ANALYSIS OF THE EFFICIENCY OF INNOVATION MANAGEMENT IN THE COUNTRIES OF THE EURASIAN ECONOMIC UNION

Kurmanov N., Aliev U., Suleimenova S. [*]

Abstract: The article contains a cross-country analysis of the effectiveness of innovation management based on information from the Global Innovation Index among the countries of the Eurasian Economic Union (EAEU). From the analysis, it follows that the problem in the EAEU countries is low demand for innovations and its inefficient structure: it is more profitable for enterprises in the EAEU countries to purchase ready-made equipment abroad than to engage in their own innovative activities. A comparative analysis of the Global Innovation Index shows that indicators of the development of institutions and infrastructure ensure the relatively high positions of Kazakhstan, first of all, with a significant lag in all measurements of the efficiency of resource use of innovation

Introduction

R and D and subsequently innovation are the key elements, which affect the growth of a country's GDP. Inefficient use of the innovation potential leads to the fact that additional investments in research and development do not have an adequate effect on the growth of the country's GDP. The purpose of the work is a cross-country analysis of the effectiveness of innovation management based on information from the Global Innovation Index among the Eurasian Economic Union (EAEU) member states. Objectives of the study are:

− to consider the main approaches to evaluating the effectiveness of innovation management at the macro level
− to conduct a cross-country analysis of the effectiveness of innovation management among the EAEU member states
− on the basis of the obtained data to evaluate the weak and strong points of the innovation system of Kazakhstan

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Literature Review

In studying the processes that reflect the development of the innovation sphere of the economy, as well as for developing effective policies, integrated approaches are useful, including those based on the index method of analysis (Nardo et al., 2008). The interest of scientists to research based on composite indices is mainly due to the fact that they offer a practical implementation of multi-criteria evaluation of the "success" of the level of development of fairly complex objects, such as regions, innovation ecosystems, and a country. Such studies help to uncover the disadvantages, problems and advantages of the objects under study, as well as the factors hindering or contributing to progress (Kurmanov et al., 2016).

In the scientific literature, various studies are conducted for input resources to analyze the effectiveness of the innovation sphere. Thus, the most popular among a variety of indicators are the number of scientists per million population (Sharma and Thomas, 2008; Wang and Huang, 2007), the cost of using intellectual property rights, and the knowledge-intensiveness of GDP (Hollanders and Ceikel-Esser, 2007). The following output parameters are taken into account: received from the implementation of intellectual property rights, high-tech exports, export of information and communication technologies and payments (Kireyeva et al., 2018). At the macro level, many research organizations and institutions have conducted research on innovation. The Organization for Economic Co-operation and Development (OECD) in its report (OECD, 2004) explores, using various qualitative and quantitative indicators, the results of innovation activities and the conditions for the development of innovations in 27 OECD countries. The European Commission study (Technopolis group and MIOIR, 2012) offers a comprehensive methodology for assessing innovation activity at the macro level. The study of CEMI RAS (Golichenko, Balycheva, 2016) examines the national innovation system within the framework of the functional and structural-object approaches, which allows detecting the bottlenecks of the system, identifying and constructing cause-effect chains of factors. The reviewed methodologies suggest analyzing a number of indicators with the output of an aggregate indicator of innovative development-index, as well as creating ratings that allow determining the place of one country relative to others by the studied indicator. The Global Innovation Index assesses the potential of the national innovation system rather than the efficiency of using the available resources in this area. Thus, it is crucial to evaluate the effectiveness of the innovation system of the Republic of Kazakhstan in the context of cross-country comparison.

Materials and methods

The authors of the article analyze the effectiveness of innovation management on the basis of the Global Innovation Index (GII). For a comparative analysis, five developing markets were selected: the Republic of Armenia, the Republic of Belarus, the Kyrgyz Republic, the Republic of Kazakhstan and the Russian

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Federation (represented by the EAEU countries). The global innovation index quite fully reflects the key components and factors of modern socio-economic progress (to a greater extent - economic). The GII also contains indicators that characterize the "impact of knowledge". The GII-2017 rating is based on 82 indicators (most of which are indicators obtained from national statistical agencies) and includes 127 countries from all regions of the world, where 92% of the total population of the planet lives and which together produce 98% of global GDP.

The GII-2017 issue was mainly prepared on the basis of information of 2016 (38.7% of the total data volume), 38.1% of data was dated 2015, 11.3% - 2014, 5.7% - 2013, 6.3% of the rating data reflect the situation relevant for the period 2006-2012.

