

# Methodological approaches to assessing the risk of innovative development in the economy of the Republic of Kazakhstan

## Enfoques metodológicos para evaluar el riesgo de desarrollo innovador en la economía de la República de Kazajstán

Begendyk S. UTIBAYEV [1](#); Raushan M. ZHUNUSOVA [2](#); Gulzhan B. UTIBAYEVA [3](#); Assilbek BAIDAKOV [4](#); Dinara AKHMETOVA [5](#); Ainur BULASHEVA [6](#); Almagul TAURBAYEVA [7](#); Gulmira ABDYKARIMOVA [8](#)

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### ABSTRACT:

This article considers the problems of assessing the risks of innovative development in conditions when the world experience of development shows that the level of competitiveness of the country's economy and position in the global market directly depends on its innovation potential. It is noted that in the context of the globalization of the world economy, it is the innovative vector of development that becomes the main competitive advantage at the national level. Particular attention is paid to the degree of scrutiny of the problem of risks at the state level as a whole and the effectiveness of the application of already developed methods for assessing them in an ever-changing economic environment. Several methodological approaches, which make it possible to assess the instability of innovative risk and to determine its confidence intervals, have been substantiated.

**Keywords** Risk assessment, economy security, innovation sphere, international rating

### RESUMEN:

Este artículo considera los problemas de evaluar los riesgos del desarrollo innovador en condiciones cuando la experiencia mundial de desarrollo demuestra que el nivel de competitividad de la economía del país y su posición en el mercado global depende directamente de su potencial de innovación. Se observa que en el contexto de la globalización de la economía mundial, el vector innovador del desarrollo se convierte en la principal ventaja competitiva a nivel nacional. Se presta especial atención al grado de escrutinio del problema de los riesgos a nivel estatal en su conjunto ya la eficacia de la aplicación de métodos ya desarrollados para evaluarlos en un entorno económico en constante cambio. Se han fundamentado varios enfoques metodológicos que permiten evaluar la inestabilidad del riesgo innovador y determinar sus intervalos de confianza.

**Palabras clave:** Evaluación de riesgos, seguridad económica, esfera de la innovación, calificación internacional

Before proceeding directly to the methodology of risk assessment at the state level, one should consider the most well-known approach, which involves assessing the state of economic security by the system of criteria and threshold values of its indicators, based on the sources generalizing world experience as well as on the results of scientific and practical researches.

At the same time, it should be noted that not all proposed indicators are a reflection of the state of the economic system, but they can also act as estimates of the state of economic security of the country. Moreover, depending on the characteristics of socio-economic systems, it is advisable to consider the same parameters as indicators characterizing the degree of influence of negative factors on economic security, and as indicators characterizing the actual content of these negative effects (Senchagov, 2005).

At present, there are at least three groups of threshold values for assessing the level of economic security (Bogomolov, 2006, p. 83):

- 1) macroeconomic, reflecting the main, principal features of national interests and approved at the governmental level;
- 2) threshold values of the functional and industry level, approved by the relevant ministries;
- 4) threshold values of regional economic security.

From our point of view, the list of indicators of the state of economic security should be dynamic and reflect the reaction of the socio-economic system to external and internal processes. Threshold values cannot be static either. However, according to economists, the critical value of economic security indicators does not always mean a complete collapse of the economy or its separate areas. First of all, it testifies to the need for prompt intervention by the management bodies with the aim of changing dangerous trends (Entrepreneurship and scientific and technical development, 2016, p. 169-171).

For illustrative purposes, the system of indicators of the country's economic security was presented in Table 1. We believe that such a construction is the most reasonable for Kazakhstan as well, since it will allow taking into account the sectoral and territorial features of economic security.

