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ANALYSIS OF THE CURRENT STATE OF SCIENCE IN KAZAKHSTAN AND ITS IMPACT ON THE NATIONAL ECONOMY

Abstract. Science is considered worldwide as a driving force for the development of the economy and society as a whole. In recent years, the Government of Kazakhstan has been giving particular importance to the issues of development of domestic science in order to increase its contribution to solving economic problems. This research aims to analyze the current situation in the field of science in Kazakhstan and the impact of its development on the national economy. Also this research will attempt to prepare recommendations to improve the present state of the domestic science. The following general methods were used in the research: generalization, concretization, comparison, analysis, systematization.

The results of this study showed that in Kazakhstan there is a number of problems in the field of science that have not been solved for several decades. It should be noted that they are related not only with a low level of financing, but also with the lack of an effective national innovation system, in which there is a close interaction between all its elements.

The development of domestic science in Kazakhstan is considered as one of the priorities of strengthening the national economy. Despite the ongoing reforms and measures taken by the Government, there is no close interaction between the scientific sphere and the branches of the country's economy, and the developments of scientific activity are not used to solve economic problems, and as a result, science does not make a significant contribution to the economic growth and competitiveness of the country.

Key words: science, technology and innovation (STI); research and development (R&D); national innovation system (NIS); financing of science; economic growth; competitiveness of the national economy.

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ҚАЗАҚСТАНДАҒЫ ҒЫЛЫМНЫҢ ҚАЗІРГІ ЖАҒДАЙЫН ЖӘНЕ ОНЫҢ ҰЛТТЫҚ ЭКОНОМИКАҒА ӘСЕРІН ТАЛДАУ

Аннотация. Ғылым бүкіл әлемде экономика мен жалпы қоғам дамуының қозғаушы күші ретінде қарастырылады. Соңғы жылдары Қазақстан Үкіметі Отандық ғылымды дамыту мәселелеріне айрықша мән беріп келеді. Ондағы мақсат – экономикалық проблемаларды шешудегі отандық ғылымның үлесін ұлғайту. Бұл зерттеу Қазақстандағы ғылым саласының қазіргі жағдайын және оның дамуының ұлттық экономикаға әсерін талдауға бағытталған. Сондай-ақ, бұл зерттеуде отандық ғылымның дамуындағы ағымдағы жағдайды жақсарту бойынша ұсыныстар әзірлеуге әрекет жасалады. Зерттеуде келесі жалпы ғылыми әдістер қолданылды: жалпылау, нақтылау, салыстыру, талдау, жүйелеу.

Осы зерттеу нәтижелері Қазақстанда бірнеше онжылдықтар бойы шешілмей келе жатқан ғылым саласында бірқатар проблемалар бар екенін көрсетті. Олар ғылым саласын қаржыландырудың төмен деңгейімен ғана емес, сонымен бірге, барлық элементтері арасында өзара тығыз байланыс орнаған тиімді ұлттық инновациялық жүйенің болмауымен де байланысты екенін атап өту маңызды. Қазақстанда Отандық ғылымды дамыту ұлттық экономиканы нығайтудың басымдықтарының бірі ретінде айқындалған. Алайда, жүргізіліп жатқан реформалар мен Үкімет тарапынан қабылданып жатқан шараларға қарамастан, елдегі ғылым саласы мен экономика салалары арасында өзара тығыз байланыс орнатылмаған, ал отандық ғылыми әзірлемелер экономикадағы өзекті проблемаларды шешуде қолданылмайды, осының нәтижесінде экономикалық өсу мен мемлекеттің бәсекеге қабілеттілігін арттыруда Отандық ғылым айтарлықтай үлес қоса алмауда.

Түйін сөздер: ғылым, технологиялар және инновациялар (ҒТИ); зерттеулер мен әзірлемелер; ұлттық инновациялық жүйе (ҰИЖ); ғылымды қаржыландыру; экономикалық өсу; ұлттық экономиканың бәсекеге қабілеттілігі.

