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SCIENTIFIC INNOVATION POTENTIAL OF THE REPUBLIC OF KAZKAHSTAN AND ITS PERSPECTIVES

Abstract. In the modern world economy countries that can use innovations can win major international competition. However, each country has such an opportunity for development, which is determined by the scientific innovation potential of each country. In this regard, the most important issue is the study of the process of formation and development of the national innovation system (NIS) in Kazakhstan and the improvement of the organizational economic mechanisms of its functioning.

The main subsystems of Kazakhstan`s NIS according to the program creation and development of NIS of Republic of Kazakhstan, are scientific potential, innovative entrepreneurship, innovative and financial infrastructure.

Science is an important part of the national heritage, which is the main resource of economic and social changes in the country. In many cases, the scientific potential determines the country's place in the world community, the prospects for competition in foreign markets and the ability to solve its internal problems. The article describes the scientific innovation potential of Kazakhstan and shows the percentage of indicators of our country's scientific potential for many years. At the same time, the dynamics of the development of highly qualified specialists, the number of researchers who develop the country's scientific potential, are presented through tables and clearly defined requirements for their qualification.

The author has analyzed the statistical data of the main indicators of scientific and innovative development of the Republic of Kazakhstan. The author also analyzes the country's scientific potential, draws several conclusions and suggests effective ways of developing scientific innovation potential.

Key words: innovation, innovation potential, science, innovative development.

INTRODUCTION

In the modern world, in the context of accelerating scientific and technological progress innovations are becoming crucial for the sustainable growth of the national economy which is increasing its competitiveness. Countries that pursue an active innovation policy and create a favorable economic climate for innovation demonstrate high rates of economic development, high competitiveness of manufactured goods and services in international markets.

Innovation is a process that ensures the growth of competitiveness and turns scientific results into a new technological process or product. Only those countries that can use innovations in the modern world economy can win major international competition. However, each country has such an opportunity for development, which is determined by the scientific innovation potential of each country. In this regard, the most important issue is the study of the process of formation and development of the national innovation system (NIS) in Kazakhstan and the improvement of the organizational economic mechanisms of its functioning.

President of the Republic of Kazakhstan N.Nazarbayev in his message to the people of Kazakhstan "Strategy of Kazakhstan-2050": the new political course of the developed state ", noted the need to support the promotion of innovations in the national economy:" ... the introduction of innovations is important, but this is not the main goal. When our new technologies are in demand, they will be able to benefit from the country only when it is necessary on the market. Otherwise, innovation is a waste of money "[1].

The study of NIS determines its complex structure, consisting of interconnected subsystems, which include a number of elements in each of them. All levels of the NIS are interrelated and mutually complementary. Despite the diversity of elements of national innovation systems, all elements of this system that have a certain integrity serve a common goal. In this regard, particular attention is paid to the construction of systems, their main components, their interconnection and interaction.

MAIN PART

For the successful development of NIS is the effective functioning of all subsystems and their elements. The main subsystems of Kazakhstan`s NIS according to the program creation and development of the National Innovation System of the Republic of Kazakhstan, are scientific potential, innovative entrepreneurship, innovative and financial infrastructure.

Let's look at the key indicators that characterize the effective functioning of the subsystems of Kazakhstan`s NIS. After gaining independence, the scientific and technical potential of the transition period was significantly lost. Scientific and project development was not required, as a result of low funding, many sectors of the research institute and design organizations were eliminated. Human resources have also decreased significantly [2].

In the Republic of Kazakhstan, scientific research and development in 2017 involved 386 organizations (in 2016 - 383 organizations). According to the Statistics Committee of the Ministry of National Economy of the Republic of Kazakhstan, the number of research organizations has declined, but in 2017 this indicator increased by 13,2% compared to 2013 [3]. The growth rates of organizations are shown in Table 1.

Table 1 – Number of organizations engaged in R&D in 2013-2017 by sector of activity, units.

Types of organizations	2013	2014	2015	2016	2017	Growth rate, (2017-2013)/ 2013*100 %, %
All organizations,units	341	392	390	383	386	13,2
Public sector	78	100	94	100	101	29,5
Higher vocational educational sector:	112	107	103	103	99	-11,6
Business sector	110	147	154	149	146	32,7
Non-profit sector	41	38	39	31	40	-2,44
Note – Committee on Statistics of MNE RK: http://stat.gov.kz [3].						

The public sector, including institutions funded from the state budget, in 2017 was represented by 101 organizations.

The number of organizations in the business sector, including organizations whose main activity is related to the production of products or services for sale, decreased by 3 units in comparison with 2016.

The higher education sector (99 organizations) includes universities, institutes, academies and other institutions of post-secondary education, regardless of the source of their funding and legal status; research institutes, experimental laboratories and clinics, which are managed by institutions of higher education.