GII-2017 was calculated on the basis of 82 indicators, which, relative to the data source, can be divided into three groups:
- 58 indicators are calculated on the basis of statistical data of national agencies,
- 19 indicators are calculated based on international ratings,
- 5 indicators are calculated based on the survey data of the World Economic Forum.

All indicators of the Global Innovation Index are included in 21 indicators, each of which is formed through the aggregation of several (2-5) indicators. Groups of three rating indicators form seven components calculated using the aggregation of indicators included in it. The final GII rating is calculated as the average of two subindexes -- innovation resources and innovation results:
1) Subindex of innovation resources: disposable resources and conditions for the implementation of innovations: 1. Institutions, 2. Human capital and science, 3. Infrastructure, 4. Domestic market development, 5. Business development.
2) Subindex of innovation results: achieved practical results of innovation implementation: 6. Development of technologies and knowledge economy and 7. Development of creative activity (GII, 2017).

The efficiency ratio of innovations is defined as the ratio of the achieved practical results of the formation of innovations to the conditions for carrying out innovations and disposable resources. The efficiency factor of innovation reflects the aggregated performance of innovation activity with given innovation potential.

The most recent report was published in 2018. Our study analyzes the GII rating from 2011-2017. The positions of countries in the Global Innovation Index depend not only on assessments of the conditions and effectiveness of innovative development but also on changes in the practice of forming the rating itself. Thus, annually relevant recommendations are developed to improve the calculation methodology; changes are made to the calculation procedure (data sources, composition of countries, accounting for missing values and emissions in the data, etc.). Thus, the GII allows evaluating the influence of various factors, to conduct cross-country comparisons; however, the comparison with the results of previous years is not always correct but requires additional analytical efforts.

To analyze the innovation activity, the authors of the article have selected five emerging markets: the Republic of Armenia, the Republic of Belarus, the Kyrgyz Republic, the Republic of Kazakhstan and the Russian Federation (represented by the EAEU countries). The EAEU is a large unified market without interstate customs borders with a population of 183.7 million people (Eurasian Economic Union in figures, 2018: 16). The EAEU countries have differences in economic growth strategies, in national models of economic development, in the structure of national economies, in the size of markets, resource potential, the level of interstate trade and economic cooperation. However, there are ample opportunities to deepen international cooperation in public and private research and development to enhance the future economic growth of the EAEU member states.

Results

In most developed and developing countries, economic growth in a changing technological structure is associated with the introduction of new industries and technologies. One of the important conditions for increasing the role of the state in the international division of labor in conditions of high competition in world markets is innovation and timeliness (relevance) of production. The level of innovative development of the state according to the GII shows that Kazakhstan and other countries participating in the EAEU have limitations on the technological breakthrough in the future (Table 1).

Table 1. Positions of the EAEU Member States in the GII rating in 2011–2017
(GII, 2011, 2012, 2013, 2014, 2015, 2016, 2017)

Year	2011	2012	2013	2014	2015	2016	2017
Number of countries under study	125	141	142	143	141	128	127
Armenia	69	69	59	65	61	60	59
Belarus	-[1]	78	77	58	53	79	88
Kazakhstan	84	83	84	79	82	75	78
Kyrgyzstan	85	109	117	112	109	103	95
Russia	56	51	62	49	48	43	45
EAEU	59	55	65	52	52	47	50

[1] *Belarus is represented in the GII rating since 2012*

In 2017, the Eurasian Economic Union in the GII ranking took the 50th place out of 127 economies. When compared to 2016, there was a decrease in three positions (from 47th to 50th place), which was caused by a change in the positions of Belarus (from 79th to 88th place), Kazakhstan (from 75th to 78th place) and Russia (from 43rd to 45th place). Analysis of the data in Table 1 shows that the position of Kazakhstan in the GII rating for 2011-2017 increased by 6 steps, while by Russia by 19 steps, Armenia - by 23, Kyrgyzstan - by 9. During this period, the most favorable for Kazakhstan was 2016, 75th place.

In general, the EAEU member states are not high in the GII rating. It should be noted that the best indicator of grouping (Russia) is two times lower than that of the leader of the rating (Switzerland).

Next, the study looks at the dynamics of changes in the complex index of input factors (institutions, human capital and research, the general infrastructure, the complexity of the markets and the complexity of doing business) that provide the demand for innovation from society (Table 2).