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АНАЛИЗ СОВРЕМЕННОГО СОСТОЯНИЯ НАУКИ В КАЗАХСТАНЕ И ЕЕ ВЛИЯНИЕ НА НАЦИОНАЛЬНУЮ ЭКОНОМИКУ

Аннотация. Наука во всем мире рассматривается как движущая сила развития экономики и общества в целом. В последние годы Правительство Казахстана придает особое значение вопросам развития отечественной науки с целью увеличения ее вклада в решение экономических проблем. Данное исследование направлено на анализ современного состояния сферы науки в Казахстане и влияния ее развития на национальную экономику. Также в этом исследовании будет предпринята попытка подготовить рекомендации по улучшению текущей ситуации в развитии отечественной науки. В исследовании применялись следущие общенаучные методы: обобщение, конкретизация, сравнение, анализ, систематизация.

Результаты этого исследования показали, что в Казахстане существует ряд проблем в сфере науки, которые не решаются уже несколько десятилетий. Следует отметить, что они связаны не только с низким уровнем финансирования, но и отсутствием эффективной национальной инновационной системы, в которой существует тесное взаимодействие между всеми ее элементами.

Развитие отечественной науки в Казахстане рассматривается как один из приоритетов укрепления национальной экономики. Несмотря на проводимые реформы и меры, принимаемые Правительством, отсутствует тесное взаимодействие между научной сферой и отраслями экономики страны, а разработки научной деятельности не применяются для решения экономических проблем, и в результате наука не вносит существенного вклада в экономический рост и конкурентоспособность страны.

Ключевые слова: сфера науки, технологий и инноваций (НТИ); исследования и разработки; национальная инновационная система (НИС); финансирование науки; экономический рост; конкурентоспособность национальной экономики.

Introduction. The modern world presents new challenges and countries of the world have to find new ways of development. Companies, industries and countries operate in a continually changing environment and new risks, uncertainties and other factors emerge continually. The Global Risks Report, published by the World Economic Forum (WEF), every year examines risks across five categories: economic, environmental, geopolitical, societal, and technological. In the Report a global risk is defined as the possibility of the occurrence of a condition or an event that, if it occurs,

could lead to significant negative impact for several countries or industries. It is worth to note, that COVID-19 and its economic and societal consequences continue to pose a critical threat to the world. The Global Risks Report 2022 states that by 2024 the global economy is projected to be 2.3% smaller that it would have been without the pandemic. Commodity prices could remain volatile because of growing tensions between Europe and Russia, China's energy shortage and continued supply chain disruptions. These pandemic-related disruptions in supply chains combined with resurgent consumer demand, as well as higher commodity prices have led to acceleration of inflation. This in turn can increase risks from central bank interest rate rises (WEF, 2022).

In Kazakhstan, alike in other economies of the world, higher prices and more expensive debt have impact on individuals as well as small and medium enterprises, suffering from weakening consumption. Additionally, geopolitical tensions are currently identified as a critical medium- and long-term threat to the world. Moreover, the recent January events in the country encourage Kazakhstan to prioritize effective measures to restore economic growth. At this turbulent time for the global economy, as well as for the national economy, internal and external challenges serve as a call for Kazakhstan to rethink and redesign its economic system towards being more innovative and more competitive.

The 2020 special edition of another report published by the WEF – the Global Competitiveness Report is dedicated to the measures taken by different countries on the road to recovery from the impact of the pandemic on their economy. According to this report, the key features of competitiveness that enhanced countries' responses to the pandemic are:

1. Economic digitalization and digital skills. Countries that could continue running significant segments of their economy remotely were better placed to go through the pandemic than those who could not.

2. Safety nets and financial soundness. Countries that could support companies with either direct subsidies or credit could prevent excessive bankruptcies and job losses.

3. Governance and planning. Countries that could better plan and coordinate health measures with fiscal and social policies have been relatively more successful in mitigating the effects of the crisis.

4. Health system and research capacity. Countries with greater biotechnology capacity and established national and international collaborations between universities and companies have been able to develop solutions to the current crisis, and are better placed to cope with future pandemics.

Taking into account the fact that the Global Competitiveness Index (GCI) of the WEF demonstrates the degree of efficiency in the use available resources by the country, in the case of Kazakhstan, it is possible to explain that it was relatively less prepared, and consequently, demonstrated relatively unsuccessful performance than other advanced economies. Among above-presented features the first and fourth indicators are closely related to the scientific and technological development of the country.

