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# University innovation capacity: From assessment to governance decisions Evidence from Kazakhstan's national universities

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## Abstract

The article presents a systematic approach to managing the innovative potential of universities and demonstrates its application using materials from national universities in Kazakhstan. The purpose of this study is to develop a practical recommendation for enhancing the management of innovation capability in universities of the Republic of Kazakhstan. It is based on a seven-block model of innovation potential (education, research, management, human resources, infrastructure, finance, internationalization), which allows for the identification of strengths and weaknesses and the translation of assessment results into decisions on structures, processes, incentives, and monitoring. The research methodology is based on expert assessment involving institution managers. The focus is on national universities as they are the main actors in the higher education system and form the basis for building an innovative economy in Kazakhstan. This framework enabled a comprehensive analysis of the current state's sustainability and the identification of prospective directions for improvement. The findings can be used to contribute to the optimization of university innovation strategies and to strengthen their competitiveness in both academic and research domains.

**Keywords:** Expert-based assessment, Governance transformation, Higher education institutions, Innovation, Policy recommendations.

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## 1. Introduction

In today's rapidly changing global landscape, technological progress and innovation are key drivers of economic growth and societal development. Higher education institutions, in particular universities, play a crucial role in fostering innovation by conducting cutting-edge research, developing new technologies, and training a skilled workforce. In this context, the innovation capacity of universities becomes a key factor determining their ability to contribute to national and

global progress. The Republic of Kazakhstan, seeking to strengthen its position in the global knowledge economy, has recognized the importance of strengthening the innovation capacity of its universities. Despite significant investments and reforms in the higher education sector, the innovation performance of Kazakhstan's universities still varies significantly. This disparity calls for a thorough assessment of their innovation capacity to identify strengths, weaknesses, and areas for improvement.

The existing literature provides substantial evidence of improvements in innovation investments and outcomes at national universities in Kazakhstan, but there are still significant gaps in data regarding the quality of outcomes, comparability, and the translation of reforms into successful commercialization and industry partnerships. Future research should prioritize these areas to create a more comprehensive and internationally competitive evaluation system.

The necessity of developing the innovative capacity of higher educational organizations relates to a number of tendencies and challenges of the last decade concerning education as a significant part of the national economy. Scientific publications often use the concepts of “innovation,” “innovative activity,” “innovative capacity,” “innovativeness,” and others. They were developed and specified in the course of methodological, theoretical, and empirical studies by a number of scientists. The concept of “innovation capacity” began to develop actively in the late 1970s. Nowadays, in studies, “innovation capacity” as an object of study is presented in large quantities.

The role of universities is becoming increasingly important in the innovative development of the economy. According to Loaiza-Aguirre et al. [1], currently, universities are directly responsible for the production, distribution, and transmission of knowledge. Modern structures in social, economic, and political spheres that are observed in society require significant changes in university management. Hence, in order to operate completely and contribute to the innovative development of a country, a higher education institution must have a high level of innovative capacity. This implies that universities must continuously improve and develop their capacities in research and innovation, since these, on the one hand, are measures of the social, economic, and political impact that these institutions generate in their environment; and on the other hand, they contribute to explaining the emergence of universities that dominate the generation of knowledge in the world Henao-García et al. [2]. Nosonov [3] notes that the study of the main areas for realizing the innovation capacity of higher education and the development of an appropriate strategy are needed to develop mechanisms for transferring high-tech production and modern management technologies developed in higher education institutions to the real sector of the economy.

Today, Kazakhstani universities need to carry out a number of measures to ensure that the regional and all-Kazakhstani economy will be the centers of innovation activity and the driving force of innovative development. The largest universities of Kazakhstan, in the foreseeable future, aspire to become research universities. The innovative capacity of a research university is a set of available and ready-to-use internal and external resources and opportunities of a world-class university that enable it to effectively carry out its mission [4]. This requires the formation of new approaches, the main goal of which is to improve the quality of educational activities, development of science and technology. To achieve this goal, it is necessary to pay attention to the development of systemic, financial, and structural mechanisms.