Table 2. Positions of the EAEU Member States in the GII rating on the sub-index of innovation resources, 2011-2017 *(GII, 2011, 2012, 2013, 2014, 2015, 2016, 2017)*

Year	2011	2012	2013	2014	2015	2016	2017
Number of countries under study	125	141	142	143	141	128	127
Armenia	69	73	59	81	69	80	82
Belarus	-[1]	80	77	70	55	64	63
Kazakhstan	84	67	84	69	75	65	64
Kyrgyzstan	85	90	117	90	94	92	86
Russian	56	60	62	56	52	44	43

[1] *Belarus is represented in the GII rating since 2012*

The data in Table 2 indicate that Kazakhstan, Russia and Belarus are steadily improving their positions in the innovation resource subindex. However, as can be seen from the data of table 3, in terms of the efficiency of innovation activities, the positions of these countries in the EAEU are noticeably weaker. This reflects the lack of effective implementation of existing innovation potential in these countries. The present study further evaluates the dynamics of changes in the complex index reflecting the results of innovations in society (the development of technologies and the economy of knowledge, the results of creative activity).

Table 3. Positions of the EAEU Member States in the GII rating on the subindex of innovation results, 2011-2017 *(GII, 2011, 2012, 2013, 2014, 2015, 2016, 2017)*

Year	2011	2012	2013	2014	2015	2016	2017
Number of countries under study	125	141	142	143	141	128	127
Armenia	60	68	47	55	51	43	47
Belarus	-[1]	75	79	50	58	103	109
Kazakhstan	103	105	106	101	107	90	93
Kyrgyzstan	80	131	133	131	118	109	104
Russia	50	49	72	45	49	47	51

[1] *Belarus is represented in the GII rating since 2012*

Analysis of the data in Table 3 shows that the position of the EAEU member states on the subindex of innovation results correlates with the dynamics of the position of the states in the overall GII rating and indicates that society is becoming

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increasingly indifferent in relation to innovations. Moreover, here follows a paradox: on the one hand, there is an improvement in the factors and conditions affecting the development of innovations in the EAEU countries (except Armenia), on the other hand, society is becoming increasingly passive in relation to innovations. From this, it follows that the problem in the EAEU countries is low demand for innovations and its inefficient structure: it is more profitable for enterprises in the EAEU countries to purchase ready-made equipment abroad than to engage in their own innovative activities. Neither the state nor the private sector has shown interest in introducing innovations. In this regard, production falls due to the obsolescence of equipment, technologies and processes. Thus, the economy stagnates due to the unreadiness of society to innovate.

According to Figure 1, in 2017, the innovation efficiency ratio in Armenia was 0.8, and Russia -0.61. This indicator is lower in Kyrgyzstan - 0.47, Kazakhstan - 0.46 and Belarus - 0.39. In 2017, Kazakhstan lagged behind the average EAEU by 3.1% and was inferior to Armenia and Russia.
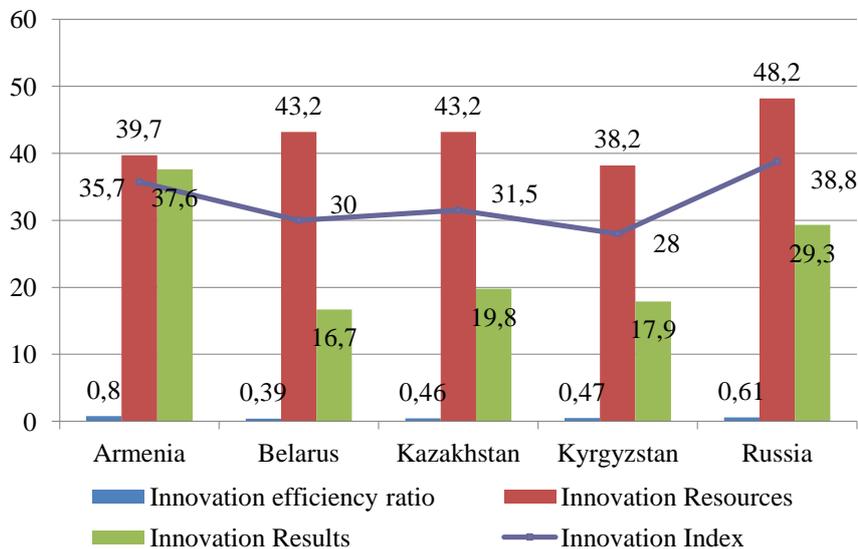
Figure 1. Innovation Index by EAEU States, 2017 *(GII, 2017)*

Obviously, higher indicators on the achieved practical results of the formation of an innovative economy are observed in Armenia and Russia. Thus, in accordance with the estimates of GII experts, in 2017 Kazakhstan used its innovative potential by 46%, while Russia by 61% and Armenia - 80%.

