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Research article

Contemporary Issues in Enhancing the Innovation Capability of Universities in Kazakhstan

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Abstract. The article discusses the current problems and prospects for the development of the innovative capability of universities in the Republic of Kazakhstan. The need to develop the innovative capability of a higher education organization is associated with trends and challenges of the last decade related to education as a socially significant part of the national economy. Today, Kazakhstani universities require measures to become centers of innovation activity and a driving force for innovative development in the regional and national economies. The methodological basis of the article includes an expert survey method to identify barriers to increasing the innovation capability of universities. Experts from 11 national universities participated in the survey, which included the first heads of universities and heads of departments for the development of science and innovation. The results of the survey analysis showed that the largest number of respondents noted insufficient funding, limited collaboration with the industry, as well as bureaucratic obstacles. The materials of the article can be used for further development of measures to enhance innovation activity in higher education and increase its competitiveness.

Keywords: universities, innovation capability, innovation management, science, Kazakhstan.

Introduction

President of the Republic of Kazakhstan Kassym-Jomart Tokayev noted the importance of developing science and innovation to achieve economic progress in the country. He asserted that Kazakhstan should strive to be among the leading countries and not remain on the sidelines of scientific progress [1]. In the annual Global Innovation Index study, Kazakhstan ranked 78th out of 133 countries in terms of investment in research and scientific and technical development, introduction of innovative ideas, education costs, and infrastructure development in 2024,

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and 81st out of 132 participating countries in 2023. The best countries in this rating include Switzerland, Sweden, the USA, Singapore, the UK, South Korea, and Finland [2]. Unfortunately, Kazakhstan still lags behind the world leaders, which emphasizes the urgent need for further thoughtful and well-founded political reforms and concrete actions.

Innovation activity of higher education organizations of the Republic of Kazakhstan is of great strategic importance for the growth and development of the country. Orientation on innovations, mastery of modern sciences and technologies, as well as introduction of educational standards at the international level, will have a positive impact on the economic and socio-cultural growth of Kazakhstan. Thanks to this, universities improve the country's education system and increase the quality of new generation specialists, which, in turn, contributes to the innovative development of the national economy.

The largest universities in Kazakhstan are striving to become research universities in the foreseeable future. This requires the formation of new approaches, the main purpose of which is to improve the quality of educational activities, the development of science and technology. To achieve this goal, it is necessary to pay attention to the development of systemic, financial, and structural mechanisms. Therefore, the study of the issues raised within the framework of the theme under consideration is very important and relevant both theoretically and practically. The need to develop the innovation capability of higher education organizations is related to a number of trends and challenges of the last decade concerning education as a socially significant part of the national economy. An effective university innovation capability management process makes it possible to use university resources effectively and to generate innovation results with a high capability for commercialization using innovation stimulation tools.

In our works, we have previously published studies on theoretical aspects of innovation potential management, on analyzing innovation processes in universities, including the study of their missions and strategies, and other issues. This article is devoted to the identified problems on the topic under study, as well as to the future trends in higher education, in order to see in what direction to act in the future.

Purpose of the research. The aim of this paper is to identify the main problems of enhancing of innovation capability of universities in the Republic of Kazakhstan and to determine possible directions of their solution.

Literature review

One of the indicators reflecting the quality of innovation activity and the prospects of its development at future stages is innovation capability. The concept of 'innovation capability' has been actively developed since the late 70s of the twentieth century. To date, in the studies of foreign and domestic scientists, innovation capability' is considered as an object of research. The analysis of scientific literature has shown that at present, this concept, despite its importance both at the level of the enterprise and in the economy of the country, has not yet found a proper reflection in the scientific works of researchers.

Scientific and theoretical basis of the work are fundamental works of domestic and foreign scientists on theoretical and practical problems of formation, development and management of innovation capability of universities. These works are devoted to research on the management of innovation processes and the formation and use of innovation capability. The 'innovation

capability' representation of the economic model was introduced by K. Freeman to describe the process that ensures the growth of the system through innovation. According to Freeman, innovation is seen as a set of measures for the development, use, and exhaustion of production-economic and socio-organizational capability underlying innovation [3].

Thus, the genesis of theoretical concepts of innovation capability definition allowed us to formulate a number of authors' definitions, as well as to identify the main components of the organization's innovation capability. In this context, we define the innovation capability of a university as the ability to transform the components or resources (personal, educational, intellectual, and material-technical, financial) coordinated with each other, which can carry out effective activity in the conditions of an innovation environment. We believe that this approach to explaining the innovation capability of higher education institutions allows us to understand its economic essence more deeply and identify its main features.

