals and objectives, indicators, assessment databases, etc.

Therefore, it is necessary to review and analyze domestic and foreign methodological approaches to assessing the innovative development of the region.

First of all, let's clarify the concept of innovative development in the region.

Innovative development of a region is a system of interconnected processes, factors and conditions that affect innovation processes, creating and applying integrated balanced development, taking into account the needs of all interested parties in the region (government bodies, population, etc.) [2].

GENERAL METHODOLOGY FOR ASSESSING THE INNOVATIVE DEVELOPMENT OF REGIONAL ECONOMIC SYSTEMS

As mentioned earlier, there are different approaches to the structure of RIS. Approaches are conditionally grouped in two main areas:

- 1. RIS is considered as a system of interconnections and interactions of elements.
- 2. RIS is seen as a process of interconnected phases of innovation.

In fact, RIS has a very complex structure and RIS should be studied in both directions.

Thus, the innovation system of the region is a sequential process of implementation of various stages of innovative activity by economic entities, which are elements of the system and interact with each other (**Table 1**).

According to this approach, the RIS conceptual model is based on the stages of the innovation process in different blocks. Thus, presented the mechanism of interaction of the structural elements of the innovation system. Here, the functional block reflects the potential of "RIS creation features" and "Access to the system".

Another "Process block" is the stage of direct innovation. The leading element here is the research and business sector. These elements enable the creation, testing and commercialization of innovation in close collaboration.

Table 1

Approaches to assessing the innovative development of the region

Approach	URL
The Global Innovation Index	https://www.globalinnovationindex.org
Global Innovation Barometer	https://www.ge.com/stories/innovation-barometer
European Innovation Scoreboard	http://ec.europa.eu/DocsRoom/documents/25101
Regional Innovation Scoreboard	http://ec.europa.eu/docsroom/documents/23881
Innobarameter	https://ec.europa.eu/growth/industry/innovation/facts-figures/innobarometer_en
Community Innovation Survey	http://ec.europa.eu/eurostat/web/microdata/community-innovation-survey
Innovation Cities Index	https://www.innovation-cities.com/indexes
Eco-Innovation Scoreboard	https://ec.europa.eu/environment/ecoap/indicators/index_en

Note: [3–11] were developed by the author.

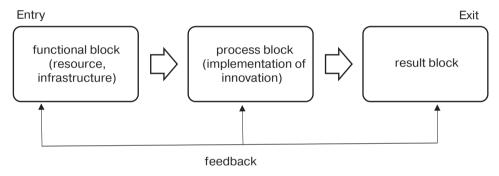


Fig. 1. Block of regional innovation system

The basis of interaction is the active participation of the state and the institutional environment, and the quality of development of the innovation environment affects the speed and effectiveness of the innovation process.

The "Result block" reflects the impact of RIS, in other words, an increase in the standard of living of the population through sustainable economic growth based on increased regional competitiveness in the region. RIS effects are used as a resource (base) for building the capacity of the system and a new stage in its development.

Let's take the RIS model shown in **Fig. 1** as the basis for developing an approach to assessing the development of RIS. Let's use the more well-known foreign and local approach as a methodological basis for evaluating RIS.

The main indicators reflecting the state of RIS that impede the use of existing methods in Azerbaijan are local statistics. Local calculations are also based on indicators that are generally available in official statistics.

The sub-indices of RIS innovation potential and its effectiveness should be considered separately

in the structure of the RIS innovation index. Because the effectiveness of RIS is a key factor in its effectiveness. Therefore, indicators characterizing the effectiveness should be calculated separately and have significant weight in the structure of the index.

In assessing the innovative development of the regional economic system, the following areas should be taken into account:

- The composition of the primary indicators reflecting the status of RIS should be reviewed;
- Grouping of indicators in the sub-index with the condition of transferring indicators of potential and effectiveness of RIS into different groups;
- Determining the weight of the subindex in terms of the importance of the outcome indicators.