Unfortunately, Kazakhstan is among the countries that lag behind the developed countries of the world in terms of innovative development and overall competitiveness. Over the recent 30 years of independence, undoubtedly, a number of programs and laws in the field of science have been adopted, but domestic science has not yet demonstrated an impressive contribution to the development of the national economy. President of the Republic of Kazakhstan Kassym-Zhomart Tokayev in his state of the Nation Address dated 01.09.2021 noted that the most important priority is the development of science, and an urgent task is not just kept up with new trends, but to be one step ahead and generate trends. In the Nation Address by the President dated 01.09.2020 it was highlighted that the country needs a separate program document on the scientific and technological development, and moreover, its primary task should be to attract science to solving problems at national level. Until current days, the goals and objectives of the development of the sphere of domestic science have been reflected in the development programs of education and science of the Republic of Kazakhstan. One of the most recent and perhaps the most important changes in the field of science occurred quite recently – on June 11, 2022. The President divided the Ministry of Education and Science into two authorities: The Ministry of Education and the Ministry of Science and Higher Education. The scope of activity of the first includes issues of pre-school, secondary, technical and professional education, post-secondary education, additional education, and protection of children's rights; the second authority will deal with issues in the field of higher and postgraduate education, science, and language policy, respectively (Kursiv.media, 2022).

This decision was made for better coordination of scientific activities. Therefore, the analysis of the current state of domestic science and the assessment of development prospects for the near future are becoming more relevant. Within the framework of this study the author makes an attempt to conduct a comprehensive analysis of the features of the development of science in Kazakhstan and elaborate on the practical recommendations for improvement of the current situation.

Research Material and methods. Global threats and risks affect the economy and GDP of different countries in different ways, so economic recovery and development occurs in different ways. The innovative commitment of a country or firm plays a major role in ensuring economic stability and growth at both the micro and macro levels. Nurbatsin and Kireyeva (2020) investigated the determinants of innovation for firms in Kazakhstan, and found that foreign participation, the size of the firm, and the age of the firm have a significant impact on innovation activity. These authors argue that most commercial firms in less developed countries, such as Kazakhstan, are small and medium-sized and very often face various difficulties, including limited human and financial capabilities, weak infrastructure base and unfavorable government policies. The key findings of their research are that any government policy aimed at stimulating the innovative behavior of firms should take into account microenterprises, small and medium-sized firms, as well as manufacturing firms, especially those engaged in the textile and machine-building industries, since they are the main sources of innovation.

Many recent studies have argued that innovation is becoming extremely important for the successful recovery and sustainable development of the economy. Kozubayev (2019) states that an active state innovation policy contributes the sustainable development of economy. His research indicates the creation of a national innovation system (NIS) as a crucial condition for building an innovative economy. The structure of a NIS is given in the figure below:

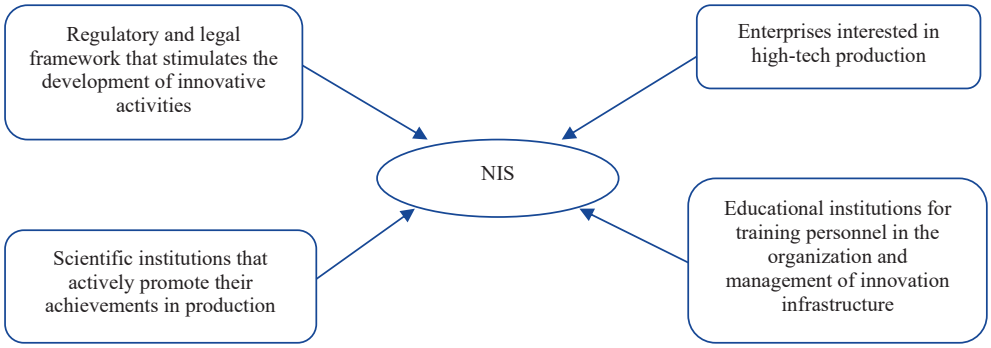

Figure 1. The structure of a NIS
Note – Compiled by the author based on source (Kozubayev, 2019)

According to Kozubayev (2019), this network of institutions in the public and private sectors is assumed to ensure the use and promotion, dissemination of new technologies across the country through close interaction. It is reasonable to state that the formation of NIS occurs specifically for each country and this process is determined by the existing social and economic situation in particular country.