With advances in technology and global knowledge and skill, the education sector is striving to upgrade itself by adding new technological, theoretical, and practical knowledge to the fields [4]. Government innovation policy can play a critical role in stimulating universities to develop these kinds of activities, and to encourage and reward participation by entrepreneurs in these activities [5].

Methodology

Within the framework of the research, general scientific methods such as analysis and synthesis were used. To identify barriers to innovation development, an expert survey of representatives of the academic community was conducted. The information base was publications in rating journals, works of domestic scientists, and data from the Ministry of Science and Higher Education of the Republic of Kazakhstan.

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

To identify the problems of managing the innovation capability of national HEIs, it is necessary to consider several aspects. These issues are related to various factors, including strategic planning, funding, infrastructure, motivation of academic staff, linkages with the productive sector, and the legislative and regulatory environment. As part of ensuring the objectivity of the study and exploring public opinion on the issues raised in this paper, the main aspects of the study were discussed in our expert survey.

The experts who participated in the study comprise specialists from national universities and individuals in managerial positions, i.e., they possess experience and competence in this field. The composition of experts was determined considering the degree of their awareness and participation in practical, analytical, or research work on university problems. The methodology for information collection was based on an expert survey, in which experts were allowed to select several suggested answers. The survey aims to assess seventeen obstacles faced by the university in conducting research and innovation activities (Table 1). These obstacles were assessed on a scale from 1 to 4 (where 1 is an insignificant obstacle, 4 is a significant obstacle).

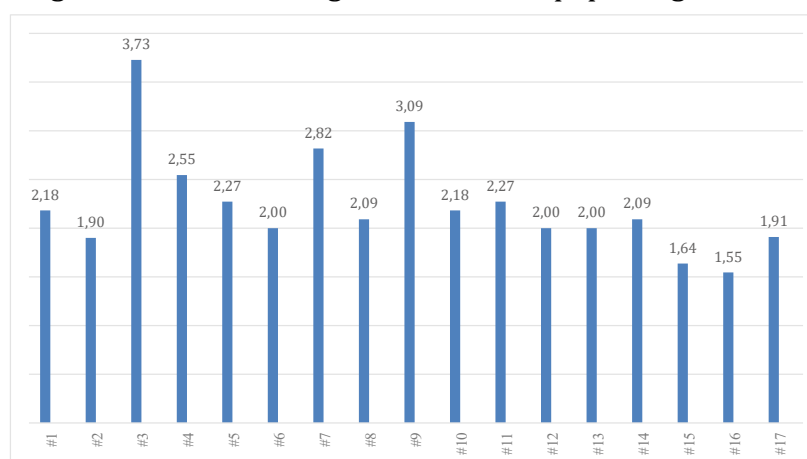
Table 1. The obstacles faced by the university in conducting research and innovation activities

| | | |
|---|---|---|
| #1. Bureaucracy | #7. Low level of English language skills of staff | #13. Weakness of mutual understanding in the process of co-operation |
| #2. Corruption | #8. Lack of subscription to scientific literature | #14. Inconsistency of university research with the needs of enterprises |
| #3. Low financial support | #9. Lack of demand from enterprises | #15. Issues of sharing copyrights for joint projects |
| #4. Weak scientific infrastructure of the university | #10. Lack of interest of the university staff | #16. Lack of legal grounds for the development of co-operation |
| #5. Low level of knowledge and skills of scientists | #11. Weak scientific and technical equipment of the university | #17. Inconsistency of approaches in terms of project realization and financing timeframes |
| #6. Lack of co-operation between scientists of Kazakhstan | #12. Different understanding of the results and process of co-operation | |

Note: developed by the authors [5]

Results and discussion

The results of the survey conducted among experts demonstrate both strengths and problematic areas in managing the innovation potential of universities. A detailed analysis of the data obtained is given in the following sections of the paper, Figure 1.

**Figure 1 The results of the obstacle detection survey**

Note: developed by the authors [5]

When sorting the barriers according to their average ratings, the most significant challenges identified were as follows: Low financial support-3.73, the importance of this barrier was noted by about 80% of respondents; in addition, lack of demand from enterprises-3.09, about 70%

of respondents. Obstacles like low level of English language skills of staff and weak scientific infrastructure of the university were also highlighted by experts as significant. The lowest barriers of importance are lack of legal grounds for the development of co-operation-1.55, at least 20% of respondents; as well as issues of copyright distribution-1.64, corruption-1.9.

Scientific and technological progress is an inextricable interconnection of fundamental research and innovative developments. Effective financing of science plays a crucial role in the formation of advanced technologies, ensuring sustainable economic growth and improving the quality of life of society.