The structure of the Regional innovation development index should consist of four sub-indices reflecting the situation with RIS (**Fig. 2**):

The "Opportunities for innovation" subindex reflects the initial conditions and capabilities of the innovation system. The indicators characterizing the potential of RIS include: human potential,

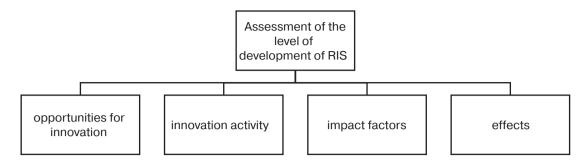


Fig. 2. Development assessment of RIS

scientific, industrial and technological status, the degree of informatization of economic entities:

The "Innovation activities" subindex refers to indicators characterizing the activity of innovations in the region, the qualitative characteristics of innovative business entities and the printed activity of researchers. Should be noted the quality of research, the interaction of the scientific community with the business sector of the economy, the number of applications for patents and inventions, etc.

The "Effects" subindex reflects the effectiveness of the innovation system in the region and the effectiveness of innovation in creating innovative products, services and technologies.

RIS refers to a list of indicators reflecting productivity: the amount of money earned on the export of innovation and quality of life.

Evaluation of the innovative development of regional economic systems allows us to determine the effectiveness of the generated RIS, and an analysis of the dynamics of the data allows us to develop organizational and managerial decisions to increase its effectiveness.

It is regrettable, that the assessment of RIS by this method has some difficulties in Azerbaijan. Because each of the four sub-indices does not have statistics in Azerbaijan.

General characteristics of approaches to assessing innovative development in the region.

Most methodologies for assessing the innovative development of a region are based on a survey of the institution's management. This helps to understand the relationship of business units to innovation and their application. This is often regulated using Eurostat data. In general, the methods used are consistent with the creation of an institutional environment in developed countries with regional natural, economic and social features.

Thus, a summary of methodological approaches to assessing innovative development in the region under consideration is presented in **Table 2**.

Table 2

General characteristics of methodological approaches to assessing the innovative development of a region

Features	Explanation
goal	research on innovative development in the region;
position	assessment of the innovative development of the region, the creation of a regional rating for comparison, the identification of weaknesses and strengths of the innovative development of the region;
object in question	the region is limited to certain administrative boundaries (city, cluster, region, group of regions, country);
assessment factors	impact on the innovative development of the region (industrial, economic, integrated, social, environmental and economic);
used primary information	statistical data, data of enterprises and international organizations, data of sociological studies;
used methods	quantitative and qualitative assessment methods;
indicators	depending on the method, the number changes, in some blocks the indicators are grouped;
applied weight coefficients	in special cases

Most methodological approaches to assessing regional development are based on an integrated approach that takes into account economic, social and institutional indicators and reflects a specific form of innovative development. Even most of these approaches are based on economic approaches. This is explained by the expenses of society on the development of innovations and the income from the use of the population in the economy and life. Other researchers, however, focus on using the results of large enterprises, ignoring the characteristics of small businesses and regional characteristics.

In addition, the methods considered are not used in assessing specific regions. Foreign scientists suggest taking into account the natural and demographic factors affecting the economy when assessing the innovative development of the region [12]. Others suggest looking at the regions of small nations and their cultural traditions, traditional economic activities and the external environment that affects them [2].

ASSESSMENT OF THE INNOVATIVE POTENTIAL OF REGIONS IN AZERBAIJAN

Today, the formation of an innovative structure in the regions of Azerbaijan is still at an early stage. The assessment of the Regional Innovation System (RIS) is still in its infancy. Various scientists (A. Huseynova, T. Aliyev) [13; 14] in their works studied and evaluated methods for assessing regional innovative activity in the Republic.

The existence of many approaches to assessing RIS is associated with the complexity of its structure. It is necessary to develop a system of special indicators in order to identify the internal structure of an innovation-oriented economic system in the region and evaluate the mechanisms of interaction of its key elements.

The main goal is to identify a more effective regional innovation system through assessment.

The European Innovation Scoreboard methodology, taken as a basis, determines the source of information, the composition of criteria and indicators, organizational methods, general rules for

the analysis and evaluation of the scientific and technical complex based on the innovation index.

Assessment methodology of A. Huseynova was taken as the basis for assessing and analyzing the regional innovation index in Azerbaijan [14].

