



## **Journal of Internet Banking and Commerce**

*An open access Internet journal (<http://www.icommercecentral.com>)*

*Journal of Internet Banking and Commerce, April 2016, vol. 21, no. S3*

***Special Issue: Finance, Services Sector and Commerce: Innovations and Investments***

***Edited By: Mihail N. Dudin***

### **Innovation Activity in the Republic of Kazakhstan: State Controlling and Ways to Increase Management Efficiency**

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### **Abstract**

The main goal of the research is to reveal the dominant role of the state in the innovational development of the country and to define promising areas of the cooperation between the state, universities (research institutes) and industry in conducting the research activity. At the present time the innovation activity is a locomotive of progressive phenomena in the economy of the country. Herewith, it is noted that in the Republic of Kazakhstan innovation activity, according to its indicators, falls behind the desired efficient result. This article defines the level of the development of innovation entrepreneurship activity in Kazakhstan. It states the problems related to the innovation development due to the current tendencies of the development of economy in the world. It offers measures for stable and dynamic development of the country that includes the notion of the competitiveness and development of innovational schemes of development that are based on efficient interrelation and optimal combination of interests of the state, universities (research institutes) and private sector of Kazakhstan. On the basis of the conducted analysis of variables – factors of innovational development - it was revealed that the efficiency of managing innovation activity by governmental authorities was a “primal cause” that had an impact on such indicators as the level of development of innovational infrastructure and wealth of the country. The authors also proposed the measures of state regulation of the innovation development of enterprises and stimulation of partnership of the science with the production.

**Keywords: Technological Parks; Innovational Development; State and Private Partnership; Gross Domestic Product; Office (center) of Technologies Commercialization**

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## **INTRODUCTION**

### **Introduction to the Research Problem**

The state, universities (research institutes) and the private sector are the three platforms the innovation activity in the country is based on. In the 1990s Professor Henry Etzkowitz (the Stanford University) developed the model of the “triple spiral” on the interrelation of these institutes. It became the guarantee of successful development of many advanced economies that applied it.

According to the conducted analysis of the innovation activity in the republic, its serious role in the development of the country is noted. However, it is necessary to state that at the present time innovation activity is on the level that is insufficient for strengthening competitiveness of the republic on a worldwide scale. Having considerable experience of initiatives of the innovation nature, the country has not yet undergone big breakthrough in the area of innovation activity [1].

Thus, the lack of the system approach of governmental management authorities to innovation projects and processes suppresses particularly comprehensive innovation development of not only separate entrepreneurial structures, higher educational establishment, research institutes, but also the country, by preventing it from correct defining the priorities of the future innovation development. One of the basic conditions of the innovation activity includes scientific researches, development of innovational products, and entrepreneurship’s performance of technological processes. At the present time the innovation activity of Kazak enterprises does not exceed the share of 8.1%. So, according to the data of 2012, innovatively active enterprises in the share correlation include 79.3% in Germany, 60% in Sweden, 58% in Finland, 33% in Turkey, 50% in the USA, 47% in Hungary, and 9.1% in Russia [2].

Important prerequisites for stimulating the development of innovations at the enterprises of the country include, first of all, stimulation in the development of educational, scientific and production potential. Due to investments in innovations, the majority of enterprises increase the innovation activity not only at their enterprises but also in the industry. This is an incentive for innovative technologies at other enterprises. In case of low innovation activity in the industry, the optimal strategy of enterprises is the abstention from investing. However, with time it can become a serious danger of technological weakness and development restraint.

In 2014 the share of innovational products was 1.50% of such indicator as gross domestic product (hereinafter referred to as GDP). The expenses for innovations were 0.17% of GDP. The innovation activity of enterprises in the processing industry remains low. It is 10.9% of all enterprises [3].

## **Factors that Suppress Innovational Development of the Economy**

Besides, there are the following problems related to the innovational development of the republic enterprises:

- A lot of scientific research results, technologies and products are uncompleted for transferring to the market; it decreases the value of these products (or technologies) for possible partners.
- There are no contemporary mechanisms for transferring technologies, results and products to the market. Under the conditions of the market, it is peculiar of the mechanism to relate the innovations acquisition to small business that has a high level of risk, and high efficiency in case of success. Advanced economies have a separate sector in economy that provides the required conditions or the infrastructure for small innovative enterprises.
- There are no developed infrastructural elements for the development of innovation projects: business incubators, technoparks, venture funds, and other separate financial mechanisms to contribute to the development of enterprises (small, in particular). Besides, certified estimators of companies, intellectual property are required.
- The domestic market lacks the demand for innovational products, technologies or industrial novation. Scientific activity is an element of the service industry that requires the market demand. However, at the present time the internal market of providing science-driven products and scientific services is not vast. A lot of companies do not have an opportunity to buy this service [4].