Table 1. Indicators of economic security

Indicators	Threshold values
Volume of gross domestic product	
in total from the average for the G7, %	75
per capita from the average for the G7, %	50
per capita from the world average, %	100
Share in industrial production of manufacturing industry, %	70
Share in industrial production of machine building, %	20
Investment volumes in % of GDP	25
Expenses for scientific research in % of GDP	2
Share of new product types in the total volume of machine-building products, %	6
Share of people earning less than the living wage, %	7

Population life expectancy (years)	70
The gap between the incomes of 10% of the highest income groups and 10% of the lowest income groups (times)	8
Crime rate (the number of crimes per 100 thousand inhabitants)	5,000
Unemployment rate by ILO methodology, %	7
Inflation rate per year, %	20
Domestic debt volume in % to GDP for a comparable period of time	20
Current need for service and repayment of domestic debt in % to tax revenues to the budget	25
External debt volume in % to GDP	25
Share of external borrowings in covering the budget deficit, %	30
Budget deficit in % to GDP	5
Foreign currency volume in relation to the amount of tenge in national currency, %	10
Foreign currency volume in cash to the amount of tenge in cash, %	25
Money supply (M2) in % to GDP	50
Share of imports in domestic consumption, %	30
including food, %	25
Differentiation of population by the living wage (times)	1,5
Note: compiled by the authors based on data from (Experts named three megatrends of innovative development, 2013).	

Experts believe that today mankind is at the end of the era of cheap labor, followed by a new revival of industry. The key technological trends of the near future are 3D printing, robotization, creation of new materials with special properties and mass customization (Myagkova, 2011).

Proceeding from the fact that the basis of economic growth in the world is scientific and technological progress, in the United States, Europe and Japan, the contribution of scientific and technological progress to economic growth is up to 90%. All over the world, the main source of profit today is an intellectual rent, or the results of scientific and technological progress. The development of these countries has long been transformed into an innovative socio-economic base. This implies that an economy based on scientific knowledge is being created.

The overwhelming part of GDP growth in Western countries was obtained due to scientific achievements, embodied in new technologies, systems and equipment. The achievements of

science and technology determine not only the dynamics of economic growth, but also the level of state competitiveness in the world community (Omelchenko, 2011). Unfortunately, the share of Kazakhstan in the world market of high technology products is less than 1 percent, which, undoubtedly, shows the level of state competitiveness in the global space.

However, innovative activity is a priori highly risky. As a rule, out of 10 developments, 5 are unprofitable. Of the remaining 5 developments, only 3 make it possible "to break even". But the remaining 2 innovations yield such a profit that it is distributed to all 10 developments with a volume of at least 40% (Online conference with participation of Z.Kh. Baimoldina., 2013). Innovative risks are characterized by a multifaceted nature, and at the state level they are manifested in the sphere of state innovation policy, protection of the interests of intellectual property, social security and civil liability (The Corruption Perceptions Index, 2012).

The specificity of innovative risks of the state, their high variability are the reason for the need to form a special system for their evaluation. The main difficulty faced by states is the absence, distortion or incompleteness of statistics on the implementation of innovative projects and the inclusion of negative factors for innovative development, which does not provide a general picture of the implementation of state innovation policy as a whole. This situation is caused by a number of factors (Ivashchenko, 2007).

The first and foremost is that as long as the events in this country did not cause specific losses, these risk-containing events cannot for the most part be included in the potential statistical base. At least because they do not provide certain estimates of damage, and simply cannot be seen by researchers.

Second, an important role is played by the confidential nature of information of this kind. Obviously, state bodies have a sufficiently large amount of information concerning the events that fall into the category of innovative risks. But this information cannot become fully open and accessible to market participants.

Thus, it seems practically impossible to build a system of the quantitative assessment of innovative risk at the state level that would be accurate and meet the requirements of economic security.

Therefore, when analyzing innovative risks, it is possible and necessary to apply qualitative estimates. The most accurate is the division of innovative risks, depending on the degree of impact, into two components: macro-level risks and micro-level risks. In accordance with this classification, we will consider the methodology for assessing innovative risks at the macro level, since it includes the consideration of micro-level risks.

At the same time, we proceed from the fact that the available and considered methods are, first of all, at the micro level and cannot be used in the pure form to assess threats to the state in the context of the implementation of innovation policy, therefore we offer our own, in our opinion, more complete assessment methodology adapted to the macro level.