Sener and Delican (2019) investigate the causal relationship between foreign trade, technological development and competitiveness. For the analysis they use a set of variables, including exports, the ICT development index, global innovation index and global competitiveness index, for selected developed and developing countries for the period 2007-2017. Their findings indicate that developed countries do not need to look for new markets to export to and that they can focus on high and technological production. Because developed countries have a high share of high technological products in foreign trade. In developing countries, export goods mostly consist of low and medium technology products and agricultural products, and the competitiveness of these product groups is low. These authors conclude that by supporting collaboration between government, industry and universities countries will have an opportunity and capacity to maintain and develop their levels of competition and innovation.

Several studies have explored the university-industry partnerships in Kazakhstan. One study found that top-down management approach of the higher education system, a poor research environment and difficult working conditions for university faculties are obstacles to these kinds of collaborations (Jonbekova et al., 2020). Similarly, Kenzhaliyev et al. (2021) claim that in Kazakhstan initiatives to support innovation

and R&D come strictly from the top management, and ultimately, the opinion of scientists, innovators and various participants involved in innovation activities is rarely taken into account.

At the same time, other domestic authors conducted a SWOT-analysis of the scientific and innovative system in Kazakhstan (Mussayeva et al., 2021; Nurgaliyeva et al., 2021), and highlighted lack of interactive links between research institutes and commercial organizations, low demand for new knowledge and research results from business structures, insufficient supply of skilled labor, low quality of research, as well as lack of funding of scientific and technical activities as weaknesses.

Apart from these studies, there are a number of foreign and domestic studies which predominantly focus on innovation financing issues. The study conducted by Fonseca et al. (2018) emphasizes that the science, technology and innovation (STI) will remain among the main driving forces of economic and social development, and states that financing STI has grown in importance and complexity over last decades. Authors in their paper focus on the different instruments and incentives governments may use to improve the financing of innovation.

To make an analysis of the current state of the field of STI in Kazakhstan, to identify development prospects for the near future and to formulate recommendations regarding creating and developing effective NIS, general scientific methods will be used in this paper. Methods of this study include generalization and concretization, comparison, analysis, systematization.

The opinions of experts and specialists engaged in the field of science were taken as the basis for the preparation of recommendations for improving the NIS.

Result and discussion. In the first Constitution of the Republic of Kazakhstan (adopted on January 28, 1993) the priority directions for development were the following spheres: education, science and culture. For comparison, in the current Constitution of Kazakhstan (updated on June 2022), economic development for the benefit of the whole people is one of the fundamental principles of the country's activity. In the book by the Head of Committee on development of science and people education in the Republic of Kazakhstan during 1990-1993, Doctor of Economical science – O. Sabden, the state, legislative support, state policy and the main directions of the development of science for the first years of independence were highlighted. The table below shows the total number of scientific workers for the first years of independence of Kazakhstan and for the current 2022.

Table 1. Total number of scientific workers in Kazakhstan in 1994 and 2022

	At the beginning of 1994	April 2022
The total number of scientific, scientific and pedagogical workers and specialists engaged in scientific work /	around 40 000	22 655
Note – Compiled by the author based on sources (Sabden, 2011; periodicals)		

As can be seen from table 1, about 40 000 people were engaged in scientific activity in Kazakhstan at the beginning of 1994. Whereas in 2022, this figure is

22 655 people. This means that over the 30 years of the country's independence the number of scientific personnel has fallen by almost half. Based on the review of academic literature and business periodicals, it can be assumed that this situation may be associated with a decrease of the attractiveness of a career in the scientific field, a low salary of scientific personnel, a lack of stimulation of scientific work, as well as a low level of material and technical security of scientific institutions. The fact that the beginning of the 2000s is characterized by a sharp reduction of personnel in the sphere of science in the Eurasian economic union member states (including Kazakhstan), is also reported in the study of authors from Kyrgyzstan (Zholdubayeva et al., 2019). They provide data on the number of staff of research organizations for the period from 2013 to 2017. In the table 2 data for Kazakhstan is given.