For the country to enter the area of world technologies, it is necessary to specify macro technologies that can become competitive on the international stage in the area of producing science-driven products. Such areas as power economy, biotechnologies, space, telecommunications and data transmission, special chemistry are of high priority for the country. However, there are such areas where the country has its own scientific schools.

At the same time in case of applying this approach, there is a possibility of limiting the thematic direction of conducting applied and fundamental researches to those problems that are currently urgent for the technologically backward entrepreneurship, and not paying attention to other areas of perspective researches. It can affect the ensuring of global competitiveness of the science of Kazakhstan and the creation of the potential of science for the purpose of long-term economic development [5].

At the present time the entrepreneurship also needs the quickest modernization of technologies and equipment. For this purpose, in case of exhausted production base, the stimulation of innovations development is not efficient enough. In addition, the

principle limiting role lies in the low quality of entrepreneurship's management skills, complexity of marketing research of the innovational product, and insufficient level of motivation with the owners of business for its long-term development.

The striving of governmental authorities to direct the investment demand of the entrepreneurship to the internal supply can become a basis of strengthening protection measures, appearance of new obstacles and import of technologies and environment. It can finally slow down the tempos of the industry modernization, and present direct dangers for the entrepreneurship's competitiveness [6].

The forecast of the non-energy sector development showed that the availability of the innovation element for the purpose of providing their competitiveness with the required tempos subject to the lack of additional efforts is not realistic. In order to prevent the inertness in the development, it is necessary to change the environment and conditions that stimulate the development of innovations.

The following problems remain efficient on the way to the innovation development:

- Maintaining considerable abruptions between the stages of the innovation process; it does not allow the innovational potential of the country that is available in the science to be realized,
- Low activity of development institutes and technological parks, low number of projects that have been financed, weak connections with entrepreneurs of regions,
- Insufficient number of scientific employees in industry,
- Level of researchers' remuneration, which in spite of positive dynamics during the latest years remains very low,
- Systematic decrease in the efficiency of expenses for technological innovations: low percent of the elasticity coefficient of the manufactured products according to the expenses for technological innovations – 0.17 (0.24 in 2010).

## **IMPORTANCE OF THE CONDUCTED RESEARCH**

The main factors of the economy development include scientific progress and knowledge of the modern society. It makes the basis for the economy of innovations whose differentiating mark is the continuous creation of new products or services. In case of non-availability of innovation element, the competitiveness of both national enterprises and the country is impossible [7].

The countries with the advanced economy are characterized by high intensity of innovation progress. Technological innovations are a basic factor of economic and social development. In advanced economies new (improved) products, technologies, and equipment account for the largest share of GDP. According to various estimations, 75-100% of the industry production growth is ensured by using innovations. Due to this, in the world-wide economic competitiveness, the countries that provide favorable

conditions for the innovation development win. It also includes state assistance in conducting applied and fundamental researches, creating innovational infrastructure, training relevant specialists, scientific manpower for the innovational area as well as in the system of security and involving intellectual property in the economy of the country (Report “Raising EU R&D Intensity”) [8].

After acquiring the independence in the transition period, the scientific potential of the Republic of Kazakhstan was considerably lost. Scientific and project works happened to be unnecessary. As a result of low financing, a lot of research organizations were terminated. The workforce capacity considerably decreased [9].

At the present time, analyzing scientific potential of the country, it is possible to make the following basic conclusions:

- There are structural shifts in the number of organizations that carry out research and development works (hereinafter referred to as the R&D) in the republic according to sectors of economy whose reason is a considerable decrease in the number of organizations in the private non-commercial sector,
- The number of organizations in the area of entrepreneurship considerably increases. However, at the present time a lot of enterprises in Kazakhstan still focus on the transfer of technologies, because there are no sufficient financial resources for carrying out the complete cycle of R&D. It slows down the tempos of the development and commercialization of technologies.
- The manpower and qualitative composition of the researchers who carry out scientific researches and developments has increased over recent years. The higher education sector is a leader according to the number of specialists involved in researching and developing.
- Researchers’ remuneration is far from international standards. And in spite of positive shifts over recent years, it remains very low.

