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### Development of innovative economy in Kazakhstan

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Инновациялық экономиканың  
Қазақстанда дамуы

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Развитие инновационной  
экономики в Казахстане

The article considers the main indicators of innovation development of economy of Kazakhstan. The paper determined the positive trends of innovative development which includes the growth of innovative products and services, increasing the number of people employed in R&D, growth of innovation activity of domestic enterprises. It was identified negative aspects which include the reduction of the share of R&D expenditures in GDP, weak links among the business and the scientific sector, low salaries of researchers in the higher education sector. The innovative activity of domestic companies, despite significant growth in recent years, is still critically low. It was found that the threat of the development of the innovation system can be: the weakening of the scientific potential of the country in connection with the move of scientists and engineers of Kazakhstan in foreign countries («brain drain»); increased competition in the area of innovation from the developing countries; the lack of domestic production with high added value on the world markets. Opportunities for the development of innovative economy in Kazakhstan connected with the implementation of the program of industrial-innovative development of Kazakhstan for 2015-2019 years, as well as strengthening cooperation between the private sector and science, the growth of the market for high-end products in the framework of integration processes.

**Key words:** innovative economy, scientific potential, innovation active enterprises, innovation system, Kazakhstan.

Мақалада Қазақстан экономикасының инновациялық даму негізгі көрсеткіштері қарастырылды. Инновациялық дамудың оң беталыстары ретінде инновациялық өнімді шығару көлемдерін арттырылуы, ғылыми-зерттеу және тәжірибелік конструкторлық жұмыстарды атқару саласындағы қызметкерлердің саны өсуі, отандық өндірістердің белсенділігі арттырылуы болып саналады. Жалпы ішкі өнімдегі ғылыми-зерттеу және тәжірибелік конструкторлық жұмыстарды атқару саласына жіберілетін шығындар үлесінің төмендеуі, кәсіпкерлік секторы мен ғылыми сектордың арасындағы байланыстың дамымағаны, жоғары оқу орындарда жұмыс істейтін қызметкерлер алатын еңбекақысының төмен болғаны сияқты жағымсыз аспектілер де анықталды. Соңғы жылдардың ішінде отандық кәсіпорындарының инновациялық белсенділігі арттырылғанымен де, олардың деңгейі өте төмен. Қазақстандық ғалымдар мен инженерлердің шетелге көшіп кеткеніне («милардың шашырауы») байланысты елдің ғылыми әлеуетінің әлсіреуі, инновация саласындағы дамушы елдер тарапынан бәсеке деңгейінің күшейгені, дүниежүзілік нарықтарында қосылған құны жоғарылатылған отандастық өнімнің жоқтығы инновациялық жүйенің дамуына қарсы әсер ететін жағдайлар ретінде қарастырылады. Қазақстандық инновациялық экономикасының даму мүмкіншіліктері Қазақстан Республикасының 2015-2019 жылдарға арналған индустриалдық-инновациялық даму бағдарламасының жүзеге асырылуына және жекеменшіктік сектор мен ғылым арасындағы әрекеттесу деңгейінің өсуі, интеграциялық үдерістердің шеңберінде жоғары технологиялық өнім нарығының дамуына байланысты.

**Түйін сөздер:** инновациялық экономика, ғылыми әлеует, кәсіпорындардың инновациялық белсенділігі, инновациялық жүйе, Қазақстан.

В статье рассматриваются основные показатели инновационного развития экономики Казахстана. В статье определено, что положительными тенденциями инновационного развития являются рост объемов инновационной продукции, увеличение числа занятых в сфере НИОКР, рост инновационной активности отечественных предприятий. Также определены и негативные аспекты, к которым относятся снижение доли затрат на НИОКР в ВВП, слабые связи предпринимательского сектора с научным сектором, низкая заработная плата исследователей в секторе высшего образования. Возможности для развития инновационной экономики в Казахстане связаны с реализацией программы индустриально-инновационного развития РК на 2015-2019 годы, а также с усилением взаимодействия между частным сектором и наукой, ростом рынков для высокотехнологичной продукции в рамках интеграционных процессов.

**Ключевые слова:** инновационная экономика, научный потенциал, инновационно-активные предприятия, инновационная система, Казахстан.