Table 2. Number of personnel in Kazakhstan engaged in scientific research and development during 2013-2017 (thousand people)

2013	2014	2015	2016	2017
23.7	25.8	24.7	23.0	22.1

Source: Zholdubayeva et al., 2019

It is important to note, that until June of the current 2022, the Ministry of Education and Science (MES) provided guidance in the field of science. And according to open access internet sources and data provided by Forbes.kz, beginning from 1992 till 2022 there were 13 Ministers of this authority. It can be assumed that the frequent change of the heads of this Ministry may be one of the reasons that the reforms were carried out on a regular basis and the target indicators, specifically in the field of science, were also constantly changing, and therefore there was a lack of proper control over their achievement. If the average term for being Minister of Education and Science was 2-3 years, then it is quite understandable that it is not a sufficient time to set a sequence of priorities in the development of science and achieve practical results. By the way, the problem of the fast-changing Ministers of Education is also mentioned in the study by Jonbekova et al. (2020) as one of the constraints to develop robust university-industry partnerships that contribute to innovation and economic growth.

On June 11, 2022 the President reorganized the Ministry of Education and Science by dividing it into the Ministry of Education and the Ministry of Science and Higher Education. Meanwhile Askhat Aimagambetov became the Minister of Education, and Sayasat Nurbek became the new Minister of Science and Higher Education. After being appointed to this position, the Minister of Science and Higher Education, in one of his interviews with journalists, noted that the purpose of the new authority is to develop science in the country and increase the contribution of domestic science to the growth of the national economy. This means that the current year 2022 is a transitional period for Kazakh science, which at the same time poses a challenge, since it is crucial to assess the results of the measures taken to develop domestic science over 30 years of the country's independence, as well as poses an

opportunity to identify new goals and objectives, new directions, to set priorities in the development and strengthening of the field of science, so that the results of the activities of domestic scientists and researchers can be applied in solving economic problems at the national level. Actually, this article attempts to make considerable contribution to this topic.

As already revealed, today there is a decrease in the number of scientific personnel, due to the low attractiveness of work in this field. In addition to this problem, there are difficulties with financial support for science. This is evidenced by the statistics on the amount of funding for science, presented in the National Report on Science (2021). According to the National Report, in 2020, R&D spending in Kazakhstan amounted to 0.13% of GDP. To evaluate a country's commitment to R&D, it is worth looking at spending as a percentage of GDP. Gross domestic expenditures on R&D, expressed as a percent of GDP include both capital and current expenditures in the four main sectors: business enterprise, Government, higher education and private non-profit (UNESCO Institute for Statistics, 2022). Figure 2 below presents R&D expenditure as a percentage of GDP in Kazakhstan over the past 25 years from 1997 to 2021.

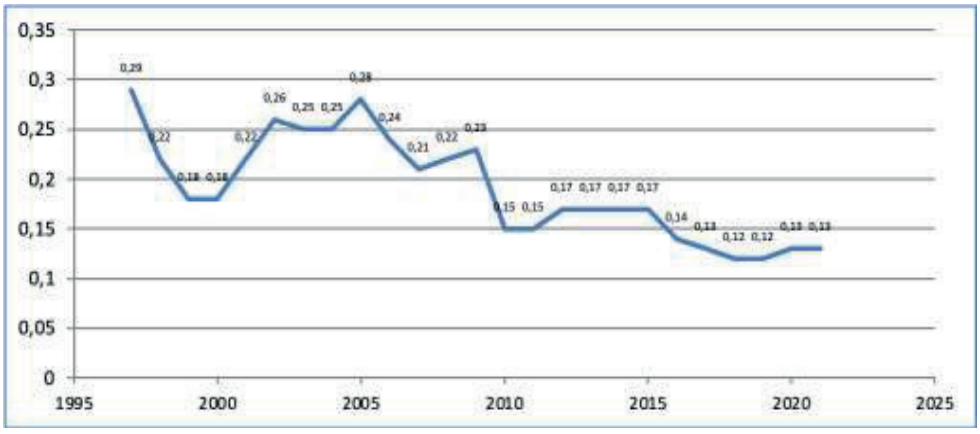

Figure 2. Research and development expenditure (% of GDP) in Kazakhstan in 1997-2021
Source: UNESCO Institute for Statistics