This paper attempts to provide answers to the following question: “How can a seven-domain assessment of university innovation capacity be translated into concrete governance decisions in Kazakhstan’s national universities?” This issue aims to assess the innovation capacity of national universities in Kazakhstan using the expert assessment methodology. By relying on the opinions of experts in this field, we will be able to gain a deep understanding of the various factors affecting innovation in these educational institutions. The purpose of this study is to provide a comprehensive assessment of the current state of the innovation capacity of Kazakhstani universities and to offer practical recommendations to improve their innovation capacity. Addressing the shortcomings identified during the expert assessment will enable policymakers and university management to implement targeted strategies to create a favorable innovation environment. This, in turn, will allow Kazakhstani universities to better compete in the international arena and make a more effective contribution to the country’s economic and social development.

In the following sections, we will detail the methodology used for the assessment, present the findings of the expert evaluations, and discuss their implications for the future of higher education and innovation in Kazakhstan.

## 2. Methods

The assessment of the innovation capacity of universities has attracted considerable attention in academic research, given the crucial role that these institutions play in promoting technological progress and economic growth. Various studies have examined different aspects and methodologies for assessing the innovation capacity of universities, with particular emphasis on factors such as funding, quality of faculty, infrastructure, and collaboration with industry.

We consider the innovative capacity of the university as its ability to transform the components or resources that are able to carry out effective activity in the conditions of an innovative environment. The resources of the university include human, educational, intellectual, material-technical, and financial. Conducting an assessment of each of the resources that make up the university's innovation capacity makes it possible to manage these resources effectively, optimize the process of innovation implementation, and strengthen collaboration with industry and international partners. It also allows informed decisions to be made about the development of research activities and educational programmes, contributing to the overall competitiveness of the university at a global level. The application of qualitative research in higher education can lead to insights that inform pedagogical practices, curriculum development, and institutional policies. Mantula et al. [5] assert that the application of qualitative research in higher education can lead to insights that inform pedagogical practices, curriculum development, and institutional policies. The qualitative assessment of innovation capacity includes the following methods:

expert assessments (interviews, focus groups, Delphi method, SWOT analysis, case studies); document analysis (content analysis); educational quality assessment (observation, surveys and questionnaires, social network analysis).

Expert assessment methodologies have been increasingly used to evaluate the innovative capacity of universities. This approach involves gathering insights from individuals with extensive knowledge and experience in the field of higher education and research. According to Kaufman and Beghetto [6], expert assessments are valuable for providing nuanced and comprehensive evaluations that quantitative metrics alone may not capture. These assessments typically involve rating various indicators of innovation, such as research output, faculty quality, and industry partnerships, on a predefined scale.

Expert assessment methodologies offer a robust means of evaluating these factors, providing detailed insights that can inform policy and strategic decisions. As universities continue to play a critical role in driving innovation, understanding and enhancing their innovative capacity remains a key priority for researchers and policymakers alike.

In order to assess the innovation capacity of Kazakhstani universities, this study used the methodology of expert evaluation. This approach allows for a comprehensive and objective assessment of the key factors influencing the innovation activity of universities. An integrated assessment of innovation capacity based on a systematic approach that reflects the results of different spheres of university activity, proposed by the group of authors Emelyanov et al. [7] and Ibodova [8], also used the integrated assessment of innovation capacity in her research. The proposed methodology was tested on the indicators characterizing the innovation capacity of the Kursk State Technical University (Russian Federation), a number of universities of the Republic of Tajikistan (Tajik State University of Commerce, Technological University of Tajikistan, etc.).

The implementation of the system approach is based on the expert method of comprehensive assessment of innovation capacity through the sequential construction of logical matrices, which are filled out by an expert or the head of a higher education institution. As a result, eight national universities and one international English-language research university with a special status (Nazarbayev University) participated in our survey. Our criterion for selecting national higher education institutions and Nazarbayev University to assess their innovation capacity is justified by their leading role in the national education and science system, developed research infrastructure, and significant influence on regional and international cooperation. These HEIs demonstrate best practices and have the capacity to grow and innovate, making them key elements of Kazakhstan's innovation ecosystem.

To achieve the purpose of the study, we followed the recommendations of Emelyanov et al. [7] on the steps for the assessment of innovation capacity. The sequence of steps required for conducting this research is shown in Figure 1.