## DEVELOPMENT OF INNOVATIVE ECONOMY IN KAZAKHSTAN

The basic elements of national innovation system have been created within last 10 years in Kazakhstan, but out-of-date representation about linear model of innovative activity and an elementary chain for revealing of effects of scientific and technical progress dominates: R&D expenses - increase in the absolute volume of sales. Nevertheless, in postindustrial economy the process of diffusion of innovations often goes by nonlinear way, cooperation and collaboration in the sphere of innovation are developed on initial stages of innovative process, distribution of innovations goes in clusters often with smaller expenses, than in separate firms etc.

Mutual relations between manufacturers and consumers of new knowledge and technologies in our country are an exception, than system. The universities register individual patents and do not realise the innovative function because of out-of-date material base, absence of resources on carrying out of laboratory and skilled works, etc. As a result the program of the forced industrial development supports projects which are not innovative by their nature.

Large corporations of Kazakhstan do not demonstrate active development and implementation of innovative technologies. Although, all over the world corporations, along with the Government, take leading positions in scientific researches, creating the enclaves whose give innovative impulse for small and medium business.

As a result the Republic Kazakhstan worsens the places in a Global competitiveness rating on *Innovation* and *Business sophistication* factors during some years. For example, Kazakhstan's position on the *Innovation* factor fell by 21 points in 2014 compared to 2006.

These issues clearly show that the formation the innovation system in Kazakhstan is still in progress. The analysis of some key indicators of innovation development of the country can help to understand the bottlenecks of local innovation system and provide some recommendations to improve its mechanisms in terms of creating of knowledge based economy in the country.

The concept of National innovation system (NIS) becomes very popular between experts and policy-makers during last decade. It was developed in work by Christopher Freeman (1987), Bengt Ake Lundvall (1992) and Richard Nelson (1993) [1-3].

The system nature of the concept of innovation system means that the development of technology is not as a chain leading from research to innovation, but as a process of interaction and feedback between the full range of economic, a social, political, institutional and other factors that determine creation of innovations.

The formation of the state innovation system is the initial stage of constructing the economy of post-industrial society based on use of new knowledge. In the same time NISs of different countries differ from each other [4].

NISs of different countries may have different goals. In each case, the development strategy of certain NIS determined by macroeconomic policy of the state, legislation, forms of direct and indirect state regulation, scientific, technological and industrial capacity, domestic markets, labor markets, as well as historical and cultural traditions and peculiarities. The development of innovation activity is not affected by any type of state or political regimes. Thus, innovation is successfully developed in federal states (USA, Germany) and unitary ones (France), in the states under a constitutional monarchy (Britain, Netherlands, Spain), as well as under the communist regime of China. Therefore we can

assume that the crucial factor is the stability of the political situation in the country [5].

Regulating functions of states in the development of NIS includes: the establishment of framework conditions for innovation business development strategy for innovative economic development, conducting forecasting technological development and definition of the basis of scientific and technological priorities, support the development of innovation infrastructure, development and implementation of measures to implicitly and explicitly encourage innovation. However, these measures are generally not intended for direct funding of the development of R&D sphere, priority is given to funding the fundamental science.

The Committee on Statistics of the Republic of Kazakhstan is the official organization which collects the R&D statistics. Throughout the years financial support of R&D is increased (table 1). In structure of expenses the great part belongs to business sector. R&D expenditures in absolute terms are increased every year but related to gross domestic product it had reduced considerably in 2010. At present expenses for R&D in percentage to gross national product do not exceed 0.17 percent that is very low indicator.

**Table 1** – Key R&D indicators in Kazakhstan in 2006-2014

<i>Indicators</i>	<i>2006</i>	<i>2008</i>	<i>2010</i>	<i>2012</i>	<i>2014</i>
GDP, billion tenge	10 213.7	15907.0	21815.5	30 347.0	38033.1
Inramural Expenses on R&D in Current Prices, million tenge	24 799.9	34 761.6	33 466.8	51 253.1	66 347.6
as percent to GDP	0.24	0.22	0.15	0.17	0.17
Volume of innovative production in Kazakhstan, million tenge	156 039.9	111 531.1	142 166.8	379005.6	580 386
Share of innovative production in GDP, percent	1.53	0.69	0.66	1.25	1.5
Patent application for inventions	1 557	1 668	1 850	1 468	n/a
Number of Personnel Involved in R&D (at the end of the year) persons of which:	19 563	16 304	17021	20404	25 793
Researches	12404	10780	10870	13494	18930
Doctorate degree	1157	1191	1347	1065	2014
Candidate degree	3147	2861	3041	3629	5335
PhD			59	131	335
Doctor on the profile			-	719	610

Source: Committee on Statistics of the Republic of Kazakhstan ([www.stat.gov.kz](http://www.stat.gov.kz))

The number of researchers is increased considerably in 2014 to compare with 2006.