The smallest number of organizations is represented in the non-profit sector of science, which includes legal entities funded by private non-profit organizations - 40.

Research structures ensure the development of new breakthrough technologies that will subsequently be introduced in industrial enterprises, the rapidity and efficiency of the commercialization of new ideas and developments largely depends on their location. The absence of such organizations in industrial enterprises makes them unable to conduct research and development, which excludes them from the process of innovative development. Many industrial enterprises of Kazakhstan are still focused only on technology transfer, because do not have the financial means to conduct the entire cycle of R & D and the introduction of innovations in production.

Table 2 shows structure of the distribution of organizations engaged in R & D. *It* should be *noted* that most of *this rise is* accounted for business sector in the overall structure of organizations.

Table 2 – Structure of the distribution of organizations engaged in R & D, %

Sectors	2013	2014	2015	2016	2017
All organizations	100	100	100	100	100
Public sector	22,9	25,8	24,1	26,1	26,2
Higher vocational educational sector:	32,8	26,8	26,4	26,9	25,7
Business sector	32,3	38	39,5	38,9	37,82
Non-profit sector	12	9,4	10,0	8,1	10,36
Note – Committee on Statistics of MNE RK: http://stat.gov.kz [3].					

According to the statistical data of Table 2, we will determine the linear coefficient of absolute structural shifts of the number of R & D organizations by sectors of the economy. In the conditions of measuring absolute structural shifts, the classical formula of the average linear deviation is transformed into the following:

$$L_b^{Ab} = \frac{\sum_{i=1}^{n} |d_j - d_0|}{n} \quad (1)$$

d – specific weight of the characteristics; n – number of gradations in the structures; j – current period; 0 – base period.

$$L_{17/13}^{Ab} = \frac{|26,2 - 22,9| + |25,7 - 32,8| + |37,82 - 32,3| + |10,36 - 12|}{4} = 4,39$$

This coefficient characterizes the average value of deviations from the specific weights, which means how many percentage points on average the relative weights of the parts in the compared populations deviate from each other.

The more value of the linear coefficient of absolute structural shifts, the greater the relative weights of the individual parts for the two compared periods on average, the greater the absolute structural shifts.

The value of the coefficient for the period 2013-2017 is 4.39%, which indicates structural shift in the number of organizations performing R & D in Kazakhstan by sectors of the economy during this period.

Along with scientific and research organizations, the country's scientific potential includes highly qualified specialists capable of developing ideas that are subsequently embodied in innovative products and technologies. Innovative economics makes high demands on the number and level of qualifications of scientific workers.

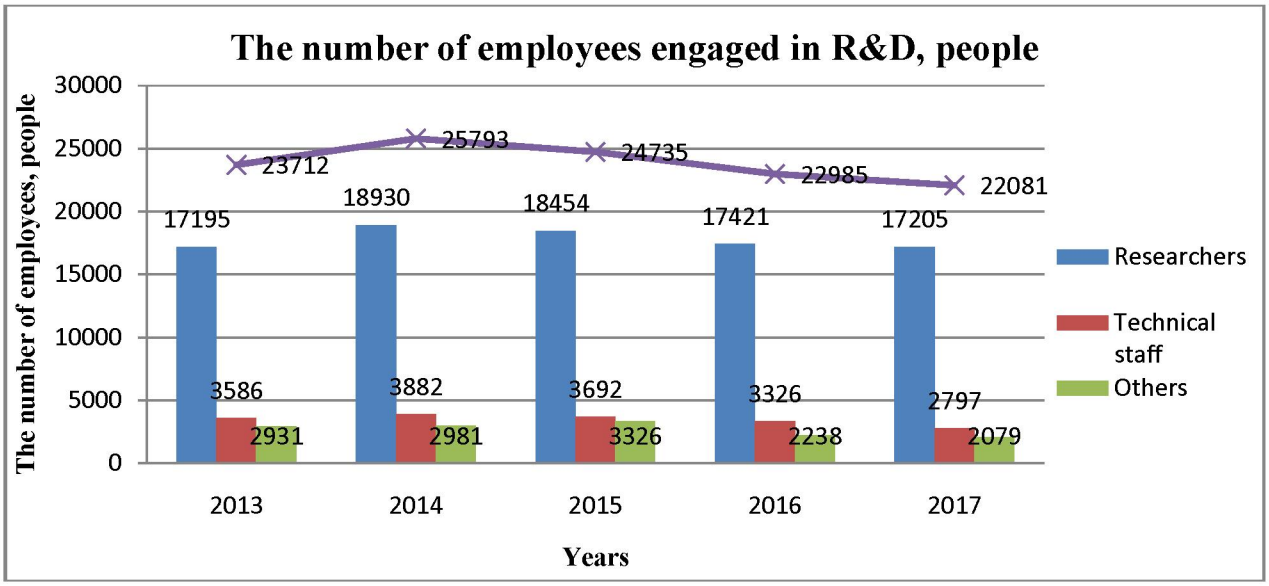

Figure 1 - The number of employees engaged in R&D, people

Note – Made by authors on the basis of a source [3],[4],[5].

