ANALYSIS OF INNOVATIVE ACTIVITY IN REGIONS OF KAZAKHSTAN

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Abstract: The authors emphasize that the Republic of Kazakhstan is characterized by significant differences in the level of innovation capacity of regions. This article summarizes that the result of the monitoring of innovation potential of the regions are prerequisites for innovation policy adjustments, make it more dynamic, which ultimately contributes to its effectiveness.
Key words: innovative potential, innovation capacity of regions, innovation policy

INTRODUCTION

In order to implement the state programs effectively within the framework of industrial-innovative development of Kazakhstan – it is necessary to identify the potential of each region in the country. Innovative development programs increase the interest of regions in creating a favorable climate for innovation and their responsibility for the implementation of this process. Therefore, an objective assessment of the innovative potential of the region, as well as the parameters and characteristics of its innovative capacity are of particular importance especially during making economic, technical and social solutions of the region's development. In other words, the dire need to use the innovative potential of the region arises based on its size, structure, characteristics, load level and efficiency of return as an object of managment.

MAIN PART

Firstly, let us consider the kinds of innovative potential (see Table 1)

Table 1 – Classification of innovative potential based on different characteristics

Features	Classification	Class characteristics
From the point of view of the system effectiveness growth	Resource potential of components	
	Infrustructure potential	
	Effectiveness potential	
According to the level of innovative potential	Innovative potential of the country	The objective prerequisites for the implementation of the country's innovation and growth activities with the aim to increase its efficiency and better functioning of its economic system
	Innovative potential of the region	The region's ability to attract resources with the aim of innovative development. A set of regional innovative systems, united by a common purpose and working within the frame of state economic policy and legislation.
	Industry-wise	
	Innovative potential of an enterprise	
	Innovative potential of a project	
By means of actual use	Explicit (present, static)	
	Hidden (possible, dynamic)	
Allows to determine the real possibilities of the subject	Used	
	Not used	
	Desired	
On the role of human capital	Man-oriented	
	Technico-	

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in implementing the ideas of innovative character	oriented	
By matching the criteria of possibility	Relevant	
	Non-relevant	
By the level of use of production costs	Maximum (real)	
	Effective	
	Optimal	

It should be noted that various international organizations have developed their own system of indicators that reflect the level of innovative potential (capacity) of a country or region. In the world practice, the assessment of the level of innovation potential is carried out by means of various methods, the most widely used are:

• the index of scientific and technical potential as an integral component of the index assessing the level of competitiveness of the country;

• innovative activity evaluation system with indicators of the country according to the European Innovation Scale (EIS);

• a system of indicators to assess the innovative activity according to the procedures and methods of the Organization for Economic Co-operation and Development (OECD);

• Knowledge Assessment Methodology (KAM);

• ranking of countries in terms of innovation activity level

According to the estimates of western economists, above mentioned methods allow to assess the state of innovation in the analyzed countries, to trace the dynamics of change of innovative activity, to analyze the strengths and weaknesses of individual regions and make a conclusion about the degree of difference between them.

As for the assessment of innovative potential in the CIS (Commonwealth Independent States) countries, four main types of assessment are used:

1. Rating approach
2. Regulatory approach
3. Approach based on the definition of the integral of innovation potential
4. Assessment based on the formation of a regional innovative system (RIS).

Under the latter approach the method of express diagnosis of innovative activity in the region proposed by A. B. Pushkarenko and L.V. Vesnina can be applied [1, 2]. The authors' techniques allow to perform basic and special functions of potential management. Also as part of this approach - calculation the total regional innovation index (Maastricht Economic Research Institute on Innovation and Technology MERIT), structural analysis technique of innovation activity areas (S.V. Krotov) [2], a technique of region positioning (A. E. Warsaw) [3] and methods of integrated assessment of scientific and technical potential of the region (N.E. Tropinina) [4] are used. This way, the methodology used to analyze the innovation potential of the region consists of the following major steps:

1. A comprehensive analysis of specific investment projects of an innovative nature offered by enterprises of regions;
2. Analysis of the structure (sectoral) innovation capacity of the region;
3. Calculation and analysis of main indicators;
4. Clustering (macro-regioning) of territories by the criteria of innovative activity;
5. Forecast efficiency to create structures that support innovation.