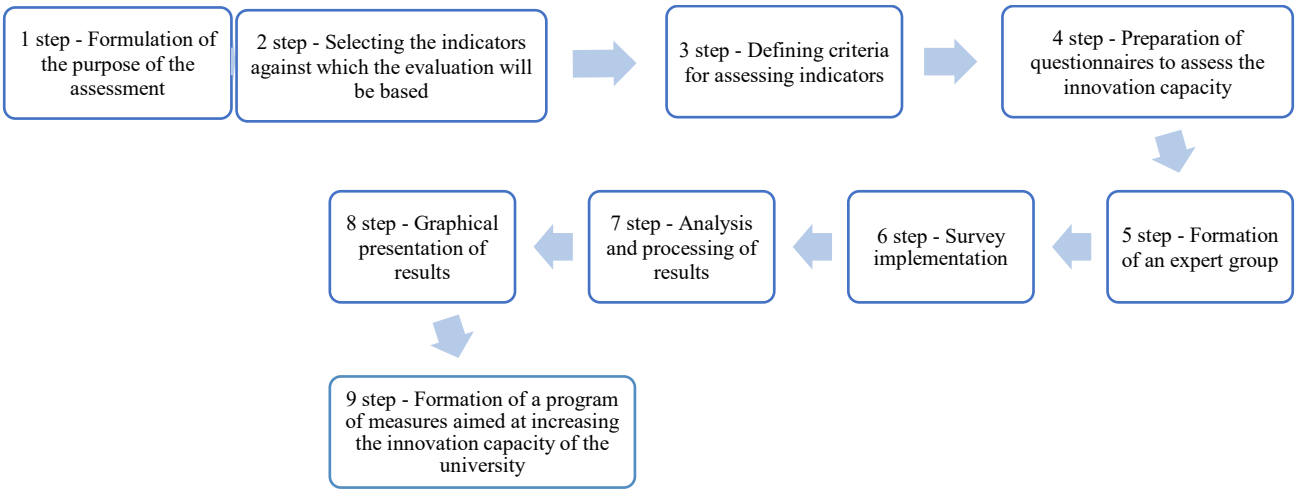


**Figure 1.**
Stages of the methodology.

First and foremost, the assessment process begins with the formation of methodological foundations, including the selection of an approach, justification of the expert method, and questioning. The characteristics of the assessment of the innovative potential of national universities are as follows:

The purpose of the assessment is to determine the level of innovative potential of national universities in Kazakhstan based on experts' self-assessment of key parameters reflecting the state of innovative activity.

The object of the assessment is seven national universities of the Republic of Kazakhstan. We also decided to include Nazarbayev University in this list as an innovative leader among the country's higher education institutions, serving as a benchmark for assessing potential areas of transformation for national universities implementing the international research university model (benchmark).

The method is expert assessment based on established criteria.

The experts are vice-rectors or heads of science and innovation departments at each university.

The assessment tool is a questionnaire containing a list of criteria for innovative potential. It was selected from eight indicators for seven university positions.

Assessment scale: 1 – at the initial stage; 2 – developing, but unstable; 3 – functioning steadily; 4 – high level of development.

Data processing – calculation of an integral indicator for each organization by creating a matrix of assessments and summing the assessments according to the criteria.

Interpretation of results: formation of a ranking of universities, identification of strengths and weaknesses, grouping of universities by levels of innovation potential.

Conclusion: assessment of the current state of the innovation potential management system, identification of growth points, and development of management recommendations.

In our opinion, this assessment helps to identify the strengths and weaknesses of the organization, assess its readiness for technological development and cooperation with business, and form a strategy for increasing competitiveness in the field of science and innovation.

For the second and third stages, a set of indicators for assessing innovation potential relevant to the university's activities has been defined. Eight indicators were selected for seven university positions. This selection is based on research conducted in the theoretical part, i.e., within the framework of this topic, indicators characterising innovative potential were summarised from the works of scientists and brought into line with Kazakhstani higher education organisations. We believe that the seven proposed groups of criteria will allow for a comprehensive assessment of the university's innovative activities and innovative potential.

The next steps include conducting a survey. The survey is based on an expert assessment of indicators of innovative potential. For this purpose, a discrete rating scale consisting of four stages is introduced. Each rating corresponds to a predefined set of criteria, such as research, education, international organization and management, human resources, material and technical support, and financing of innovative activities.