Historical experience demonstrates that states investing in scientific research achieve significant success in technological and socio-economic development. Financial support makes it possible to implement large-scale projects in such areas as astronautics, artificial intelligence, biotechnology, and medical engineering. These areas require special attention as they have a high potential to transform key manufacturing and healthcare sectors. Let's look at the most important point in the barriers to the development of research and innovation in universities, according to experts.

Financing of scientific research from the republican budget accounts for the largest volume of programme-targeted funding by source, followed by grant funding. Table 2 shows that every year there is a significant increase in the volume of budget allocations, in accordance with which the number of competitions announced by the organization of departmental ministries also increases.

Table 2. Financing of scientific research, million tenge, 2019-2023

| Indicators | 2019 | 2020 | 2021 | 2022 | 2023 | Deviation (+/-) |
|--|--------|----------|----------|----------|-----------|-----------------|
| Total from the republican budget of which: | 36 929 | 49 711,8 | 64 542,5 | 67 014,7 | 144 050,6 | +77 035,9 |
| Basic | 5 122 | 5 317,5 | 5 715,1 | 5 711,1 | 8 236,7 | +2525,6 |
| Grant | 9 424 | 16 669,7 | 19 608 | 30 281,8 | 51 184,3 | +20 902,5 |
| Programme-targeted | 22 383 | 22 324,6 | 34 358 | 31 021,8 | 64 959,3 | +33 937,5 |
| Financing commercialization projects | no | 5 400 | 4 860 | 0 | 16 751,1 | +16751,1 |
| Share of domestic R&D expenditure in gross domestic product, % | 0,12 | 0,13 | 0,13 | 0,12 | 0,14 | 0,02 |

Note: Compiled based on data from the National Report on Science [6]

Nevertheless, the science intensity of GDP in 2023 in Kazakhstan was 0.14 per cent and, according to the UNESCO Institute for Statistics, it ranks among the last countries in the world by this indicator. Public funding plays a significant role in stimulating and supporting R&D. First, this is justified by the fact that the creation of new scientific knowledge requires significant investment, and there are very few guarantees of its commercialization and income generation.

This is what prevents the business sector from actively participating in R&D investments. They are reluctant to take risks, since for entrepreneurs, the only sources of income are funds obtained from their own activities.

These results confirm that the university has 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; weak link between education, science and production; 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, for which it is necessary to widely involve scientists of scientific laboratories of the Institute in the management of scientific work of doctoral and master's students, the work of dissertation councils. This will allow us to expand the application of the results of scientific research in the educational environment to improve educational programs, promote the development of research capability and increase the competitiveness of specialists. A research university should be an entrepreneur capable of ensuring its financial sustainability in the conditions of increased competition between universities.

Modern scientific infrastructure is necessary to improve the global competitiveness of domestic science. Outdated, uncompetitive scientific infrastructure and a low level of material and technical equipment of scientific organizations and universities hinder the development of domestic science. The lack of laboratories in high-tech and interdisciplinary areas has led to the fact that the results of domestic scientific research are not recognized in the global scientific space. This indicates their low quality and low productivity. In addition, due to the high cost of world-class equipment, budget funds for their acquisition are often limited. In addition, the main reasons for low labor productivity in agriculture include insufficient technical equipment, issues of implementation of the transfer of efficient agro-technologies, and their accessibility for small and medium-sized farms.

The lack of a metallurgy testing laboratory certified according to international standards in the industrial sector has a negative impact on exports and meeting the growing demand for steel. At the same time, the depreciation of the equipment of medical universities is 80 percent. In this regard, the issue of additional equipment of these laboratories is acute, and there is a need to establish such molecular genetic laboratories in other regional universities to conduct research at the place of material collection. To equip the laboratories, equipment is needed to conduct molecular genetic studies, as well as the creation of biobanks based on medical universities.

The quality of scientific research is affected by the lack of necessary tools, instruments and equipment, and physical and moral ageing of fixed assets. This is one of the problems of research infrastructure. Even though in 2020, organizations in this sector updated 13.5% of laboratory

equipment, this has never influenced the process of modernization of research infrastructure in all sectors. Such indicators of material and technical equipment of scientific organizations lead to the non-competitiveness of their research. There are no mega-grants where modern equipment and instruments for conducting major scientific research can be purchased.

To unlock the full innovation capability 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 necessary to develop strategic initiatives aimed at improving management in universities, as well as establishing their 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. To develop the innovation capability of Kazakhstani universities, using international models, the following mechanisms can be introduced, as shown in Figure 2:



Figure 2 Mechanisms for increasing the innovative potential of the university

Note: Compiled based on data from the National Report on Science [6]

Following global trends in higher education is very important for Kazakhstan. Worldwide higher education 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 improve 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. 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.