To investigate the innovative potential of the regions, the following actions are needed:

- Compiling descriptions of all promising innovations by making a poll of research, design, engineering and manufacturing organizations in the region,
- Obtaining information support from the regional administration,
- Obtaining necessary estimates on minimum set of analytical information,
- Modeling of the dynamics of innovation implementation.

According to N. A. Repchenko and O. M. Fokina [5], the expert evaluation of innovative potential of the region should be carried out within four sections:

1. Scientific and technical groundwork of personal and acquired developments and inventions.
2. The state of infrastructural capacity of industrial enterprises, scientific and technical organizations in the region to ensure the passage of invention in all stages of the innovation cycle and turning it into a novelty or innovation.

3. External and internal factors that reflect the interaction of innovative potential with other parts of the aggregate capacity of the region and that influence the success of the innovation cycle.
4. The level of innovation culture that characterizes the willingness and ability of enterprises in the region to implement novelties in the form of innovation.
In each described method the indices are used:
1. To assess the resources - number of personnel engaged in research and development per thousand employees in the economy, the share of people with high and secondary vocational education in total number of employed;
2. To estimate the costs - domestic spending on research and development, the number of newly created advanced production technologies; the numbers of advanced production technologies that have been used;
3. As a result indicators - the proportion of organizations engaged in technological innovation, the total number of organizations, the volume of innovative products of the total volume of goods shipped.

T. N. Plotnikova, V. I. Samarukha and T.G. Krasnova believe that existing methodologies for the evaluation of innovative potential do not consider the marketing aspects of innovation [6]. According to them, the development and implementation of innovations require considering the following basic points (as marketing tool):

1. The strategy of regional specialization in the field of development of certain areas of innovation.

2. The features of offered innovative products.

3. The range and assortment of innovative products and services offered within the analyzed activities.

4. Unused channels of distribution of innovative products in the interregional space.

5. Promotion features of regional innovation products.

Indeed, one can agree with the authors - excluding that the above mentioned methods of determining the potential of innovation look more like a tool of a mathematical theory.

Let us use the method of calculating the index of innovation for the regions of Kazakhstan considering the work of S. R. Khalimova [7].

The preparatory phase of the analysis – is the choice of objects for consideration. This study examines the factors influencing the development of innovation at the regional level, so of all the constituents of the country the most active in innovations have been selected. The development of innovative activity is assessed using the following indicators:
1. The share of organizations that perform research and development;
2. The level of innovation activity (in percentage);
3. The share of innovation active organizations;
4. The volume of innovative products and services in relation to the costs of technological innovation;
5. Expenditures on technological innovation in relation to GRP;
6. The volume of innovative products and services in relation to GRP.

Considered indicators characterize innovative activity from the point of view of its implementation. Application of the relative indicators allows to avoid the influence of scale of the region during selection.

To select the most innovatively active regions on the above indicators the innovativeness index is constructed that characterizes the relative level of development of innovative activity in the region (the higher the index value, the more innovatively active the region is - see formulas 1-2):

$$\text{Innovativeness index}_{\text{j}} = \frac{\sum_{i=1}^{6} I_{ij}}{6} \qquad (1),$$

Iij – intermediary indices

$$\text{I}_{\text{ij}} = \frac{X_{ij} - X_{i\min}}{Xi\max - Xi\min} \qquad (2),$$

X_{ij} – the meaning of a variable i for region j; X_{imin} – minimum meaning of a variable i; X_{imax} – maximum meaning of a variable i.