In scientific research and development 22,081 people were involved in 2017, (in 2016 - 22,985 people), including 17,205 research specialists. Compared with 2014, in which the largest number of employees was registered during the five-year period, in 2017 the number of employees engaged in R&D decreased by 3.7 thousand people (Figure 1).

In 2016, out of 17,400 researchers, the largest the number (5.2 thousand) was involved in the field of natural sciences. At the same time, the staff of the highest qualification comprised: doctors of sciences - 574 people, candidates - 1.3 thousand, PhDs - 200 and doctors on the profile – 199.The number of masters was 1.2 thousand people [6].

The largest number of research specialists in 2017 was involved in the field of engineering sciences-5 thousand. The number of cadres of the highest scientific qualifications in this field of science was only in the second position and amounted to 2,557 people: 979 candidates, 383 doctors of science, 114 doctors of philosophy PhD and 77 doctors on the profile; 1000 masters. In general, the share of researchers in the engineering sciences accounted for about 29.3% of the total number. Then follow the natural sciences, where the share of research specialists accounted for 29%. The number of candidates of sciences was 1221 people, doctors - 577, doctors on the profile - 117, doctors of philosophy PhD - 224 and masters - 1236 people. The least represented by the highly qualified personnel were medical sciences. They accounted for only 6.1% of the number of research specialists. In this field of science the smallest number of highly qualified personnel was noted: candidates - 327 people, doctors - 182, doctors on the profile - 47, doctors of philosophy PhD - 31 people, masters - 202 people.

Table 3 – Dynamics of the number of researchers with scientific degrees

Indicators	2013	2014	2015	2016	2017	Growth rate, 2017/2013, %
Number of staff engaged in research and development (at the end of the year), people	23712	25793	24735	22985	22081	93,1
including researchers, people:	17195	18930	18454	17421	17205	100,0
Doctor of Science	1688	2006	1821	1828	1818	107,7
Doctor by profile	605	596	549	493	354	58,5
PhD philosophy	218	330	431	456	589	270,2
Candidates of Science	4 915	5 254	5119	4754	4 541	92,4
Note – Made by authors on the basis of a source [3],[4],[5] .						

The analysis of the formation of a contingent of human potential with the highest scientific qualification shows that there is a shift towards the number of doctors of philosophy (PhD) and doctors in the profile, whose preparation is carried out in Kazakhstan. The number of specialists in these qualifications has increased in all areas of science.

A special event of this year for the science of our country was the Address of the President of the country N.A. Nazarbayev to the people of Kazakhstan on January 10, 2018, "New Development Opportunities in the Conditions of the Fourth Industrial Revolution," which sets the task of increasing the efficiency and effectiveness of science, synchronizing it with the innovative development of the republic's economy. For this it is necessary: Development of high school science with a priority on research in metallurgy, oil and gas chemistry, agro-industrial complex, bio- and IT-technologies; Implementation of joint projects by universities with leading foreign universities and research centers, large enterprises and TNCs; Co-financing from the private sector of all applied research and development; System policy to support young scientists with the allocation of quotas within the framework of scientific grants; Implementation of the phased transition to English of applied scientific research [7].

CONCLUSION

Concluding the analysis of the scientific potential of Kazakhstan, the main directions for the further development of Kazakhstan's science are the following:

1. Increase in the demand for the results of scientific developments in the real sector of the economy. An important direction in the development of the scientific sphere remains integration into the world scientific space. At present, international cooperation in the field of science and technology is developing on the basis of bilateral agreements with 33 countries of the world.

2. Development of effective mechanisms to increase the competitiveness of the human resources potential of science. To achieve a breakthrough, it is necessary to create favorable stimulating conditions for young, promising scientists. In order to strengthen the scientific and human potential of the country in 2017, the state educational order for the preparation of PhD doctors was first increased. So, in 2017, 1437 grants were awarded (in 2016 - 780), for the preparation of undergraduates was awarded 10 735 grants (in 2016, 8160).

3. To pay attention to the main priorities of the development of science of Kazakhstan. The priorities includes:

- Rational use of natural resources, including water resources, geology, processing, new materials and technologies, safe products and structures;
- Power engineering and machine building;
- Information, telecommunication and space technologies, scientific research in the field of natural sciences;
- Sustainable development of the agro-industrial complex and safety of agricultural products;
- National security and defense.

4. Another urgent task is digitalization, which is applied not only in the science of Kazakhstan, but also penetrated into all spheres of society: the economy, government bodies, law, business structures, etc.