The expert survey consists of three sections. The first part includes five questions aimed at determining the profile of the respondents. The second part comprises fifty-five questions divided into seven groups. The third part contains seventeen questions aimed at identifying barriers to the development of innovation activities. The experts who participated in the survey were officials (leaders) of national universities in science and innovation. The experts involved in the study are specialists from national universities and individuals in leadership positions, i.e., they have experience and competence in this field. The composition of the experts was determined based on their level of awareness and participation in practical, analytical, or research work on university issues. The third part of the survey aims to identify the opinions of experts on barriers and topical issues in the development of innovation and science in higher education institutions. The purpose of the expert survey is to determine the opinion or personal point of view of the expert. The survey https://docs.google.com/forms was sent to experts via the link. As a result, experts from eight higher education institutions participated in the assessment, and twenty-four responses were received. The calculations for each higher education institution are provided in the appendices. The experts assessed seven key sets of indicators affecting the innovation activity of higher education institutions (Table 1).

**Table 1.**
Grouped indicators of innovation capacity by areas of university activity.

| **1-group. Educational Activities** | **2-Group. Research and development activities** |
|---|---|
| Providing the opportunity to educate students on three-level programs of higher education, the development and introduction of new educational technologies, and active teaching methods; | 1. Holding scientific and practical conferences, symposiums and seminars; |
| 2. Introduction of new specialties, taking into account the requirements of the labor market, new disciplines, and disciplines of students' choice. | 2. Creation of research centers for conducting scientific and project-analytical works; |
| 3. Development and use of educational programs that have received national and, at the same time, independent, international accreditation. | 3. Publication of scientific articles and reports on the results of research activities; |
| 4. Availability of a system of continuing education that meets the needs of business structures in terms of competencies and qualifications; | 4. Participation of teaching staff and researchers in the activities of newly created business incubators, techno parks and other subjects of innovation infrastructure, on the basis of the university or with its participation; |
| 5. Use of the results of the HEI's design and innovation activities in its educational programs; | 5. Number and value of registered and sold patents and other intellectual property objects (e.g., know-how, etc.); |
| 6. Involvement of stakeholders in the development of educational standards and programs; | 6. The number of received national and international awards, prizes in the field of science, culture and education; |
| 7. Quality of graduates according to independent assessment of employers; | 7. Equipping of scientific laboratories with modern technologies, with access to the Internet, multimedia equipment; |
| 8. Promotion of innovative and entrepreneurial skills development in HEI educational programs. | 8. Fulfillment of research orders from the subjects of the labor market (state, private business). |
| Group 3 - Administrative and management activities: | Group 4 - Human Resources (HR) |
| 1. Using the credit system in the management of the educational process of the HEI; | 1. Quantitative provision of HEI educational and research activities with personnel; |

| | |
|---|---|
| 2. Elaboration of the strategic program of HEI development and mid-term action plan; | 2. Qualification indicators of scientific and pedagogical staff and teaching and support staff (the share of doctors and candidates of sciences); |
| 3. Development and implementation of a quality management system in the educational process; | 3. Availability of the system of professional development, training and retraining of personnel in the field of innovation activity; |
| 4. Participation in international educational organizations and international exchange programs; | 4. The number of teachers who took part in international exchange programs; |
| 5. Creation of an innovative university management structure; | 5. international exchange programs; |
| 6. Application of modern information and communication technologies in university management; | 6. Number of invited foreign professors and teachers; |
| 7. Functioning of the infrastructure for quality control and monitoring of educational, scientific, and international activities of the HEI; | 7. The number of practicing teachers; |
| 8. Number of undergraduate and postgraduate students involved in the implementation of the educational process and research activities; | 7. The share of teaching staff and researchers under 40 years old; |
| Group 5 -Material and technical support | 6 group - Financial support |
| 1. Equipping of laboratories and classrooms for research and educational activities. 2. Equipment for the implementation of research and educational activities; | 1. Share of grant funds received within the framework of international projects; |
| 2. Equipment for the implementation of research and educational activities; | 2. The share of financial resources received for the fulfilment of state orders aimed at the development and implementation of new educational technologies; |
| 3. Availability of the information system for managing the educational process; | 3. The share of university expenditures for the implementation of innovative projects; |
| 4. Provision of research and educational activities with material resources (library fund, electronic educational resources, etc.). | 4. Amount from the realization of scientific and technical products developed within the framework of innovative educational and scientific projects; |
| 5. Provision of personal computers and the possibility of access to the Internet during training sessions; | 5. Specific weight of other sources of financing aimed at innovation activity of the HEI; |
| 6. Provision of research activities with new information technologies; | 6. The amount of HEI expenditures on increasing the motivation of HEI employees in the development of innovative projects; |
| 7. Providing access to electronic educational resources and foreign periodicals for students and staff of the university; | |
| 8. Availability of a publicly accessible website of the HEI; | |
| Group 7 - Infrastructure | |
| 1. Priority of the region in the scale of the republic, availability of strategic and innovative sectors of the economy in the region; | |
| 2. Correspondence of the goal of the innovation project of HEI to the priorities of socio-economic development of the region, strategies, and programs of regional and national development; | |
| 3. Resource-confirmed interest in the implementation of the educational project of authorities, organizations, business structures, and international funds and organizations; | |
| 4. Availability of a system of targeted training and professional development for the economic cluster; development of targeted programs with the participation of employers; | |
| 5. Availability of innovation infrastructure (including material and technical and information base, scientific personnel in ‘breakthrough’ areas and unique scientific schools, business incubators, technology parks, transfer centers, etc.) integrated into the region; | |
| 6. The number of international projects in the field of education and scientific research; | |
| 7. The number of students and teachers who participated in international exchange programs. | |