The proposed methodology focuses on qualitative analysis. Quantitative estimates are of an auxiliary nature and serve to correct and more accurately interpret the qualitative estimates obtained. The structure of the study basically corresponds to the chosen classification of risk factors.

For a variety of industries, the set of criteria and indicators that characterize innovative risks can vary significantly. However, the listed criteria may be appropriate in assessing innovative development in general. It should be noted that of the greatest value, in this case, is not the transformation of the list of significant factors, but the collection of objective information (Illarionov, 1999).

It seems necessary to use the blocks of non-financial factors presented below, which are a semi-quantitative assessment of innovative risks.

Block 1. The level of prevalence of technological modes in the economic development of the state. There is a direct relationship between the current level of the technological order, its

adequate definition and the magnitude of the innovative risk. The incorrect setting of priorities from the point of view of the current technological order accordingly increases the innovative risks of the state, reducing its investment attractiveness. Below is a list of indicators and points, which can be used to assess innovative risks in terms of the technological mode (up to 10 points).

A. The third technological mode - textiles, railways, coal and machine tool industry, ferrous metallurgy, electrical engineering, heavy engineering, steel industry, inorganic chemistry, power lines:

- the predominance of the third and the presence of the previous technological modes in the economy of the state - 0 points;
- the predominance of the third technological mode - 0 points;
- the economy of the state is at the intersection of the third and fourth technological mode - 1 point;

B. The fourth technological mode - automobile manufacturing, aircraft construction, rocket engineering, non-ferrous metallurgy, synthetic materials, organic chemistry, oil production and processing:

- the predominance of the third and the rudiments of the fourth technological mode in the economy of the state - 0-2 points;
- the predominance of the fourth technological mode - 3 points;
- the economy of the state is at the intersection of the fourth and fifth technological mode - 4-5 points;

C. The fifth technological mode - electronic industry, computers, optical industry, telecommunications, robotics, gas industry, software, information services, nuclear energy, information technology, genetic engineering, the beginning of nano- and biotechnology, space exploration, satellite communications, video- and audio equipment, the Internet, mobile communications:

- the predominance of the fourth and the rudiments of the fifth technological mode in the economy of the state - 6 points;
- the predominance of the fifth technological mode - 7 points;
- the economy of the state is at the intersection of the fifth and sixth technological mode - 8-9 points;

D. The sixth technological mode - nano- and biotechnologies, nanoenergetics, molecular, cellular and nuclear technologies, nanobiotechnologies, nanobionics, nanotronics and other nanoscale industries; new medicine, household appliances, modes of transport and communications, the use of stem cells, the engineering of living tissues and organs, reconstructive surgery and medicine, information technology:

- the predominance of the fifth and the rudiments of the sixth technological mode in the economy of the state - 9 points;
- the presence of the sixth technological mode by 5% - 10 points;

Block 2. The degree of transparency of the innovation sphere of the economy (up to 5 points). Below is a list of indicators and points, which can be used to analyze the transparency of innovation:

- the concealment or provision of deliberately distorted information on implemented innovative projects for state bodies - 0 points;
- the insufficient volume of information provided for state bodies by enterprises engaged in innovative activities for identifying the effectiveness and prospects of innovative projects - 1-2 points;
- the availability of all necessary information on the implementation of innovative projects in the absence of research on the industry market - 3-4 points;
- full openness on the part of executors of innovative projects and compliance of projects with selected priorities of innovative development - 5 points.

Block 3. Normative and legal protection of the state innovation sphere. In this category, an assessment is made of the legal protection of the innovation sphere, from the private owner of intellectual property to the implementation of strategic policy documents. When assessing the

legal protection of the state innovation sphere, one should take into account the following aspects:

- the level of investment attractiveness of the state depends on the degree of legal protection of the innovation sphere;
- the legal mechanism for the protection of the intellectual property sphere determines the competitiveness of the state and the creativity of the economy;
- the ultimate achievement of the state's priority tasks depends the degree of fundamentality of the existing strategic program documents and the chosen strategic course of innovation policy in general.