In 2017, in the framework of the scientific theme "Modern mechanisms of innovation management in the development of entrepreneurship in the Republic of Kazakhstan" (Kirdasinovaa and Kurmanov, 2017), a sociological study was conducted based on the methodology of the International Business School

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INSEAD (France). According to the results of the study, it was concluded that the success of the economy is associated with the presence of the innovation potential, as well as the conditions for its implementation.

On the question of the degree of influence of innovation factors on the five-point scale, experts evaluated seven factors:

1. Institutes
2. Infrastructure
3. Human capital and research
4. Business development
5. Results of creative activity
6. Development of technology and knowledge economy
7. Development of the domestic market

Thus, according to the results of the conducted sociological research, the most significant assessments of respondents of the successful innovative development of the Republic of Kazakhstan were obtained by such factors as: "Institutes" - 3.3; "Infrastructure" - 2.4; "Domestic market development" - 2.2 (Figure 2).
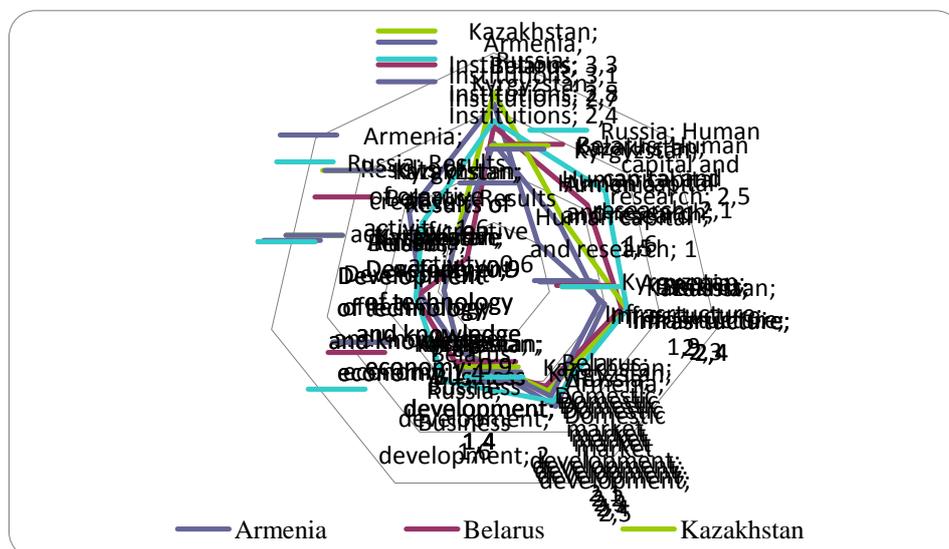
Figure 2. Resources and results of innovation in the EEU countries, 2017 *(compiled by the author according to the results of an expert sociological survey)*

Unfortunately, the lowest estimates of respondents were received by such factors as "Human capital and research" - 1.6 (in Russia — 2.5; Belarus — 2.1); "Business development" - 1.4 (in Russia - 2.0; Belarus - 1.6); "The results of creative activity - 1.1 (in Russia - 1.6; Armenia - 1.9). Such a factor of innovation development as "the development of technologies and the economy of knowledge" in all the EAEU countries is the same - 1.4, except for Kyrgyzstan - 0.9.

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According to the results of the sociological study, it was concluded that Kazakhstan was in the strong positions in terms of the innovation index in 2017 when compared to the EAEU countries those were the development of institutions, infrastructure, including the general infrastructure and environmental sustainability, as well as the development of technology and the knowledge economy. Unfortunately, the weak positions of Kazakhstan in comparison with the countries of the EAEU are observed in the assessment of the results of creative activity, business and human resources, including research activity in the country, level and standards of education. Subsequently, the authors of the present study show interest to conduct a detailed assessment of the strengths and weaknesses of the innovative development of Kazakhstan in accordance with subindexes and GII indicators.