The calculations were carried out according to two main methods: assessment of the innovative development of the regions and methods of factor analysis of the innovative development of the regions. Both methodologies are based on a system of indicators characterizing the internal and external environmental and socio-economic factors of RIS. The proposed methods use tools that are widely used in the international arena. The innovation index is formed in accordance with internationally recognized principles for assessing the regional innovation system. The innovation index was calculated for each region according to a comparative assessment of the innovative potential of Azerbaijan.

This methodology has been refined taking into account the national and specific features of Azerbaijan, statistical indicators in this area, information that can be collected and processed, the innovative potential of the regions, the system of indicators has been changed and calculated for Azerbaijan. Calculations were carried out over 2 blocks (resources and scale), 4 groups and 14 indicators. Special index indicator is noted as G_{ijl} , where i=1,2; j=1,2; l—depends on the number of indicators in each group (**Table 3**).

Data was collected and calculated in accordance with the specified methodology. The calculation results are not much differ from previous years. This proves that the regions have not made much progress in this area, the situation has not changed. The results are shown in the **Table 4**.

As can be seen from the table, Baku is ahead in all groups.

The regional innovation system consists of 3 subsystems: regional policy, research and innovation policy, regional socio-economic policy.

According to the above methodology, A. Huseynova presented a methodology for assessing the impact of the socio-economic environment

Table 3

Distribution of system indicators [14]

Block	Group	Distribution of system indicators		
Resources	Labor resources	4		
	Material and technical base	2		
Scale	Scientific activity	6		
	Innovative activity	1		

Table 4
Innovation index by economic zones of innovation development

Regions	By reserve group	By scale group I ₂	Regional innovation index I	
Baku	0,355347	0,40469	0,380019	
Nakhchivan	0,248108	0,228631	0,23837	
Mountainous Shirvan	0,312987	0,048597	0,180792	
Absheron	0,117459	0,234816	0,176137	
Ganja-Gazakh	0,109372	0,225259	0,167315	
Lankaran	0,143004	0,129577	0,13629	
Guba-Khachmaz	0,087007	0,17371	0,130358	
Aran	0,120869	0,104973	0,112921	
Sheki-Zagatala	0,037363	0,145204	0,091283	

on the development of innovations in the regions. The assessment was based on 4 factors (level of innovative development, level of education, level of welfare of the population and level of infrastructure development).

As can be seen from the table, Baku is again ahead (**Table 5**).

The field of science and technology in Azerbaijan should be improved as soon as possible. The development of scientific and technological potential and innovation in economic zones is one of the key issues in the development of the national innovation system in the country.

Let's analyze the indicators of science in Azerbaijan (**Table 6**).

Analyzing the indicators of science in Azerbaijan, we see that 76 % of research organizations are in Baku (**Fig. 3, Fig. 4**).

To calculate a scientific indicator, it is necessary to bring the indicators given in **Table 6** to the same unit of measurement. In other words, let's normalize the indicators and calculate the scientific index by the average value of the normalized values of these indicators.

$$E\dot{I} = \frac{\sum_{i=1}^{n} E\dot{I}_i}{n}$$

Herein $E\dot{I_i}$ — i-indicator as part of a group, n — number of indicators.

If we look at the **Table 7**, we will see that, according to the scientific index, Baku has stepped forward.

Such an uneven distribution of science in the country and the low amount of scientific and technical work carried out in the regions during the year, the low share of innovations in the development

Table 5

Factor index [14]

	Regions	level of innovative development index	level of education index	level of welfare index	level of infrastructure development index
1	Baku	0,91	1	1	0,75
2	Absheron	0,50	0,28	0,21	1
3	Nakhchivan	0,28	0,24	0,20	0,41
4	Ganja-Gazakh	0,26	0,20	0,25	0,33
5	Aran	0,18	0,03	0,17	0,36
6	Mountainous Shirvan	0,17	0,03	0,13	0,33
7	Lankaran	0,16	0,04	0,18	0,27
8	Sheki-Zagatala	0,16	0,03	0,17	0,27
9	Guba-Khachmaz	0,14	0,02	0,15	0,24