To assess the quality of personnel involved in R&D, we consider the dynamics of the number of researchers who have scientific degrees. There is a tendency to reduce the number of researchers in the period 2006-2009, due to a decrease in the number of all personnel engaged in research and development in this period. The positive trend is the increase in the number of researchers with scientific degrees. The proportion of researchers with degrees in 2006 in the total number of researchers was 34.7% and in 2014 it was 43.8%, which indicates the improvement of quality of researchers.

The level of wages in the research area largely determines its attractiveness for young professionals. Relatively high salary of staff in the field of research and development is explained by the presence of private entities among R&D organizations, which raise the average level of wages of employees involved in research. At the same time, wages of researchers of higher education is below the average salary on the economy because mainly studies are conducted at public universities, which are funded from the state budget.

Despite the annual increase in wages of researchers, the increase in wages, adjusted for inflation remains low. At the same time, in other countries the wages of researchers is one of the

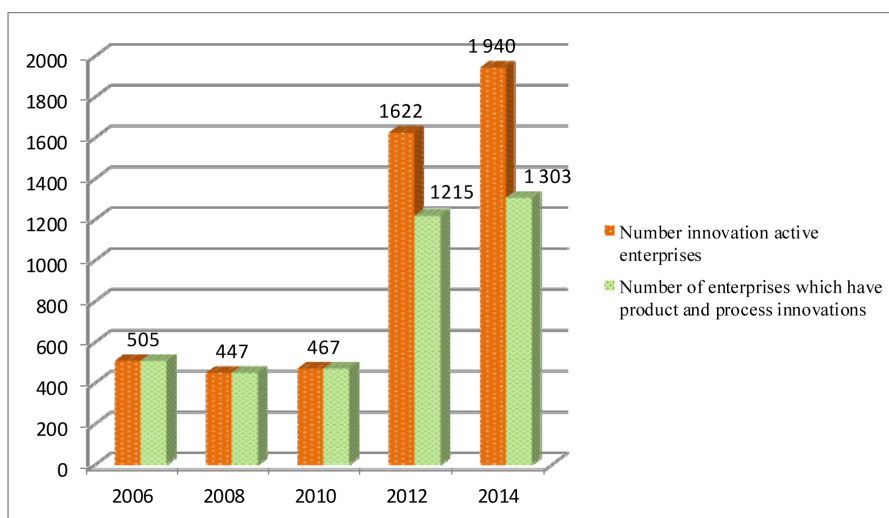
highest in the economy. For example, in the US the average salary of employees in research and development (according to data on May 2012) is almost 2 times higher than the average wage in the economy [6, c. 3-32]

The results of innovation activity are expressed in innovative products. The volume of innovative products increased in 3.7 times in 2014 compared with 2006.

The leader in producing of innovation products in 2014 is Astana city (125507.0 million tenge).

The innovative activity of industrial enterprises in the country, despite the significant growth remains low because companies are not engaged in the research and development of new products independently. According to the Committee on Statistics of the Republic of Kazakhstan innovative activity of enterprises in Kazakhstan in recent years it is about 8%, which is significantly lower than in developed countries.

Since 2012 the methodology of accounting of innovation active enterprises was changed. A survey of innovation statistics carried out in accordance with international recommendations on product, process, organizational and marketing innovations, while in previous years mainly the product innovations were taken into account. This explains the significant growth of innovative enterprises in the country (Figure 1).



Source – Committee on Statistics of the Republic of Kazakhstan ([www.stat.gov.kz](http://www.stat.gov.kz))

**Figure 1** – Dynamics of innovation active enterprises and enterprises which have product and process innovations

One of the main reasons for growth in innovative products in our country is the annual increasing in domestic R&D expenditures. Expenditures on

R&D, R&D intensity and Number of Researchers are main indicators which used for estimation of national innovation system. Other indicators show

the general level of development of science and technology in the country. They provide additional information for estimation of parameters of national innovation system. Along with patent statistics above indicators can provide complex estimation of innovation system of the country.