The data presented by the UNESCO Institute for Statistics (UIS) showed that the highest value of R&D expenditure in Kazakhstan over the past 25 years was 0.29 in 1997, while the lowest value was 0.12 in 2018 and 2019. The average value during 1997 to 2021 is 0.19%. There is a clear reduction in science funding in recent times – particularly the last 10-12 years. The UIS maintains that expenditure on R&D is a key indicator of government and private sector efforts to obtain competitive advantage in science and technology. And furthermore, the National Report on Science (2020) emphasizes that the recommended by the International Academic Council the share of spending on science even for developing countries account for 1-1.5% of GDP.

As reported by the UIS, studies have found that every dollar invested in R&D

generates nearly two dollars in return. Global spending on R&D has reached a record high of almost US$ 1.7 trillion. About 10 countries of the world account for 80% of spending. World's top 10 leaders in R&D investment as of 2018 were: the United States, China, Japan, Germany, Korea, India, France, United Kingdom, Brazil and Russian Federation (Global Investments in R&D, 2020).

In the another UNESCO study – UNESCO Science Report (2021) it is observed that between 2014 and 2018 global research spending rose by 19.2%, outpacing the growth of the global economy (+14.8%): almost half (44%) of this rise was driven by China alone, the second-biggest contribution came from the USA (19.4%), followed by the EU (11.0%), also the Republic of Korea (4.7%) and India (3.8%) also made sizeable contributions to growth in global research expenditure.

This latest Report (2021) declares that, eight out of ten countries still devote less than 1% of GDP to research, and they remain largely recipients of foreign scientific expertise and technology. Unfortunately, Kazakhstan is among these 80% of the world's countries. As claimed in this Report, investment in research has kept dropping in Kazakhstan, despite the government's plans to raise research intensity. As a consequence, the low level of funding of science leads to low salaries of workers of this field and to a weak or even lack of the necessary scientific infrastructure for conducting research and their implementation in practice. It is absolutely clear that due to the lack of a system of motivation and stimulation of the work of scientists, Kazakhstan is facing an outflow of skilled personnel.

It is important to note that among competitiveness criteria of the World Competitiveness Ranking used by the International Institute for Management Development (IMD) there are technological infrastructure and scientific infrastructure which are included in the category called Infrastructure (World Competitiveness Ranking, 2022). The data published by the IMD explores multiple factors that affect the prosperity of different economies. Technological infrastructure itself contains 17 components and scientific infrastructure – 22 components, respectively. These components are shown in the Table 3.

Table 3. Components of the technological and scientific infrastructure proposed by IMD

Technological Infrastructure	Scientific Infrastructure
Investment in Telecommunications	Total expenditure on R&D ($)
Mobile Broadband subscribers	Total expenditure on R&D (%)
Mobile Telephone costs	Total expenditure on R&D per capita ($)
Communication technology	Business expenditure on R&D ($)
Secure internet servers	Business expenditure on R&D (%)
Internet users	Total R&D personnel
Broadband subscribers	Total R&D personnel per capita
Internet bandwidth speed	Total R&D personnel in business enterprise
Digital/Technological skills	Total R&D personnel in business per capita
Qualified engineers	Researchers in R&D per capita
Public-private partnerships	Graduates in Sciences
Development & application of tech.	Scientific articles

Funding for technological development	Nobel prizes
High-tech exports ($)	Nobel prizes per capita
High-tech exports (%)	Patent applications
ICT service exports	Patent application per capita
Cyber security	Patent grants
	Number of patents in force
	Medium- and high-tech value added
	Scientific research legislation
	Intellectual property rights
	Knowledge transfer

Note – Compiled by the author according to the IMD

According to the IMD, Kazakhstan has demonstrated the following overall performance over the last two years: 35th rank in 2021 and 43rd – in 2022 out of 63 countries covered by the ranking. Ranking change was (-8).