Table 6

The main indicators of science in the regions of the Republic of Azerbaijan

Economic regions	Number of SR organi- zations	Number of SR employees (man)	The volume of scientific and technical work performed during the year (thousand manats)	Total cost of SR (thousand manats)	Domestic expenses SR (thousand manats)	Cost of fixed assets used in SR (milyon-manat)
Over Azerbaijan	137	20 580	124 545,4	132 340,0	129 871,8	157,4
Baku	102	16 292	93 745,5	108 212,0	106 042,6	137,2
Absheron	8	758	13 072,5	13 408,7	13 408,7	8,6
Ganja- Gazakh	8	2364	3016,4	3712,5	3712,4	1,2
Sheki- Zagatala	1	89	457,6	457,6	457,6	0,4
Lankaran	3	93	284,6	284,8	284,8	0,1
Guba- Khachmaz	2	140	759,2	759,2	759,2	1,3
Aran	3	6	51,1	51,1	51,1	0,5
Mountainous Shirvan	2	156	1124,0	1124,0	825,3	_
Nakhchivan	6	682	2272,8	4330,1	4330,1	8,1

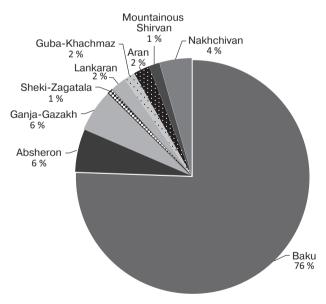
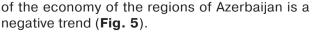


Fig. 3. Organizations engaged in scince in the regions of the Republic of Azerbaijan



Thus, the results of the analysis of indicators show that in order to increase the role and com-

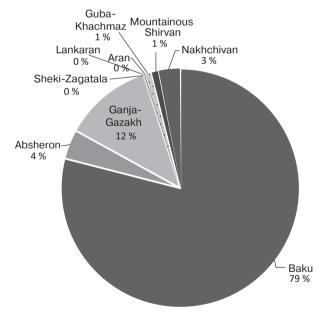


Fig. 4. Number of SR employees (man)

petitiveness of regions in the development of the economy of the republic, regions should develop education, infrastructure, have highly qualified human resources and increase the welfare of the

Table 7

Normalized science prices and scientific index by region

Regions	Number of SR organi- zations	Number of SR employees (man)	The volume of scientific and technical work performed during the year (thousand manats)	Total cost of SR (thousand manats)	Domestic expenses SR (thousand manats)	Cost of fixed assets used in SR (million manats)	Scientific Index (SI)
Baku	1	1	1	1	1	1	1
Absheron	0,069307	0,046175	0,138977	0,123497	0,126025	0,062682	0,094444
Ganja- Gazakh	0,069307	0,144787	0,031649	0,033851	0,034543	0,008746	0,053814
Sheki- Zagatala	0	0,005096	0,004339	0,003758	0,003835	0,002915	0,003324
Lankaran	0,019802	0,005342	0,002492	0,002161	0,002205	0,000729	0,005455
Guba- Khachmaz	0,009901	0,008228	0,007558	0,006547	0,006681	0,009475	0,008065
Aran	0,019802	0	0	0	0	0,003644	0,003908
Mountainous Shirvan	0,009901	0,00921	0,011451	0,009919	0,007304	0	0,007964
Nakhchivan	0,049505	0,041508	0,023712	0,039561	0,040371	0,059038	0,042283

Note: developed by the author.

population. The considered indicators reflect the location of the main potential in Baku. Therefore, the distribution of potential across regions, the development of high-tech territories there becomes an urgent problem. The Agency for the Development of Small and Medium Enterprises should take this into account and create favorable conditions for the development of innovations in the regions.

CONCLUSION

According to the results of the analysis of methodological approaches to assessing the innovative development of the regions, we can get the following results:

- the issue of assessing the innovative development of the region should be addressed by developing integrated indicators and the necessary data collection system;
- an integrated approach to assessing innovative development in the region is appropriate, including expert assessment, taking into account quantitative and qualitative indicators;
- it is necessary to take into account the natural, demographic and economic characteristics of the region. In regions with a small population, the impact of innovation on traditional lifestyles and traditional economic activities should be analyzed.