Below is a list of indicators and points, which can be used to assess innovative risks (up to 15 points):

A. Legal protection of the intellectual property sphere - legislation in the field of copyright protection, patent law, law on intellectual property:

- the degree of protection of the intellectual property sphere is at a low level due to the lack or underdevelopment of the legal framework in this field and the total lack of control by the state, burdened by corruption and bureaucracy of the state apparatus - 0-2 points;
- an average degree of protection due to the presence of the entire necessary legal framework in this field, but characterized by problems in the sphere of implementation and control with partial support at the international level - 3-4 points;
- a high degree of protection of the intellectual sphere - the state has all the necessary regulatory and legal mechanisms in this sphere with a high degree of control over their implementation - 5-6 points;
- a high degree of protection of the intellectual property sphere at the local level at an average level of regulatory support at the international level related to the partial ratification of international protection documents in this field - 7-8 points;
- a high degree of protection of the intellectual property sphere at the local level at an average level of regulatory support at the international level related to the full ratification of international protection documents in this field covering entirely this sphere - 9-10 points.

B. Legislative support for the introduction of innovations, which includes the entire regulatory and legal framework for the development and implementation of innovations, program-targeted and strategic documents that determine the innovation policy and innovative course of the state as a whole:

- a low degree of protection of the innovation sphere due to the lack or inadequacy of the legal framework in this field and the total lack of control by the state, burdened by corruption and bureaucracy of the state apparatus - 0-2 points;
- an average degree of protection due to the presence of the entire necessary legal framework in this field, but characterized by specific problems in the sphere of implementation and control - 3-4 points;
- a high degree of protection of the innovation sphere - the state has all the necessary regulatory and legal mechanisms in this field with a high degree of control over their implementation - 5 points.

Block 4. The competitiveness of innovative development of the state economy. Understanding the general principles of the impact of competitive advantages on the state position helps to make an overall forecast of innovative development, and, if necessary, make some adjustments in accordance with constantly changing economic processes.

A. Development of state institutions:

- the level of corruption of the state apparatus - 0-5 points;
- the effectiveness of legal framework - 0-5 points;
- the transparency of decision-making in the public sector - 0-5 points.

B. Dynamics of the main quantitative indicators of innovative development of the country's economy:

- the aggregate level of organizations' innovative activity  $<50\% \geq$  - 0-5 points;

- the share of organizations implementing technological innovations in the Republic of Kazakhstan in the total number of organizations  $<30\% \geq$  - 0-5 points;
- the share of expenditures for research and development performed without attracting foreign investment is not  $<40\%$  - 0-5 points.

C. The state's place in the ratings of international appraisal organizations:

- in the rating of the state in the Global Competitiveness Index of the WEF – not lower than the 30th place - 0-5 points;
- in the rating of the state in the Global Innovation Index of the INSEAD business school – not lower than the 65th place - 0-5 points;

D. Government support for the innovation sector:

- the interests of the government, local authorities, public organizations are in conflict with the interests of companies engaged in innovation - 0-1 points;
- industries (innovative enterprises) do not have substantial support and social significance - 2-3 points;
- the development of industries (innovative enterprises) is supported at the state level and / or within the framework of interstate programs, or significant for local authorities and / or within the framework of environmental and social programs - 4-5 points.

E. Dependence of innovative development of the state on the import of new technologies:

- the innovative shift entirely depends on borrowed technologies - 0-1 point;
- the partial dependence of innovative development on borrowed technologies (from 30% on borrowed technologies) - 2-4 points;
- the development of the innovation sphere of the economy is practically independent of borrowed technologies - 5 points.

Block 5. Strategic perspective.

A. The quality of strategic planning

- the actual situation in the innovation sphere does not correspond to the planned strategic goals and priorities in the field of state innovation policy - 0 points;
- the results of innovation policy have some deviations from the planned strategic course - 1-3 points;
- state innovative policy goes in unison with the goals and tasks set by the state in this field - 4-5 points.