To calculate the integral index of the innovative potential of universities, it is necessary to take into account the unequal significance of various components (education, science, personnel, etc.). Here, we use the hierarchical analysis method developed by Thomas Saaty to determine weight coefficients, which is one of the most suitable and widely used tools for multidimensional analysis under conditions of expert uncertainty. The method allows subjective expert assessments to be converted into objective quantitative coefficients, verifying their reliability.

Methodology for determining the weighting coefficient

Stage I. Determination of criteria. The following seven blocks have been identified as part of the assessment of the university's innovation potential:

1) Fedu - educational activities
2) Fman - organisational and managerial activities
3) Fres - research activities
4) F-per-personnel provision
5) Fint-international activities
6) F-financial provision
7) Fmat-material and technical provision

Stage II. Formation of a pairwise comparison matrix. At this stage, a pairwise comparison of all criteria is carried out to determine which of them is more important than the other in terms of its impact on innovative potential. The elements of the matrix are numerical values on the Saaty rating scale, reflecting the expert's preferences (Table 2).

**Table 2.**
Description of the Saati numerical scale

| **Score value** | **Score value** |
|---|---|
| 1 | Equal importance |
| 3 | Moderate preference |
| 5 | Important advantages |
| 7 | Obvious advantages |
| 9 | Absolute superiority |
| 2,4,6,8 | Intermediate values |
| 1/3, 1/5, etc. | Reverse comparison |

To determine the weight coefficients of the significance of the indicators, each expert fills out a pair Comparison Matrix (Table). The type of matrix that experts fill in is as follows:

**Table 3.**
Matrix.

| | **Fedu** | **Fedu** | **Fedu** | **Fedu** | **Fedu** | **Fedu** | **Fedu** |
|---|---|---|---|---|---|---|---|
| Fedu | 1 | | | | | | |
| Fman | | 1 | | | | | |
| Fres | | | 1 | | | | |
| Fper | | | | 1 | | | |
| Fint | | | | | 1 | | |
| Ffin | | | | | | 1 | |
| Fmat | | | | | | | 1 |

Where Fedu - Fmat are evaluation blocks, and values in cells are expert estimates.

Stage III. Calculation of the weight factor. After filling the Matrix:

The matrix is normalized: each element is divided by the sum of its column. The weights ($w_i$) are calculated as the mean of the normalized matrix path.

Stage IV. Compliance check (consistency index)

To confirm the logic of expert judgments, the conformity index (CI) and the Saaty conformity index (CR) are calculated:

Maximum personal identification: λmax=7,256\lambda_{max} = 7,256

Comparison index (is): CI=0.043

Comparison (OS): CR=3.23%

Since CR < 10%, the Matrix is coordinated and can be used to further calculate the integral index of innovation potential.