Using formula (1), the authors have calculated the innovativeness index for Kazakhstan regions (see Table 2):

Table 2 – Innovativeness index of Kazakhstan regions for 2012

Regions	Innovativeness index j	level
East Kazakhstan	0,55	high
Almaty city	0,45	
Zhambyl	0,33	
Pavlodar	0,33	
Karagandy	0,31	
North Kazakhstan	0,31	
Astana city	0,28	average
Aktobe	0,27	
South Kazakhstan	0,27	
Kostanay	0,25	
Zhambyl	0,21	
Almaty	0,17	low
Atyrau	0,11	
West Kazakhstan	0,1	
Mangistau	0,09	
Kyzylorda	0,05	

Thus, according to this method, the highest index of innovativeness belongs to the East Kazakhstan oblast and Almaty city, and the lowest index of innovativeness belongs to Kyzylorda region

The method of professor O.V. Kuur is quite relevant in order to assess Kazakhstan regions' innovative potential. The author of the method "The rating of the innovative potential of the regions of Kazakhstan" offers techniques and ways to apply a set of indicators characterizing its individual components [8]. The difficulty is to bring these indicators to the same view, as this is not possible without the integral evaluation of innovative potential. V.O. Kuur notes that the level of innovative activity of regions depends on the innovation potential, which they have and the characteristics of their infrastructure. In turn, there is a reverse effect of innovative activity of economic entities on the region and its innovative potential. In this regard, it is reasonable to determine the dependence of the innovation potential of regions against the indicators of innovation activity of its economic actors.

Given the fact that the end result of the economic activities of the regions (provinces) is the gross regional product, the innovation potential assessment should be based on building a model of GRP depending on the performance of innovation enterprises. Among these indicators, in our opinion, are the following: the number of innovative companies and organizations, the number of received patents for inventions; expenditure on technological innovation, the volume of newly introduced and improved product innovations, investments in fixed assets, the cost of fixed assets; employment in the field of innovation etc.

Based on multivariate correlation-regression analysis, calculation and trying different models we have been able to identify and justify the equation satisfying the criteria according to the gross regional product of the system of indicators for innovative activity regions of Kazakhstan.

Using the method of successive inclusion, we found that the most acceptable is the 5-factor model, which has the form (see formula 3)

$$Y = 185384 + 13179X_1 + 18,52X_2 + 2,67X_3 + 917,3X_4 + 159,76X_5, \quad (3),$$

Y - gross regional product, millions tenge;

X_1 - the number of innovatively active enterprises and organizations, units;

X_2 – the volume of innovative production that has been improved, millions tenge;

X_3 - a total volume of innovative production, millions tenge;

X_4 - investments in main capital per capita, thousands of tenge/people:

X_5 - number of employed, thousands of people.

A high level of correlation coefficient approaching a unit (R = 0,83) indicates a close connection between the identified factors and gross regional product.

The resulting model was the basis for assessing the level of innovative potential areas of the Republic of Kazakhstan and the subsequent ranking on this criterion. In determining the level of innovation in integral form, we used the technique of rating analysis based on the calculation of standardized coefficients. The technique is as follows.

At the first stage the best indicator (i.e that which has the greatest value) among the regions the maximum value – 1 is assigned, with respect to which fractions of unit value indices of other regions are calculated. This approach allows us

to balance the values of the analyzed parameters and lead them to a comparable form.

In a second step, the obtained values are squared. But since the importance of indicators in the regression equation is different - at the third stage we felt it was necessary to calculate the weight of each indicator for the extent of its impact on the GRP and use the weights (multiplying them by the corresponding standardized coefficients calculated in the second stage). This allows to determine the weighted average of the levels of innovation potential in concerned regions.

As can be seen in Table 3, the innovative potential ranges from 70.03 points in Almaty city to 2.63 points in Kyzylorda region. Thus, there is a large enough gap between the maximum and minimum values for this indicator (see Table 3):

Table 3 - The level of innovative potential of the regions of the Republic of Kazakhstan, 2012

Regions	Score	The level of innovative potential
Almaty city	70,03	High
West Kazakhstan	24,56	
Pavlodar	17,54	
Astana city	14,24	
Atyrau	12,68	
East Kazakhstan	12,47	
Almaty	9,88	Average
South Kazakhstan	9,86	
Karagandy	9,35	
Kyzylorda	9,17	
North Kazakhstan	8,08	
Kostanay	7,8	
Akmola	5,16	Low
Zhambyl	4,72	
Aktobe	3,34	
Mangystau	2,63	

Analysis of the data suggests that we can differentiate three sets of regions according to the level of their innovative potential:

- Low innovative potential - Akmola, Zhambyl, Aktobe, Mangistau regions;
- Average innovative potential – North Kazakhstan, Kyzylorda, Kostanai, Almaty, South Kazakhstan, Karaganda regions;
- High innovative potential: Almaty city, Astana city, East Kazakhstan, West Kazakhstan, Pavlodar, Atyrau regions and oblasts.