B. Dynamics of industrial production:

- production drop - 0-1 point;
- stagnation with the signs of recovery - 2-3 points;
- moderate stable positive dynamics - 4 points;
- positive annual growth is above the average for the economy of developed countries - 5 points.

C. Management of the export of innovations and domestic demand for innovative products of domestic producers:

- domestic demand for domestic innovative products is absent - 0 points;
- a weak domestic demand for domestic innovative products and a small percentage of exports - 1-2 points;
- innovative products are in great demand in the domestic market and a small percentage of exports - 3-4 points;
- the complete satisfaction of domestic demand for innovative products and orientation to exports - 5 points.

D. Management of financial resources:

- internal costs for research and development of at least 20 billion US dollars - 0-5 points;
- the share of means of the business sector in the structure of internal costs for research and development from 45% - 0-5 points;
- trends in the intensity of costs for technological innovation in the industry - 0-5 points.

## E. Personnel potential and personnel policy of the innovation sphere of the economy:

- the level of compliance of the education sphere with the priorities of state innovation policy - 0-5 points;
- full compliance of the professional training process with the provisions of the Bologna Convention - 0-5 points;
- the level of prestige of professions corresponding to the priorities of state innovation policy – 0-5 points.

The assessment of innovative risk makes it possible to calculate the number of points and to determine the primary rating of the degree of impact of innovative risk on state innovation policy. The rating identifies the risk group of the state on the basis of impact of the total innovative risk on innovative activity and the probability of its implementation (Tables 2, 3).

Undoubtedly, there is an innovative process and innovative development in Kazakhstan's economy, but their presence does not give grounds for believing that Kazakhstan's economy is innovative. To determine the magnitude of innovative risk and the degree of its impact on the economy of the Republic of Kazakhstan as a whole, with the help of the methodology described above we determined the sum of the points. Based on the results of this assessment, it is possible to analyze innovative risks (Table 2).

Table 2. Assessment of state innovative risks in the Republic of Kazakhstan

No. of block	Name of the block of non-financial factors, which are a semi-quantitative assessment of innovative risks	Point
1	2	3
1	The level of prevalence of technological modes in the state economic development	3
2	Degree of transparency of the innovation sphere of the economy	1
3	Regulatory and legal protection of the state innovation sphere	7
4	Competitiveness of innovative development of the state economy	15
5	Strategic perspective	19
Total point		45
Note. Compiled by the authors		

Let us pass to the analysis of innovative risk in Kazakhstan.

1. Before talking about the level of prevalence of technological modes in the economic development of Kazakhstan, we will characterize these technological modes. Specialists in the field of new technologies came to the conclusion that the sixth technological mode entered the distribution phase in 2011, and if the current pace of technical and economic development continues, it will finish this phase by 2020 and pass to the maturity phase by 2040. According to the theory of long-term technical and economic development, the core of the fifth mode consists of electronics, IT-technologies, robotics, fiber-optic technology, fine chemicals, various directions of biotechnology with the developed individualization of production and consumption and the key role of the environmental factor. The fourth mode is the automobile and aircraft industry, non-ferrous metallurgy, synthetic materials, organic chemistry, oil and gas chemistry.



In Kazakhstan, the technologies of the fifth mode are in an embryonic state and their share is about 1% of total industrial production. The technological basis of Kazakhstan's economy is the fourth mode, accounting for about 80% of oil production and refining, and the third mode, amounting to 30%, i.e. the outdated models. The sixth mode in Kazakhstan, unfortunately, has not yet been observed at all. According to the scale, the predominance of the fourth technological mode is 3 points.

All of the above suggests that it is necessary for Kazakhstan to step through the fourth and fifth modes in the next decade in order to approach the number of technologically advanced countries. At the same time, the main task is to create an economy that generates innovations, and not to generate innovations for their introduction into an economy. This requires the active and competent participation of the state in the innovation process provided that the state will have its own institutional structures in the field of science capable of ensuring the solution of priority national tasks of innovative development (Indicators of innovative activity, 2013).