**Table 4.**
Weight coefficients of significance of indicators.

| **Blocks** | **Weight, W** |
|---|---|
| Fedu | 0,22 |
| Fman | 0,15 |
| Fres | 0,2 |
| Fper | 0,19 |
| Fint | 0,05 |
| Ffin | 0,11 |
| Fmat | 0,08 |

The significance coefficients for each indicator of innovation potential are shown in Table 4. The use of the hierarchical analysis method made it possible to determine the measured value of each block based on expert judgment and ensured the logical consistency and reliability of the final coefficients. This increased the accuracy and reliability of the integrated assessment of the innovative potential of universities. The obtained values of the weight coefficients of the indicators confirm the hypothesis that the level of innovative potential of a university is determined, first of all, by the presence of modern professional competencies of the teaching staff, as well as their involvement in research activities aimed at creating and implementing innovations.

The level of innovative potential of each university is calculated using a formula that takes into account the values of the significance coefficients of the indicators given in the table.

$$IP = \sum_{i=1}^{n} wi * pi$$

where,

$p$ is the average value for block $i$ obtained as a result of expert assessment;

**Table 5**.

Average values of each component according to expert estimates of the components of innovative potential of universities.

| | **Fedu** | **Fedu** | **Fedu** | **Fedu** | **Fedu** | **Fedu** | **Fedu** |
|---|---|---|---|---|---|---|---|
| 1 | Al-Farabi Kazakh National University | | | | | | |
| p | 4 | 4 | 4 | 3.888889 | 3.777778 | 4 | 4 |
| 2 | Abai Kazakh National Pedagogical University | | | | | | |
| p | 2.875 | 2.571429 | 2.666667 | 2.444444 | 1.444444 | 1.714286 | 2.111111 |
| 3 | Nazarbayev University | | | | | | |
| p | 3.5 | 3.571429 | 3.666667 | 3.222222 | 3,111111 | 3.428571 | 3.888889 |
| 4 | Kazakh National Women's Pedagogical University | | | | | | |
| p | 2 | 1.857143 | 2 | 2 | 1.333333 | 1.714286 | 1.555556 |
| 5 | L.N. Gumilyov Eurasian National University | | | | | | |
| p | 2.125 | 1.571429 | 2.166667 | 2.222222 | 1.555556 | 1.714286 | 2.111111 |
| 6 | K.I. Satpayev Kazakh National Technical University | | | | | | |
| p | 3.25 | 3.571429 | 3 | 2.888889 | 3.333333 | 2.857143 | 3.222222 |
| 7 | S.D. Asfendiyarov Kazakh National Medical University | | | | | | |
| p | 3.625 | 3.857143 | 3.5 | 1,555556 | 3 | 3.714286 | 3.555556 |
| 8 | Kazakh National Agrarian University | | | | | | |
| p | 3.25 | 3.142857 | 3.333333 | 3.444444 | 3.222222 | 3.571429 | 3.555556 |

Note – author's calculations

Using the above formula and the values of individual indicators, we will calculate the level of innovative potential of the universities under consideration. The results are presented in the table. The weighted assessment of individual indicators for each university is the product of the indicator and its weighting coefficient. Calculation of the level of innovative potential:

$IP_1$=(0,22*4+0,15* 4+ 0,2* 4+0,19* 3,88+0,11* 3,77+0,05*4+0,08* 4)

$IP_2$=(0,22*2,87+0,15* 2,57+ 0,2* 2,66+0,19* 2,44+0,11* 1,44+0,05*1,71+0,08* 2,11)

$IP_3$=(0,22*3,5+0,15* 3,57+ 0,2* 3,66+0,19* 3,22+0,11* 3,11+0,05*3,42+0,08* 3,88)

$IP_4$=(0,22*2+0,15* 1,85+ 0,2* 2+0,19* 2+0,11* 1,33+0,05*1,71+0,08* 1,55)

$IP_5$=(0,22*2,12+0,15* 1,57+ 0,2* 2,16+0,19* 2,22+0,11* 1,55+0,05*1,71+0,08* 2,11)

$IP_6$=(0,22*3,25+0,15* 3,57+ 0,2* 3+0,19* 2,88+0,11* 3,33+0,05*2,85+0,08* 3,22)

$IP_7$=(0,22*3,62+0,15* 3,8+ 0,2* 3,5+0,19* 1,5+0,11* 3+0,05*3,71+0,08* 3,55)

$IP_8$=(0,22*3,25+0,15* 3,14+ 0,2* 3,33+0,19* 3,44+0,11* 3,22+0,05*3,57+0,08* 3,55)

## 3. Results

The use of an expert assessment methodology provided a comprehensive and objective picture of the innovation capacity. The obtained results and recommendations can be used to develop and implement strategies aimed at improving the competitiveness and innovation activity of higher education institutions in Kazakhstan. The results and discussion of the main findings of the study are summarized below (Table 6).