Conclusion

This study analyses the problems and prospects for the development of the innovation capability of universities in the Republic of Kazakhstan. The analysis of the national universities of the Republic of Kazakhstan has shown that the level of their innovation potential remains insufficient for successful integration into the global educational and scientific ecosystem. Among the identified problems are: limited funding for innovation projects; weak links between universities and the real sector of the economy; insufficient motivation of employees and students to develop and implement innovations; lack of international partnerships and low activity of publications in leading scientific journals. Implementation of the proposed approaches will increase the level of competitiveness of Kazakhstani universities in the international educational and scientific environment; stimulate the development of education economy and introduction of innovations in key sectors of the country's economy; attract additional investment in educational and research activities. The application of the developed proposals will be useful both for universities seeking to strengthen their positions in global rankings and for government agencies engaged in reforming the education system.

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Conflict of interest: The authors declare no conflict of interest.

Authors' contribution. A.Abaidilda – conducting a survey, interpretation of results, data collection, and processing. Sh.Sh. Turmakhanbetova – preparation of conclusions and final provisions.

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Қазақстан университеттерінің инновациялық әлеуетін дамытудың заманауи мәселелері

Аңдатпа. Осы мақалада Қазақстан Республикасы университеттерінің инновациялық әлеуетін дамытудың өзекті мәселелері мен перспективалары қарастырылады. Жоғары білім беру ұйымының инновациялық әлеуетін дамыту қажеттілігі ұлттық экономиканың әлеуметтік маңызды бөлігі ретінде білім берумен байланысты соңғы онжылдықтағы бірқатар тенденциялар мен сын-қатерлермен байланысты. Бүгінгі таңда қазақстандық университеттерге инновациялық белсенділік орталықтары мен өңірлік және қазақстандық экономикадағы инновациялық дамудың қозғаушы күші болу үшін бірқатар шараларды іске асыру қажет. Мақаланың әдіснамалық негізі университеттердің инновациялық әлеуетін арттыру жолындағы кедергілерді анықтау мақсатында сараптамалық сауалнама әдісі болып табылады. Сауалнамаға он бір ұлттық университеттің сарапшылары, соның ішінде университеттердің бірінші басшылары және ғылым мен инновацияны дамыту департаменттерінің басшылары қатысты. Сауалнама нәтижелері бойынша респонденттердің ең көп саны қаржыландырудың жеткіліксіздігін, индустриямен шектеулі ынтымақтастықты, бизнес тарапынан инновацияға сұраныстың болмауы, сондай-ақ жоғары білім беру ұйымының инновациялық инфрақұрылымының төмен деңгейі сияқты кедергілерді атап өткені анықталды. Әрине, ғылым мен инновацияны қаржыландыру кез-келген университетте дамудың негізгі жылжытушы күші болып табылады. Осы және басқа да көрсетілген кедергілерді жою жоғары білім беру ұйымдарының инновациялық дамуына оң әсер етеді. Мақала материалдары жоғары білім беру ұйымдарының инновациялық қызметті жандандыру және оның бәсекеге қабілеттілігін арттыру жөніндегі шараларды одан әрі әзірлеу үшін пайдаланылуы мүмкін.

Түйін сөздер: университеттер, инновациялық әлеует, инновациялық менеджмент, ғылым, Қазақстан.

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Современные проблемы развития инновационного потенциала университетов Казахстана

Аннотация. В данной статье рассматриваются актуальные проблемы и перспективы развития инновационного потенциала университетов Республики Казахстан. Необходимость развития инновационного потенциала организации высшего образования связана с рядом тенденций и вызовов последнего десятилетия, связанных с образованием как социально значимой частью национальной экономики. Сегодня казахстанским университетам необходимо реализовать ряд мер, чтобы стать центрами инновационной активности и движущей силой инновационного развития в региональной и казахстанской экономике. Методологической основой статьи является метод экспертного опроса с целью выявления барьеров на пути повышения инновационного потенциала вузов. В опросе приняли участие эксперты одиннадцати национальных университетов, в том числе первые руководители университетов и руководители департаментов развития науки и инноваций. По результатам опроса установлено, что наибольшее количество респондентов отметили такие барьеры, как недостаточное финансирование, ограниченное сотрудничество с индустрией, отсутствие спроса на инновации со стороны бизнеса, а также низкий уровень инновационной инфраструктуры организации высшего образования. Конечно, финансирование науки и инноваций является основной движущей силой развития в любом университете. Устранение этих и других указанных барьеров положительно скажется на инновационном развитии организаций высшего образования. Материалы статьи могут быть использованы для дальнейшей разработки мероприятий по активизации инновационной деятельности и повышению ее конкурентоспособности организаций высшего образования.

Ключевые слова: университеты, инновационный потенциал, инновационный менеджмент, наука, Казахстан.

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