Due to this, it is necessary to improve innovation infrastructure in the republic. It is based on efficient interrelation and cooperation of such basic factors of innovations development as the state (government), higher educational establishments, research institutes (scientists, developers), and entrepreneurship sector (business) [10].

## **BASIC PROVISION OF THE RESEARCH HYPOTHESIS**

For the purposes of stable and dynamic development of the country, which includes the notion of competitiveness and development of innovation schemes of growth, an optimal combination of scientists, business and government is important. The efficiency of managing innovation development of the country within the creation and development of the innovation infrastructure of the state in combination with the trust of scientists (developers) and efficient cooperation of the governmental authorities and business (state or private partnership) in complex can allow to achieve a considerable success in stimulating innovation development of the country [11].

## RESEARCH METHODS

In order to analyze efficient partnership of the state, higher educational establishments and private sector of Kazakhstan, the correlation analysis of variables was applied subject to the third variable is the controlling one.

The next statistic research was carried out on the basis of the data of 2008-2014 calculated by month (Committee on Statistics of the Republic of Kazakhstan according to the “Innovation Activity of Enterprises in the Processing Industry” statistics) and on whose basis the model of the business, population and government interrelation was developed.

### Description of the Model of Business, Population and Government Cooperation

This model of business, population and government interrelation is based on the following statistical data:

- Index of innovation infrastructure development (Total Revenues) was considered on the basis of statistical data related to the development of JSC “National Agency on Technological Development” (hereinafter referred to as JSC “NATD”) as a basic participant in the creation and development of innovation infrastructure in the Republic of Kazakhstan.
- Index of efficiency of managing innovation activity by governmental authorities – the Ministry of Industry and New Technologies of the Republic of Kazakhstan (the executive body of JSC “NATD”) (GDP (purchasing-parity power) as a share of the world GDP).
- Gross domestic product referred to the number of residents in the region (GDP per head in the republic as a whole/wealth).

It is possible to hold specific demands against these indexes. However, according to statistical experience, their use can cause useful effect [12]. We will define GDP per head in the country as an indicator of the republic wealth.

Figure 1 shows a part of the result of the conducted correlation analysis between these variables (it was noted before that the dependence between them is described by a linear statistical model). During the research, linear coefficients of the correlation were calculated for every pair of variables. Besides, partial coefficients of the correlation for every pair of variables were calculated subject to the third variable being the controlling one [13].

## RESULTS OF THE RESEARCH

Figure 1 shows high pair correlation between all the enumerated variables according to calculations.

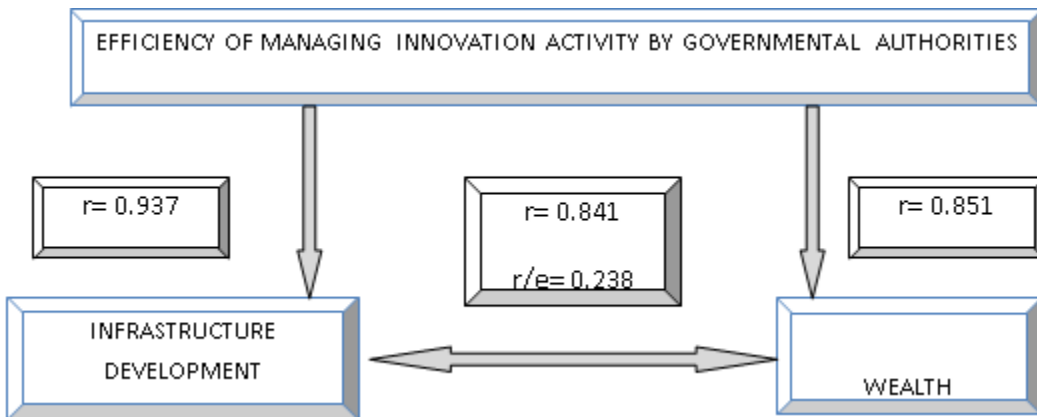


Figure 1: Model of Government, Population and Business Cooperation (Based on Relevant Indicators that were Provided)

### Linear Correlation between the Efficiency of the Governmental Authorities' Innovation Activity Management and Volume of Wealth

The coefficient of linear correlation between the development of innovation infrastructure and GDP per head (wealth) is +0.841. It means that it is possible to negate the hypothesis about the independence of variables with the error probability less than 0.0001. The sign before the correlation coefficient is stipulated by the fact that the index of the efficiency of managing innovation activity in the infrastructure reflects high profits by its utmost value.