**Table 6.**
The assessment of the use of the innovation capacity of universities.

| № | University name | Innovation capacity | Innovation capacity level | University ranking |
|---|---|---|---|---|
| 1 | Al-Farabi Kazakh National University | 3.95 | high | 2 |
| 2 | Abai Kazakh National Pedagogical University | 2.42 | above average | 7 |
| 3 | Nazarbayev University | 3.47 | high | 1 |
| 4 | Kazakh National Women's Pedagogical University | 1.85 | average | 8 |
| 5 | L.N. Gumilyov Eurasian National University | 1.98 | above average | 4 |
| 6 | K.I. Satpayev Kazakh National Technical University | 3.39 | high | 3 |
| 7 | S.D. Asfendiyarov Kazakh National Medical University | 3.31 | above average | 5 |
| 8 | Kazakh National Agrarian University | 3.52 | average | 6 |

**Note:** * The table is based on the results of an expert survey

Summing up the results of the assessment, it is possible to rank national universities by the level of innovative potential as follows.

**Table 7.**
Summing up the results of the assessment.

| IP level | Short description | Possible strategies for further action for the University |
|---|---|---|
| Average | The university is capable of creating, acquiring, and exploiting innovations in selected areas. | 1. Maintaining and increasing the innovative potential by ensuring the quantitative and qualitative growth of its components. 2. Identification of areas of scientific research with the greatest advantages of the region and their development. |
| Above average | The university has sufficient opportunities and resources to create, master, develop, and effectively use innovations in several areas. | 1. Preservation and further development of innovative potential through the development of its components. 2. Support of activities in current priority areas of innovation activity and entry into new areas and industries. |
| High | The university has a high potential to create, master, develop, disseminate, and effectively use innovations in many areas. | 1. Preservation and further development of innovative potential through the development of its components.<br>2. Support of activities in current priority areas of innovation activity and entry into new areas and industries. |

## 4. Discussion

Identification of the problems in the management of innovation capability of universities in the Republic of Kazakhstan is a key aspect of analyzing their role in the development of the country's innovation ecosystem. Despite several achievements in education and science, there are a number of problems that hinder the effective development of the innovation capabilities of universities.

These results confirm that the universities have a sufficiently developed infrastructure, good development indicators, and grounds for research. However, it is worth noting the presence of a number of problems and issues: the material and technical base of the university is being updated at an insufficient rate; outdated material and technical base and equipment of laboratories do not allow conducting high-quality scientific research; there is no mechanism of interaction between design institutes, design bureaus, and production with universities; the scientific capability of higher education institutions in Kazakhstan is used inefficiently; a weak link exists between education, science, and production; there is a lack of economic incentives for the private sector to invest in education, science, and innovation; the share of scientific research remains more than ten times below the level of developed countries.

The essence of a classical research university is to combine the educational process and fundamental scientific research. This requires teachers with fundamental knowledge. World experience shows that leading countries have managed to integrate science and knowledge as effectively as possible. This experience is also relevant for domestic universities. The main science is carried out in scientific laboratories, where associate professors and professors of the departments work and participate in scientific projects, and the scientific staff of the laboratories participate in the educational process.

Therefore, it is necessary to increase the role of scientific laboratories in the joint training of scientific personnel—doctoral and master's students, as well as bachelor's degree specialists of technical direction. It is essential to widely involve scientists from the scientific laboratories of the Institute in managing the scientific work of doctoral and master's students and in the work of dissertation councils. This approach will enable us to expand the application of scientific research results within the educational environment, thereby improving educational programs, promoting the development of research capabilities, and increasing the competitiveness of specialists. A research university should be an entrepreneurial institution capable of ensuring its financial sustainability amid increased competition among universities.