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НАУЧНО-ИННОВАЦИОННЫЙ ПОТЕНЦИАЛ РЕСПУБЛИКИ КАЗКАСТАН И ЕГО ПЕРСПЕКТИВЫ

Аннотация. В современной глобальной экономике те страны, которые могут быстро и правильно использовать инновации, могут достичь международной конкурентоспособности. Однако каждая страна имеет аналогичный потенциал развития, который определяется научным и инновационным потенциалом каждой страны. В этой связи одним из актуальных вопросов является изучение процесса формирования и развития национальной инновационной системы в Казахстане и предложения по совершенствованию организационных экономических механизмов его функционирования.

Основными подсистемами национальной инновационной системы Казахстана, принятыми в рамках программы создания и развития Национальной инновационной системы, являются научный потенциал. Поэтому сегодня в числе актуальных проблем внесены предложения по формированию и развитию национальной инновационной системы в Казахстане и улучшению экономических механизмов ее функционирования.

Наука является важной частью национального наследия, которое является основным ресурсом экономических и социальных изменений в стране. Во многих случаях научный потенциал определяет место

страны в мировом сообществе, перспективы конкуренции на внешних рынках и способность решать свои внутренние проблемы. В статье описывается научно-инновационный потенциал Республики Казахстан и показывает процент показателей (рост или сокращение) научного потенциала нашей страны на протяжении многих лет. В то же время динамика развития высококвалифицированных специалистов, число исследователей, которые развивают научный потенциал страны, представлены через таблицы и четко определены требования к их квалификации.

Автор проанализировал статистические данные основных показателей научно-инновационного развития Республики Казахстан. Автор также анализирует научный потенциал страны и делает несколько выводов и предлагает эффективные способы развития инновационного научного потенциала.

Ключевые слова: инновация, инновационный потенциал, наука, инновационное развитие.

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ҚАЗАҚСТАН РЕСПУБЛИКАСЫНЫҢ ҒЫЛЫМИ ИННОВАЦИЯЛЫҚ ПОТЕНЦИЯСЫ ЖӘНЕ ОНЫҢ ПЕРСПЕКТИВАЛАРЫ

Аннотация. Қазіргі әлемдік экономикада инновацияны тез әрі дұрыс пайдалана алатын елдер ғана халықаралық бәсекеде жеңіске қол жеткізе алады. Алайда әр елдің мұндай даму мүмкіндігі әртүрлі, олар әр елдің ғылыми инновациялық әлеуетімен анықталады. Осыған байланысты, Қазақстандағы ұлттық инновациялық жүйенің қалыптасу және даму процесін зерттеу, оның қызмет етуінің ұйымдастырушылық экономикалық механизмдерін жетілдіру бойынша ұсыныстарды енгізу өзекті мәселелердің бірі болып отыр.

Ұлттық инновациялық жүйені құру және дамыту бағдарламасы аясында қабылданған Қазақстанның ұлттық инновациялық жүйесінің негізгі қосалқы жүйелеріне ғылыми әлеует те жатады. Сондықтан Қазақстандағы ұлттық инновациялық жүйенің қалыптасуы мен даму процесін зерттеу, оның қызмет етуінің экономикалық механизмдерін жетілдіру жайлы ұсыныстар енгізу бүгінгі таңдағы өзекті мәселелердің бірінен саналады.

Ғылым саласы еліміздің экономикалық және әлеуметтік өзгерістерінің іргелі ресурсы саналатын ұлттық мұраның маңызды бөлігі болып табылады. Көптеген жағдайларда ғылыми әлеует елдің әлемдік қоғамдастықтағы орнын, сыртқы нарықтағы бәсекелестік күрестегі перспективаларын және оның ішкі мәселелерін шешу мүмкіндігін анықтайды. Мақалада Қазақстан Республикасының ғылыми инновациялық әлеуетіне сипаттама жасалып, еліміздің әр жылдардағы ғылыми әлеуетінің көрсеткіштерінің пайыздық мөлшері (өсу немесе қысқару деңгейі) көрсетілген. Сонымен қатар еліміздің ғылыми әлеуетін дамытатын жоғары білікті мамандардың, ғылыми қызметкерлердің санының даму динамикасы кестелер арқылы беріліп, олардың біліктілік дәрежесіне қойылатын талаптар да нақты айтылады.

Автор мақалада Қазақстан Республикасының ғылыми инновациялық дамуының негізгі көрсеткіштерінің статистикалық деректерін қолданып оған талдау жасаған. Сондай-ақ автор еліміздің ғылыми әлеуетін талдай отырып, бірнеше қорытынды жасайды және бүгінгі күні инновациялық ғылыми әлеуетті дамытудың тиімді жолдарын ұсынады.

Түйін сөздер: инновация, инновациялық әлеует, ғылым, инновациялық даму.

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