Due to this, it is possible to note that the country is wealthier under conditions of the well-developed innovation infrastructure. The correlation coefficient between the efficiency of the governmental authorities' management of innovation activity and wealth (0.851 that is close to the previous level of assurance) is a little higher. It means that the wealth of the country grows due to a higher level of the innovation activity management.

### Linear Correlation between the Efficiency of the Government Authorities' Innovation Activity Management and the Level of Innovation Infrastructure Development

The coefficient of linear correlation between the efficiency of the governmental authorities' management of innovation activity and the development of innovation



infrastructure is +0.937. In case of negating the hypothesis about the independence, the error probability differs after the null in the fourteenth sign after the dot. In this case the dependence is extremely high and approximates to the functionality. Based on this, it is possible to see that high efficiency of the governmental authorities' management of innovation activity almost completely provides the development of innovation infrastructure.

### **Transfer from Pair Correlations to Net Correlation**

The picture changes in case of transferring from pair correlations to partial ones. It is necessary to note that the analysis of partial correlations made before cannot act as the exhaustive proof of causal relationships between the considered variables (the nature of statistical inference).

According to the result, it was revealed that while taking into account the efficiency of the governmental authorities' management of innovation activity as the controlling one, the variable of the correlation between the development of the innovation activity and GDP per head decreases (from 0.841 to 0.238) and is not crucial (the confidence figure is 0.107). It means that the correlation between the development of the innovation infrastructure and the wealth of the country can be called false and defined by the third variable - the efficiency of the governmental authorities' management of innovation activity. The increase in the efficiency of the governmental authorities' management of innovation activity will stimulate the development of the infrastructure and growth of wealth that is expressed as GDP per head in the republic. If we take GDP per head as a controlling variable and consider its influence on the correlation between the efficiency of the governmental authorities' management of innovation activity and the development of the innovation activity, it is defined that there is no considerable fall of the correlation: from 0.937 to 0.777 (in this case the confidence figure is less than 0.0005).

The same effect will be observed if the controlling variable is the index of the innovation infrastructure development. When studying its impact on the correlation between the efficiency of the governmental authorities' management of innovation activity and GDP per head, a bit higher fall of correlation will be observed (from 0.851 to 0.355). However, this partial correlation shows statistically crucial relation (the confidence figure is 0.021).

### **Results of Researching the Model of Business, Population and Government Cooperation**

Thus, it is defined that the efficiency of managing innovation activity of governmental authorities is a primal cause that affects the development of the innovation infrastructure of the country and growth of its wealth.

## **DISCUSSION**

Due to the insufficiency of own funds at enterprises, the latter cannot both implement innovational products in the production process and modernize their own technical and technological base. Such implementation is quite a difficult process without its updating [14]. Measures of the state support proposed to be implemented in order to stimulate enterprises to update their own production technologies and technological processes are as follows:

- Providing long-term leasing financing for the period of up to 10 years with the rate of not more than 7%, and the proper funds of not less than 10%,
- Providing subjects of small (medium-sized) business with subsidizing the interest rate according to loans for the innovation activity (3-5% for small and medium-sized business),
- Providing state guarantees for obtaining bank loans by enterprises for the innovation activity,
- Providing state orders for R&D in the top priority sectors, including those for small (medium-sized) business,
- Grants for joint development activity of research institutes, higher educational establishments, and enterprises.

Taking administrative measures for the implementation of technological regulations that will comply with progressive technologies according to the level of the efficiency and energy-saving, high production ecological standards, and high penalties for polluting the environment can also serve as incentives for updating the production capacity of national enterprises [15]. The exercising of the right of referring all expenses for R&D to the products prime cost when paying the income tax by enterprises can be regarded as indirect economic measures of the state for activating enterprises in the area of the innovation activity.

In case of the lack of a stable demand for the innovational products, the development of manufacturing innovational products is rather difficult both on the internal and external markets. At the stage of creating the innovation system this demand for innovational products in the country can be generated by the state governmental authorities through the creation of the governmental order for acquiring innovational products [16]. JSC "NATD" plays an important role in forming the governmental order. Functions of JSC "NATD" must include (on a piecemeal basis):

- Revealing problems of the industry development,
- Development of the academic and technological plan that must be approved by the Ministry of Industry and New Technologies on the basis of studying the needs of national enterprises,
- Concluding trilateral agreements between JSC "NATR", enterprises and higher educational establishments (research institutes) for carrying out scientific

researches according to the established academic and technological plans.