According to experts, Kazakhstan, using foreign experience, could quite compete for some kinds of macro-technologies of those 50-55 that define the potential of developed countries. First of all, these are progressive technologies of oil production and processing, alternative energy and energy efficiency technologies, biotechnologies, advanced technologies in agro-industrial complex and information technologies (Umbitaliev, 2016), which can help reach the world level in 7-12 years. As a result, only from the export of science-intensive products Kazakhstan could annually receive 120-150 billion US dollars.

2. When assessing the degree of transparency of the innovation sphere of Kazakhstan's economy in the process of gathering information, we came to the conclusion that the amount of information provided for state bodies by enterprises engaged in innovation is insufficient to determine the effectiveness and prospects of innovative projects, i.e. this aspect can be estimated at 1 point.

3. With regard to regulatory and legal protection of the state innovation sphere, we divided the legal framework into the following areas: protection of intellectual property and support for the introduction of innovations. According to the results of the analysis, Kazakhstan has an average degree of protection due to the presence of the necessary legal framework in this field, but characterized by problems in the sphere of implementation and control with partial support at the international level (4 points). Legislative support for the introduction of innovations is at the level of average protection due to the presence of the entire necessary legal framework in this field, but characterized by a low degree of feasibility (3 points).

4. Competitiveness of innovative development of the state economy. According to the (The Corruption Perceptions Index, 2012), calculated by the technique of the international non-governmental organization, compiled following the results of 2012, Kazakhstan ranks 133 out of 174 assessed states, sharing this place with Russia. Based on this, we can assess the level of corruption as high and assign 1 point.

The effectiveness indicators of the legal framework for the institutions of development and transparency in decision-making in the public sector are directly related to the level of corruption in the bureaucracy, and therefore we have made an assessment by both indicators, which is equal to 1 point.

A significant backlog in the level of Kazakhstan's innovative development is illustrated by a number of indicators. Thus, the aggregate level of innovative activity of organizations in Kazakhstan in 2011 was 7.1%, in 2012 - 7.6%, while in a number of developed countries this indicator exceeds 50% (Omelchenko, 2011). Therefore, when assessing this indicator, one can assign it 1 point.

At the same time, the share of organizations implementing technological innovation in the Republic of Kazakhstan in the total number of organizations increased from 4.3% in 2010 to 5.7% in 2011 and remained at the same level in 2012, also showing a significant backlog from more developed economies (Omelchenko, 2011). In this connection, we gave an estimate of 1

point.

An important difference of innovation-developing economies is that the greatest share of costs falls on research and development, performed by own forces and the smallest – on the purchase of ready-made innovative solutions. Compared to 2007, there is a positive trend in Kazakhstan: the share of research and development costs made by own resources increased from 7.6% to 15.9% in 2011 and slightly decreased to 12.9% in 2012. However, a significant part of them, about a third in 2011 and 67.9% in 2012, goes for the purchase of machinery, equipment and software, with 27.2% in 2011 and 8.4% of all costs in 2012 being classified as other, which in turn are not classified in any way, and in innovation-oriented economies they occupy less than 1%. Thus, we can estimate this indicator in the amount of 2 points.

In the WEF Global Competitiveness Index 2013-2014, Kazakhstan took the 50th place with an average point of 4.41, having moved up by 1 position, compared with the last year, and by 21 positions, compared with the year before last (in the 2011-2012 ranking – 72nd place). Kazakhstan demonstrates the weakest positions by such factors as healthcare and secondary education (97), the competitiveness of companies (94), innovations (84) and the development of the financial market (103) (The Global Competitiveness Report 2013-2014). In this regard, in our opinion, this indicator can be assigned 1 point.

The Global Innovation Index is an objective indicator of the role of innovation in the global positioning of the country and the role of innovation in maintaining its competitiveness. It reflects the perception of innovation as a process and phenomenon on the part of society within the country. Such studies are essential when making decisions on the part of investors working in non-primary sectors.