So, there are substantial differences in the level of innovative potential of the regions in the Republic of Kazakhstan, meanwhile it is noted that most regions' innovative features and potential can be assessed as average.

It is emphasized that monitoring of innovative potential of regions creates the preconditions for innovation policy adjustments.

Sharing the view of Professor O. V. Kuur who states that innovation potential can be calculated starting from the GRP, we offer our formula (see formula 4):

$$Y = \frac{X1 + X2}{GRP} \times 100\%, \qquad (4)$$

Y – innovative potential;

X1 – expenses on technological research = A+B;

A – expenses on product innovations;

B – expenses on process innovations;

X2 – expenses on research and development

Table 4 presents information and assessment about the innovative potential of regions for 2011 (see Table 4):

Table 4 - Innovative potential indices in the regions of the RK

R/№	A	B	X2	GRP	У	Grade
R5 – East Kazakhstan	46888,2	0	3 959,9	921 926,7	5,52	high
R2 – Aktobe	7730,1	21644	645,1	995 650,7	3,02	
R14 – South Kazakhstan	16249,2	14117,9	930,6	1 040 967,8	3,01	
R11 – Mangistay	13512,1	4005	5 059,5	916 606,4	2,46	
R6 – Zhambyl	6641,6	1603,3	1 485,5	414 520,2	2,35	
R1 – Akmola	3626,8	0	631,0	493 769,3	0,86	Average
A1 – Astana city	17,3	1201,1	10 376,3	1 446 272,1	0,80	
R12 – Pavlodar	5314,8	1680,2	434,1	945 452,7	0,79	
R4 – Atyrau	317,9	13947,7	3 531,0	2 324 331,5	0,77	
A2 – Almaty city	2810,8	349,6	19 061,5	3 109 845,0	0,71	
R8 – Karagandy	526,4	0	2 947,0	747 107,9	0,46	Low

R7 – West Kazakhstan	1331,1	5569,8	548,2	1 685 247,5	0,44	
R9 – Kostanay	0	2673,5	329,9	714 411,4	0,42	
R3 – Almaty	1257,8	284,3	879,0	843 228,2	0,29	
R13 – North Kazakhstan	59,9	3,8	221,4	400 409,5	0,07	
R10 – Kyzylorda	0	414,9	213,0	1 210 125,8	0,05	

CONCLUSIONS

As can be seen from Table 4, the innovative potential of oblasts ranges from 5.97 in the East Kazakhstan region to 0.06 in North Kazakhstan and Kyzylorda regions. Thus, there is a large enough gap between the maximum and minimum values for this indicator.

Analysis of the data suggests that we can differentiate three sets of regions according to the level of their innovative potential:

- low level: North Kazakhstan, West Kazakhstan, Karaganda, Kyzylorda, Kostanay and Almaty regions;
- Average level: Pavlodar, Almaty city, Akmola, Atyrau and Astana city;
- High level: East Kazakhstan, Aktobe, Zhambyl, South Kazakhstan, Mangistau regions.

So, there are substantial differences in the level of innovation potential of the regions in the Republic of Kazakhstan, meanwhile it is noted that most regions' innovative features and potential can be assessed as average.

After analysis of previously used methods, it can be concluded that the ranking of the level of innovation potential of regions takes place in the following order:

- High level of innovative potential: East Kazakhstan (3 matches), Almaty city (2 matches), Pavlodar (2 matches) and Zhambyl regions (2 matches);
- Low level of innovative potential: Almaty (2 matches), Mangistau (2 matches), West Kazakhstan (2 matches), Kyzylorda oblast (2 matches).

In conclusion, it is emphasized that monitoring of innovative potential of regions creates the preconditions for innovation policy adjustments. These adjustments make the policy more dynamic and contribute to its effectiveness in the long run.

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