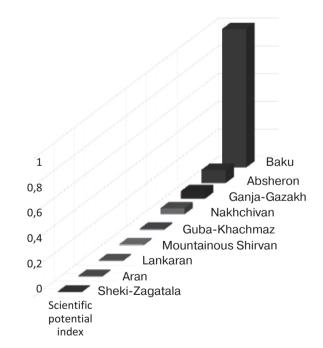


Fig. 5. Science index by regions

Thus, a comprehensive assessment of the innovative development of the regions should be developed. The results of this assessment can become the basis for a mechanism for improving public policy.

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ТАНЕР СЕНЕР АДНАН ОГЛУ, аспірант

МЕТОДОЛОГІЧНІ АСПЕКТИ ОЦІНКИ ІННОВАЦІЙНОГО РОЗВИТКУ РЕГІОНІВ

Резюме. Розглянуто методику оцінки інноваційного потенціалу регіонів. Запропоновано основні методики оцінки інноваційного потенціалу, були апробовані дані методики стосовно науково-технологічного комплексу економічних зон. Запропоновані методики мають переваги в порівнянні з експертними і статистичними методами оцінки, дозволяючи мінімізувати похибку одержуваних оцінок. У статті розглянуті та проаналізовані місцеві і міжнародні методологічні підходи до оцінки регіонального інноваційного розвитку. У дослідженні виявляються загальні тенденції і методологічні підходи до оцінки інноваційного розвитку регіону, а також розраховується індекс інновацій для кожного регіону для порівняльної оцінки інноваційного потенціалу Азербайджану. Методологія, використана в цій роботі, була вдосконалена з урахуванням національних і специфічних особливостей Азербайджану, статистичних показників в цій області, збору і обробки інформації та інноваційного потенціалу регіонів. У результаті дослідження були дані рекомендації про роль регіонів у розвитку економіки та конкурентоспроможності регіонів. Науково-практична цінність результатів полягає в можливості їх застосування в поєднанні з аналізом офіційних статистичних даних в процесі вдосконалення державної науково-технічної та інноваційної політики в напрямку більш інтенсивного використання наукових знань і досягнень в інтересах модернізації економіки Азербайджану. Запропонований підхід

здатний забезпечити інформаційну інтеграцію всіх суб'єктів наукових організацій і проводити комплексні дослідження виробничих, інноваційних та економіко-управлінських процесів в рамках розвитку науки.

Ключові слова: регіональна інновація, оцінка, методологія, інноваційний потенціал, національний.

ТАНЕР ШЕНЕР АДНАН ОГЛУ, аспирант

МЕТОДОЛОГИЧЕСКИЕ АСПЕКТЫ ОЦЕНКИ ИННОВАЦИОННОГО РАЗВИТИЯ РЕГИОНОВ

Резюме. Рассматривается методика оценки инновационного потенциала регионов. Предложены основные методики оценки инновационного потенциала, были апробированы данные методики применительно к научно-технологическому комплексу экономических зон. Предложенные методики обладают преимуществами по сравнению с экспертными и статистическими методами оценки, позволяя минимизировать погрешность получаемых оценок. В статье рассмотрены и проанализированы местные и международные методологические подходы к оценке регионального инновационного развития. В исследовании выявляются общие тенденции и методологические подходы к оценке инновационного развития региона, а также рассчитывается индекс инноваций для каждого региона для сравнительной оценки инновационного потенциала Азербайджана. Методология, использованная в этой работе, была усовершенствована с учетом национальных и специфических особенностей Азербайджана, статистических показателей в этой области, сбора и обработки информации и инновационного потенциала регионов. В результате исследования были даны рекомендации о роли регионов в развитии экономики и конкурентоспособности регионов. Научно-практическая ценность результатов заключается в возможности их применения в сочетании с анализом официальных статистических данных в процессе совершенствования государственной научнотехнической и инновационной политики в направлении более интенсивного использования научных знаний и достижений в интересах модернизации экономики Азербайджана. Предложенный подход способен обеспечить информационную интеграцию всех субъектов научных организаций и проводить комплексные исследования производственных, инновационных и экономико-управленческих процессов в рамках развития науки.

Ключевые слова: региональные инновации, оценка, методология, инновационный потенциал, национальный.

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