According to the annual report of the Global Innovation Index 2013, compiled by Cornell University, INSEAD business school and the World Intellectual Property Organization, Kazakhstan ranked 84th in the level of innovative development. In the rating, Kazakhstan received the index of 32.7 (on a scale of 0 to 100), being between Ecuador and Indonesia. For comparison, last year the republic's index was 31.9. In 2012, Kazakhstan was between Swaziland and Paraguay, which lost their positions this year, ranking 100th and 104th respectively (The Global Competitiveness Report 2013-2014, 2013). Thus, the current position of Kazakhstan influenced the assessment in 3 points.

When analyzing the extent to which the government supports the innovative sector of Kazakhstan on the basis of expert evaluation, taking into account that the domestic innovation sector is at the initial stage of its formation and faces a number of problems associated with this stage of development, it is concluded that the development of the innovation sphere is supported at the state level within the framework of state programs, which gives the right to assign an estimate of 4 points.

At this stage, one can say that the innovation shift depends entirely on borrowed technologies. But this process will not be successful if the state and business cannot coordinate their actions. According to the report on the innovative development of Kazakhstan, compiled by the UN, the transfer of technology from other countries through the use of patents and licenses is the main part of the Kazakhstan strategy to correct missed scientific opportunities in the country. State support will be provided both in the case of filing applications for the use of foreign copyright (currently only 4% of companies acquire technology in this way) and for the support of patenting abroad.

However, due to the fact that Kazakhstan is on the way to the formation of innovative development, there is still no extensive and more specific database of quantitative data on the transfer of technology to Kazakhstan. Therefore, taking into account the above-mentioned expert estimates, we can state that the indicator of dependence of innovative development of the state on the import of new technologies can be assigned an estimate of 0 points, since at the present stage of innovation policy implementation the innovation shift depends entirely on borrowed technologies.

5. From the point of view of strategic management, the results of innovation policy have some deviations from the planned strategic course associated with such factors as (1) the misuse of funds aimed at the implementation of innovative programs, (2) the approval of deliberately uneconomic and failed innovative projects (the human factor has a great influence); (3) the non-appropriation of allocated budget funds for innovative projects. In this connection, one can assign an estimate of 2 points to this indicator.

According to official statistics, the period from 1999 to 2012 in Kazakhstan can be characterized by a moderate stable positive dynamics and growth in industrial production, which can be estimated at 4 points.

One can assign 1 point to the level of export management of innovations and domestic demand for innovative products of domestic producers, when there is a weak domestic demand for domestic innovative products and the share of exports of high-tech products is 5.1%.

Kazakhstan lags behind the leading states of the world in terms of the scale of spending on science with regard to the priority of the innovation sphere in the structure of the economy. In terms of the share of expenditure on research and development in GDP, Kazakhstan is only in 69th place. Thus, based on the analysis, one can assign 1 point to this indicator.

In terms of the ratio of means of the business sector in the structure of internal costs for research and development, the largest share of costs in the overall structure of domestic costs in Kazakhstan falls to enterprises' own funds. Thus, according to this indicator, we assign an estimate of 4 points.

During the analysis of the indicator assessing the trends in the intensity of costs for technological innovation in the industry, it was revealed that the overall dynamics are negative. This indicates either an inefficient investment of funds or the fact that money is invested in existing organizations, without stimulating the creation of new enterprises. Therefore, an estimate is 1 point.

In terms of the level of compliance of the education sector with the priorities of the country's innovation policy, it should be noted that currently Kazakhstan faces an acute problem with the availability of highly qualified specialists in many sectors of the economy, including priority ones, for example, in the oilfield service sector, where the practice of attracting foreign personnel is widespread due to the lack of the necessary level of knowledge and experience among local specialists.

Thus, for the effective implementation of projects and the improvement of the quality of services in Kazakhstan, first of all, it is necessary to address the issue of training personnel in engineering and engineering professions. In this connection, this indicator is estimated by us at the level of 2 points.