Additionally, one of the 12 pillars of the Global Competitiveness Index developed by the WEF is called Innovation capability, and it has 10 components. Detailed information is given in the Table 4.

Table 4. Components of the 12th pillar: Innovation capability, proposed by the WEF

12th pillar: Innovation capability	
Interaction and diversity	
12.01	Diversity of workforce
12.02	State of cluster development
12.03	International co-inventions
12.04	Multi-stakeholder collaboration
Research and development	
12.05	Scientific publications
12.06	Patent applications
12.07	R&D expenditures (% GDP)
12.08	Research institutions prominence
Commercialization	
12.09	Buyer sophistication
12.10	Trademark applications

Note – Compiled by the author according to the WEF

According to the data from WEF, Kazakhstan was 55th out of 141 economies in 2019, and rank by R&D expenditures was 101/141, in particular.

In both ratings the economies are ranked from the most to the least competitive. It should be emphasized that there is a long-term trend – the countries on the top of the rankings usually succeed in technological development, and have a unique approach to maintaining competitiveness. For instance, in the IMD World Competitiveness Ranking (2022), the leading countries are: Denmark, Switzerland, Singapore, Sweden, Hong Kong SAR, Netherlands, Taiwan (China), Finland, Norway and the

USA. In the Global Competitiveness Report (2019) by the WEF, top 10 economies were: Singapore, the USA, Hong Kong SAR, Netherlands, Switzerland, Japan, Germany, Sweden, the United Kingdom and Denmark.

It is interesting to note that among the components of Technological Infrastructure (see Table 3) there are high-tech exports. Therefore, it will be interesting to look at the structure of exports and imports in Kazakhstan. In a newspaper article entitled "How much Kazakhstan depends on imports", the ratio of exports and imports is considered in three main blocks: resources (mineral raw materials), food and non-food products. According to the data of the National Bureau of Statistics used in this newspaper (Kursiv, 2022), mineral raw materials, such as oil, petroleum products, and natural gas are sold abroad. In the food block, the domestic market does not depend on foreign suppliers for only few types of products, and as a rule, these are primary processed goods: meat, milk, flour, cereals, salt, eggs, and bakery products. However, these goods have considerably risen in price during and after the pandemic. But in the processing industry, the situation is completely different. As stated in the article, the growth of imports over the past two years confirms the fact that this sphere of processing is less developed in the country. Most notably, this year the situation with sugar has become critical, sugar is very expensive or it is not available at all. The figures show that sugar production at local enterprises has been declining for the past five years. In 2021, domestic producers provided the domestic market by only 42%.

As for non-food products, only one out of nineteen items presented can be attributed to import-independent, this is cement (92% - own production). Producers of such goods as fertilizers (99%), and construction metal structures (87%) almost cover domestic demand. The remaining non-food products – products of the light, automotive, pharmaceutical, and woodworking industries – are not produced in sufficient quantities on the territory of Kazakhstan, and some are not manufactured at all. The latter include household appliances, vitamins. The minimum shares in the domestic market are provided by local producers of outwear (1%), shoes (3%), detergents (7%), perfume and cosmetics (8%).

The above statistics suggest that the share of high-tech exports in Kazakhstan is very small part of all exports, and it is clear that it cannot compete with imports. So, these types of products are considered almost completely import-dependent.

Based on the analysis of the current situation, it is possible to present a SWOT-analysis of the field of science in Kazakhstan.

Table 5. SWOT-analysis of the field of science in Kazakhstan

Strengths	Weaknesses
- Availability of raw materials and mineral resources; - Growing attention on the field of science from the government; - The potential of youth	- Reduction of scientific personnel; - Low level of financing; - Low attractiveness of a career in science (lack of system of motivation and stimulation of scientific personnel); - Insufficient scientific infrastructure

Opportunities	Threats
- Formation and development of collaboration between universities and enterprises; - Development of own production and reduction of import dependence; - Increasing the attractiveness of a career in science	- Long-term dependence on foreign technologies and expertise; - Continuing outflow of scientific personnel; - Import dependence; - Lack of high-tech industries; - Lack of food security

Note – Compiled by the author

Experts and representatives of the field of science share their opinions and suggest ways to solve existing problems that have been hindering the qualitative development of domestic science for many years. The following table shows some of them.