Discussion

In the global economy, there is a gap in the innovative capabilities of developing and developed countries. In this regard, making efforts to reduce the innovation gap of developing and developed countries, it is necessary first for emerging market countries to understand the strengths and weaknesses of their innovation activities, and then to develop appropriate government policy and coordinate system. At the same time, while talking about the Republic of Kazakhstan, the study can draw the following conclusion: the existing resources of innovation in the country are not used efficiently; at this stage the increase in costs in this area will not bring the desired result (Kirdasinova at al., 2016).

The positions of the EAEU member states on the subindex of innovation results correlate with the dynamics of the position of the states in the overall GII rating and indicate that society is becoming increasingly indifferent in relation to innovations. Also, here follows a paradox: on the one hand, there is an improvement in the factors and conditions affecting the development of innovations in the EAEU countries (except Armenia), on the other hand, society is becoming increasingly passive in relation to innovations. From this, it follows that the problem in the EAEU countries is low demand for innovations and its inefficient structure: it is more profitable for enterprises in the EAEU countries to purchase ready-made equipment abroad than to engage in their own innovative activities (Popova, 2013).

Analysis of the effectiveness of innovation management of the EAEU member countries has revealed the relative advantages of Kazakhstan. In particular, quite high rates of development of institutions and infrastructure are shown. With regard to the level of human development, Kazakhstan is leading in the direction of the ratio of students/teacher in secondary education. However, in a number of indicators, such as the development of the domestic market, business, technology and creative activity, economic freedom, Kazakhstan is far behind. The results of cross-country comparisons confirm the need for a balanced and comprehensive

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policy aimed at the comprehensive management of the innovation system of Kazakhstan.

Conclusions

To assess the innovative activity of countries, the use of indices and ratings of conditionally homogeneous groups allow a comparative analysis and to identify the features of the innovative development of these countries. In general, the EAEU member states are not high in the GII rating. It should be noted that the best indicator of grouping (Russia) is two times lower than that of the leader of the rating (Switzerland). With the growing cross-border exchange of talents and knowledge, the broader application of innovation results is possible. In our opinion, there are ample opportunities for deepening international cooperation in the framework of public and private R and D to enhance the future economic growth of the EAEU member states. Innovation policies at the national level should be directly aimed at promoting cross-border knowledge dissemination and promoting international cooperation. The governing structures should strive to increase the transfer of knowledge and technology, as well as their dissemination in the EAEU countries. In further studies, it is planned to conduct a cross-country analysis of the effectiveness of research management and analysis of the effectiveness of innovative activities of organizations. These studies will help to identify the vulnerabilities in the country's national innovation policy and outline growth points for the future.

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ANALIZA EFEKTYWNOŚCI ZARZĄDZANIA INNOWACJAMI W KRAJACH EURAZJATYCKIEJ UNII GOSPODARCZEJ

Streszczenie: Artykuł zawiera ogólnokrajową analizę skuteczności zarządzania innowacjami opartą na informacjach z Global Innovation Index wśród krajów Eurazjatyckiej Unii Gospodarczej (EAEU). Z analizy wynika, że problemem w krajach EAEU jest niski popyt na innowacje i jego nieefektywna struktura: bardziej opłacalne jest dla przedsiębiorstw w krajach EAEU kupowanie gotowego sprzętu za granicą niż angażowanie się we własną działalność innowacyjną. Analiza porównawcza Global Innovation Index pokazuje, że wskaźniki rozwoju instytucji i infrastruktury zapewniają stosunkowo wysokie pozycje Kazachstanu, przede wszystkim ze znacznym opóźnieniem we wszystkich pomiarach efektywności wykorzystania zasobów przez innowacje.

Słowa kluczowe: krajowy system innowacji, innowacje, działalność innowacyjna, potencjał innowacyjny, Global Innovation Index, Kazachstan, EAEU

欧洲经济联盟国家创新管理效率分析

摘要：本文基于欧亚经济联盟（EAEU）国家的全球创新指数信息，对创新管理的有效性进行了跨国分析。从分析可以看出，EAEU国家的问题是对创新的需求低且结构效率低：EAEU国家的企业在国外购买现成设备比从事自己的创新活动更有利可图。

对全球创新指数的比较分析表明，制度和基础设施发展的指标确保了哈萨克斯坦相对较高的地位，首先，所有对创新资源利用效率的测量都存在显着滞后。

关键词：国家创新体系，创新，创新活动，创新潜力，全球创新指数，哈萨克斯坦，EAEU。