In terms of the indicator of compliance of the process of professional training with the provisions of the Bologna Convention, one should note that the introduction of a three-level structure of higher education in Kazakhstan was focused on integration with the international educational space, the expansion of the range of educational programs and an increase in their mobility and flexibility in accordance with the requirements of a market economy. However, currently, the system of higher and postgraduate education in the Republic of Kazakhstan is at the stage of formation and adaptation, which makes it possible to assess the indicator considered at the level of 2 points.

In the context of increasing global innovative trends, the most popular professions in the world are engineering specialties, which are projected to take the lead in the near future. However, in Kazakhstan, there is an acute shortage of professional engineers, technicians and middle managers in production. The deficit of such specialties, corresponding to the priorities of state innovation policy, in Kazakhstan speaks about the low level of their prestige and is estimated by us at 2 points.

Summing up the total result, we received a final estimate of 45 points, which, in accordance

with Table 3, indicates that the magnitude of the total innovative risk for the Republic of Kazakhstan is the maximum allowable. The magnitude of the impact of risk on the innovation sphere of the Republic of Kazakhstan is significant, according to which a pre-critical rating 3 is assigned (see Table 4). It is characterized by a low degree of implementation of innovative projects for various reasons: obstacles of a bureaucratic and corruption nature, misuse of funds aimed at the implementation of innovative projects; possible losses in the financing of innovative projects that will not find the expected demand in the domestic and foreign markets and will not bring the expected effect; insufficient innovative development in the country.

Table 3. Total innovative risk

Rating	Probability of total innovative risk	Estimate	Description
4	0.8-1	Less than 25 points	Too-high probability of total innovative risk
3	0.5-0.7	25-50 points	The maximum allowable value of total innovative risk
2	0.3-0.4	50-75 points	The acceptable value of innovative risk
1	0.05-0.2	75-100 points	Standard
0	<0.05	100-125 points	Insignificant

Note. Compiled by the authors

Table 3. The impact of risk on the innovation sphere of the economy

Rating	Description
4	<i>Critical:</i> the total absence of innovative activity at the state level, a general economic decline, the absence of economic growth
3	<i>Significant:</i> a low degree of the implementation of innovative projects for various reasons: <ul style="list-style-type: none"> <li>- barriers of the bureaucratic and corruption character;</li> <li>- the intellectual use of financial resources aimed at the implementation of innovative projects;</li> <li>- the possibility of losses in the financing of innovative projects that will not find the expected demand in the domestic and foreign markets and will not bring the expected effect;</li> <li>- inadequate innovative development in the country</li> </ul>
	<i>Insignificant:</i> the application of the chosen course of state innovation policy has

2	positive results by the main priorities with a slight manifestation of weaknesses in this area
0-1	<i>No impact:</i> virtually invisible and do not affect the innovative development of the state
Note. Compiled by the authors	

However, despite a sufficiently high impact of risk on the innovative development of Kazakhstan, there are favorable prerequisites for further modernization and diversification as well as for the growth of the national economy in the short term. In addition, the implementation of innovative investment projects can solve not only economic problems, but also an extremely important problem of unemployment, as far as projects create a significant number of jobs.

The complex analysis and assessment of innovative risk in the Republic of Kazakhstan indicates that the result obtained is quite natural in the modern period of development of the innovation sphere of a young but strong state, since the stage of formation in any sphere is always characterized by significant risks. At the same time, it also shows that this aspect has some real possibilities for justifying a necessary set of proposals and directions to reduce and neutralize innovative risks at the state level.

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2. S. Seifullin Kazakh Agrotechnical University
  3. S. Seifullin Kazakh Agrotechnical University
  4. S. Seifullin Kazakh Agrotechnical University
  5. S. Seifullin Kazakh Agrotechnical University
  6. S. Seifullin Kazakh Agrotechnical University
  7. S. Seifullin Kazakh Agrotechnical University
  8. S. Seifullin Kazakh Agrotechnical University
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