Table 6. Opinions and suggestions of experts in the field of science regarding the development of domestic science

	Who?	What problem does he/she highlight?	What does he/she offer to solve the problem?
1	Nurlan Serekpayev, "Research and production centre for grain farming named after A.I.Barayev" LLP Chairman of the Board	1) Outflow of qualified personnel, especially young scientists in agricultural science; 2) Lack of a motivation system for university teachers (in foreign countries they belong to the category of particularly high-paid workers);	1) To develop s state program to support young agricultural scientists; 2) To relieve scientists from paperwork and give them the opportunity to engage in innovation, implementation, promotion of their product and technology;
2	Timur Savin, Candidate of Biological Sciences, Director of the Department if Science of NJSC Kazakh Agro Technical University named after S.Seifullin	3) Lack of a system of constant interaction with farmers, often scientific programs and projects are formed on the basis of proposals from research organizations, that is, based on the capabilities of scientists, and not on the needs of the agro-industrial sector; 4) Depreciation and obsolescence of buildings of research institutes and agricultural machinery, as well as laboratory equipment;	3) To support not only large farms, but also to provide conditions for small farms so that they can cooperate with the country's scientists in the creation and use of new agricultural technologies; 4) To increase funding of science, and control over the use of funds;
3	Farhad Dnishev, Doctor of Economics, Professor of the Committee of Science of the Ministry of Education and Science	5) Intermediate type of innovation system, which is characterized by fragmentation, point character, disproportions and imbalance of individual elements, underdevelopment of links between them, lack of focus on new types of innovations;	5) To strengthen horizontal interactions between science, business and the state;
4	Leila Aubakirova, General manager of the Republican state enterprise "Gylym Ordasy" of the Committee of Science of the Ministry of Education and Science	6) Lack or weak integration of science with education and production: research institutes are the main form of organization of science; they are separate from universities and industrial enterprises.	6) To diversify the forms and mechanisms of integration (scientific and educational centers; engineering and technological centers; educational, scientific and production complexes; joint departments at universities, laboratories).

Note – Compiled by the author based on periodicals

As we can see, representatives of the field of science describe the main problems and they coincide with the difficulties that are covered in both academic and business publications. It is clear that the formation of an integral NIS is a long-term task. Hence it is advisable to change the approach to its formation, taking into account the opinions and recommendations of participants of this field of activity.

Conclusions. The results of this study allow making the following conclusions. Firstly, there is a range of problems in the field of science in Kazakhstan that have been hindering the development of domestic science for a long time. Consequently, science cannot become a driver of the national economy. These problems include very low level of financing science and limited funding sources, mainly the state budget; the subsequent problems are primarily related to low funding: deterioration of buildings, machinery, laboratory equipment; unattractiveness of a career in this field; outflow of qualified personnel – lack of scientific personnel. It is also important to emphasize that among the existing difficulties there are a low share of the introduction of developments made by domestic scientists into the production – into the practice, and a weak collaboration between representatives of education, science and production.

Secondly, the situation is aggravated by the instability of the world economy and the current geopolitical climate. The issues of food security, reducing dependence on imports not only from food, but also from non-food products, as well as the unacceptability of attracting foreign scientists and developments on a permanent and long-term basis confirm the need for the development of domestic science for the benefit of the national economy.

Thirdly, both academic and business literature states that the more a country is developed in the field of science and technology, the more clearly there is an improvement in the quality of life of the population. In this regard, it is proposed to gradually increase funding for science by introducing new combined financial support mechanisms with the involvement of the private sector. Moreover, it is necessary to take into account the opinions and suggestions of experts involved in the domestic science in the formation of a NIS, and development of motivation programs for young scientists of the country. It is critically important to understand the relevance of the integration of science with education and production, and create conditions for the formation and successful development of such collaborations. When such interaction is achieved in all sectors of the economy, it is possible that the results of scientific activity of domestic researchers and scientists will generate income and make really significant contributions to the national economy, and this in turn, will make the life of every citizen even better.

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