The current state of the innovation system of Kazakhstan may be presented via SWOT analysis framework which underlines Strengths, Weaknesses, Opportunities and Threats of NIS. The analysis of main indicators of innovation development of the country allows authors to determine of key trends of innovation development of the country. They were presented according to the structure of SWOT analysis below.

Main strengths of the innovation system of Kazakhstan, in our opinion, include:

- beneficial geographical location of Kazakhstan;
- the legislative basis for supporting of NIS development on state and region levels, creation of state institutes of development, state policy for economical modernization;
- reserves of natural resources (mainly, oil and coal);
- high educational level of the population;
- availability of academic universities and qualified research personnel;
- increasing R&D personnel with scientific degrees in 2010-2014;
- qualified and relatively cheap labor force;
- state funding of innovation projects through the state institutions of development;
- increasing of domestic R&D expenses;
- state support of public-private partnerships in perspective spheres of economy.

Weaknesses. Economic development of sovereign Kazakhstan for 20 years is cause by to two factors. Historically Kazakhstan economy had formed in plan economy period and level of technological development of industries is still very low. There is a disproportion between relatively high level of scientific and technical potential and weak capability of researchers and research institutes in commercialization of innovations along with undeveloped market of innovation. The main «bottlenecks» in innovation development of the country include:

- low level of domestic R&D expenses in percentage to GDP (less than 0.2 percent);
- inadequate coordination between public and private sectors in development of priorities for research, engineering and innovation development and measures for their implementation;
- lack of a coordinated policy regarding transfer of knowledge and technologies;

- weak state support of small and medium innovation firm;
- low level of innovation activity of business (about 8 percent of all business);
- outdated technological structure of the basic capital in many industries;
- inhomogeneity of the research sector, the gap between industry requirements and science;
- inadequate level of internal demand for innovation products;
- lack of experience in innovation business enterprise and undeveloped innovation culture.

These factors reveal main problems of national innovation system in Kazakhstan: the relatively high level of academic research and the gap between available scientific and technical developments and the needs of the real economy of Kazakhstan.

Threats are the factors that can endanger the competitiveness by becoming weaknesses. They might also have potential for an opportunity. After identifying possible threats, country need to prepare for them, and if they become reality, to overcome them. If a threat, identified or unidentified, turns into reality it shifts to weakness reducing the competitiveness.

On the authors opinion, the threats of the innovation development are follows:

- changing in priorities of public policy;
- increased competition in the sphere of innovation development among developing countries;
- the widening gap between the scientific and technological and production level of developed countries;
- securing raw materials orientation of the economy due to high prices for raw materials;
- insufficient state funding;
- declining quality of education and relatively low popularity of engineering disciplines;
- «Brain drain» - moving of talented scientists and highly qualified specialists from Kazakhstan to foreign countries.

The opportunities of the Kazakhstan innovation system are connected with innovation and industrial policy. The government program of industrial and innovative development of Kazakhstan adopted in 2015 is logic continuation of state policy on an economy diversification, and it integrated the basic approaches of program of forced industrial and innovative development of Kazakhstan for 2010-2014.

It is planned to achieve the following results in the manufacturing industry by 2019 (to compare with 2012 year):

- Growth in the volume of output by 43% in real terms;
- The growth of the gross added value of not less than 1.4 times in real terms;
- Labor productivity growth by 1.4 times in real terms;
- Growth in the value of non-commodity (processed) exports of not less than 1.1 times;
- Employment growth in the manufacturing industry by 29.2 thousand people [7].

Total costs provided for the implementation of the program in 2015 - 2019 years from the national budget amount to 643 909.6 million tenge.

Another opportunities, in our opinion, include increasing efficiency NIS by improving the collaboration between industry and science, significant increase in productivity through technology transfer,

the growth of markets for high-tech products through the integration process (the Customs Union within CIS countries, EEU, WTO, etc.).

In the conclusion it may be noted that Kazakhstan follows the strategy of long-term innovation development within the conception of national innovation system. The main elements of innovation system are created but the analysis of key indicators of innovation activity show ineffectiveness of direct methods of financing and managing of innovations. The perspectives of innovation development of the country will depend on the increasing of the level of innovation activity of business and its ability to cooperate in research with higher education sector which traditionally provided with qualified R&D personnel engaged in fundamental and applied studies.

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