To unlock the full innovative potential of higher education organizations in the Republic of Kazakhstan, it is necessary to remove existing barriers and further develop mechanisms of interaction with public and private partners. To effectively overcome these challenges, it is essential to develop strategic initiatives aimed at improving management in universities, as

well as establishing close links with industry. This will not only increase the level of innovation capacity but also ensure the sustainable development of higher education in the country. It is important that all stakeholders government agencies, universities, and businesses work in the same direction to create favorable conditions for innovation and scientific progress.

Increasing the innovation capacity of higher education institutions requires the development of measures aimed at attracting alternative sources of funding for educational, research, and international activities, as well as finding ways to create innovative infrastructure (entrepreneurial units) in the university (technology parks, laboratories, business incubators, small business enterprises, centres, etc.).

In order to unlock the real innovative potential of higher education institutions in Kazakhstan, it is not enough to simply identify the problem. Rather, it is necessary to systematically eliminate the systemic constraints that hinder development. At the same time, it is essential to actively establish stable forms of interaction between universities, state bodies, and business communities.

Effective resolution of these issues is only possible if well-considered management approaches are implemented. These should be aimed at updating the internal structure of universities and strengthening their ties with the industrial sector. Such steps would not only raise the level of innovation in universities but also ensure the long-term sustainability and competitiveness of the entire higher education system in the country.

Creating an environment that fosters scientific progress requires the coordinated efforts of all participants, from ministries and universities to private companies, who are interested in the results of research and the implementation of developments. Drawing on international experience, a number of institutional mechanisms can be adopted to support the development of innovation capability in Kazakhstani universities, as illustrated in Figure 2.

Following global trends in higher education is very important for Kazakhstan. World higher educational trends focus on innovations in teaching, digitalization, interdisciplinary research, and internationalization of universities. The introduction of these approaches will allow national universities in Kazakhstan to improve the quality of educational programs and research activities, which will enhance the training of specialists for a competitive global market.

Global trends such as artificial intelligence, biotechnology, sustainable development, and quantum technologies are shaping the future of the world economy. The implementation of these trends in Kazakhstani universities promotes innovation, which can accelerate economic growth and improve the country's competitiveness. Thus, the implementation of the proposed measures will make it possible to increase the innovation activity of Kazakhstani universities, strengthen their influence on the country's economy, and integrate them into the international system of scientific developments. Further research can be aimed at assessing the effectiveness of the proposed strategies and developing models of university innovation management, taking into account national peculiarities**.** As foreign experience shows, the creation of new laboratories, techno parks, incubators, and innovation centers helps to increase the ability of universities to research and commercialize new ideas. Of course, this happens provided that their activities are properly organized and have an effectively created management system. Such infrastructure allows students, master's, and doctoral students to realize and promote their projects.

For the development of innovation activity in Kazakhstan, science-education-production should be in close contact with each other. Integration of science and education should be mandatory. As stated in the concept of development of higher education and science for 2023-2029, the main focus in the development of university science and innovation should be concentrated on three main directions: the creation of science, technology, and engineering parks; integration of universities and scientific organizations; and formation of endowment funds.

## 5. Conclusion

The study’s results provide actionable insights for policymakers and university administrators aiming to enhance the innovative capacity of Kazakhstani universities. By addressing the identified gaps in funding, faculty development, infrastructure, etc., these institutions can significantly improve their innovation capacities. The implementation of targeted strategies based on the study’s findings can help Kazakhstani universities better compete on the global stage and contribute more effectively to the country's economic and social development.

## 6. Limitations

A limitation of this study is that it only uses expert assessments, even when clear criteria and anonymous questionnaires are used, which implies the presence of subjective judgments. Personal experience, professional interests, or the expert's affiliation with a particular university may influence the scores given. To reduce this effect, measures were taken to standardize the interpretation of indicators and to check the consistency of assessments using the intraclass correlation coefficient. However, it is impossible to completely eliminate the subjective component. Nevertheless, the data obtained allows us to identify key trends and problem areas in the management of the innovative potential of national universities.

## 7. Recommendations

The study recommends further research on refining assessment methodologies and exploring additional factors that may influence university innovation. Overall, fostering a robust ecosystem that supports innovation in universities is crucial for driving sustainable development and achieving national and international competitiveness.

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