Agreements will define the list of products that can be manufactured at the existing or newly established enterprises of Kazakhstan. Defining the needs of national enterprises in innovational products in such a manner, JSC "NATD" can conclude an agreement on obligatory purchase of the manufactured products according to the approved list.

The interrelation of universities and entrepreneurship sector can be strengthened by implementing joint research projects, commercialization of researches results [17]. Universities must aim their efforts at revealing the demand of enterprises of the region for innovational technologies to ensure the demand for future projects and technologies as well as for the inflow of investments in scientific projects. According to the authors, this interrelation can be carried out due to such mechanisms as attracting leading specialists from the production area for conducting the required special courses for teachers and students, creating educational project laboratories at enterprises, short-term probations of teachers at the leading enterprises of the region.

According to the author, the basis for implementing the research and innovation activity in the educational process can be the reconsidering and updating of educational academic programs in order to direct them to the formation of students' basic skills in conducting researches and creating new forms of practice. Higher educational establishments must more actively attract specialists and experts of the sector of students' scientific work production for guidance and delivering lectures at universities [18]. In the educational area the foreign experience in carrying out the research and innovation activity must be a basis of support. In order to do so, it is necessary to implement modern communicational and informational technologies by libraries of higher educational establishments. These technologies provide access to scientific articles and scientific and technical information of electronic databases of the international level.

## **CONCLUSION**

Perspective direction in the area of cooperation between universities and industrial sector in carrying out joint researches includes the formation of business incubators, technoparks, offices or centers on commercializing technologies (that are meant to create the required conditions for entrepreneurship in the scientific area: marketing, patent and licensing, consulting, material and technical services) on the basis of universities as well as the provision of the experimental base, informational and educational support. The Ukrainian experience on creating technoparks at the leading institutes of the National Academy of Sciences is of great interest. They act as virtual structures that operate in the regime of special economic zone, have additional fringe benefits on taxation of income, interest free crediting, accelerating amortization, etc.

Thus, insufficiently effective mechanism on attracting the private sector of economy to the increase in the scientific potential, low activeness in the area of scientific

developments on the part of the market members are still weak points for the whole R&D system in Kazakhstan. Whereas the key factors for achieving and maintaining advantages on the internal and external competitive markets include the creation and implementation of new science-driven products and services in the production area [19]. Based on the foreign experience and the above analysis, it is possible to state that the internal system of the country in the area of creating and promoting innovations can be efficient and can generate higher revenues only when the country has a developed sector of entrepreneurship [20].

According to the President of the country N.A. Nazarbaev, "it is necessary to improve the law on venture financing, protection of intellectual property, support for researches and innovations and commercialized inventions. It is necessary to entirely use the attraction of foreign investments for the transfer of knowledge and new technologies in our country" [2].

Foreign investments can be made in the innovation activity in the form of international programs on scientific and economic cooperation as well as in the form of private investing from foreign financial structures and individual entrepreneurs [21].

For the purpose of speeding up the involvement of entrepreneurship in scientific environment, it is necessary to develop the mechanism of state and private partnership (hereinafter referred to as the S&PP). This is an organizational and institutional alliance of the state and private structures, international financial organizations and other institutes. S&PP is a future guarantee of creating the competitive sector of the country in the area of researches and further developments that will ensure the transformation of economy on the innovational rails, and a higher level of the innovations development [22]. Herewith, when searching for partners, it is necessary to focus on large innovational enterprises that can achieve and maintain the level of innovational development under the conditions of the state's fulfillment of regulative role required by the country economy.

The above tool on activating the innovation activity is actively used in foreign countries and proved its efficiency on a practical basis. According to the analysis of 48 projects made by the Economic Commission for Europe of UNO implemented according to the S&PP scheme, it was defined that 80% of these projects happened to be realized in the lower volume in comparison to the expected budget, 60% of the projects have been completed before the target term with a decrease in the payment for applying and improving of business. On the other part, 64% of projects that were implemented by the state governmental authorities have been completed later than the set term.

The scheme of S&PP assumes a great role for the entrepreneur. This is the entrepreneur who must be the party interested in creating and implementing the innovational product at the enterprise. However, as it was noted, the activity of national enterprises in the area of innovations is still low. The state must take measures for increasing motivational aspects of the private area and its involvement in the innovation

activity.

## ACKNOWLEDGEMENT

We are greatly thankful to the experts for appropriate and constructive proposals provided to improve our research.

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