Proceedings of
the 31st International Business Information Management Association Conference

(IBIMA)

25-26 April 2018
Milan, Italy

ISBN: 978-0-9998551-0-2

Innovation Management and Education Excellence through Vision 2020

Editor

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International Business Information Management Association (IBIMA)

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Technological Modernization of Kazakhstan In the Face of Global Challenges

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Abstract

The paper investigates the level of technological modernization in Kazakhstan. Technological progress and modernization, as well as the accompanying them knowledge, are the main drivers of the modern economic growth. A new economic reality is impossible without increasing the innovative component, as a factor of competitiveness of domestic enterprises and the country as a whole. Countries with developed economies demonstrate a high activity of innovative processes, where technological innovations are transformed into a determining factor of economic growth and social development of society. The analysis may be of interest to the different governments of developing economies like Kazakhstan in terms of choosing the necessary strategies.

Keywords: technological modernization, global competitiveness, intellectual and technological potential, innovative sphere, integration of science, education, business

Introduction

Nowadays there are number of key priorities that determine the main directions of sustainable economic development of Kazakhstan. They are the accelerated technological modernization of the economy, the creation of new industries and the further development of traditionally core industries, like mining and metallurgy, oil and gas, agriculture and construction, the growth of the Eurasian logistics infrastructure, the modernization of the labor market and productivity growth in all segments of the economy, significant improvement and expansion of the business environment.

The main priorities for increasing economic growth are outlined, namely the conditions for the successful implementation and functioning of the high-tech economy are:

- Intellectual and technological potential, generating and launching innovations;
- Institutional and technological system, focused on innovation in the economy and the demand for innovation by business entities;
- The level of economic development of the country, financial support from the state.

In a research study by Heeks and Stanforth (2015) technology has always been considered as a central role in socio-economic development, and therefore technology change was seen as an important component of development strategies around the world. There are several layers of the problem of technological and innovation development for Kazakhstan. First of all, the ability to generate new knowledge requires a high level of development of fundamental science. Secondly, there is the ability to transform fundamental knowledge into applied research and development that can be demonstrated to the businesses. Thirdly, there is the presence of demand for new solutions and technologies from business entities. As discussed by Akhmetzaki and Mukhamediyev (2017) they can be obtained through

the inflow of FDI into the country. Their social effects were investigated by Rakhmatullaeva et al. (2015). Fourthly, there is the existence of institutional conditions (especially the protection of property rights), which encourage the researchers to commercialize the results of their research. But Mau (2010) insists that the main point is still the concentration of people who are able to engage themselves in creative search, people who ask non-trivial questions and search answers to them.

In recent years, Kazakhstan has created an institutional infrastructure for National Innovation System. With the adoption of National Program of forced industrial and innovative development of the Republic of Kazakhstan, the economy has taken a course towards the transition to large-scale industrialization as a stepping stone for an innovative economy. The undertaken reforms have shaped the country's innovative infrastructure. A specialized institute for innovation issues "National Agency for Technological Development" (NATD) was set up, regional technological parks, venture funds and development bureaus were created.

The adoption of a new Law "On State Support of Industrial Innovative Activities" in 2012 was an important move in the innovation sphere of the country. According to NATD report (2013) the Law has improved the terminology in the field of innovation in accordance with international standards; it more clearly distributes the competencies of state institutions, it structured the composition of the industrial-innovative system, expanded and listed the legislative measures of state support for industrial innovation activity. As a result of systemic government efforts innovations were identified as a strategically important direction for the development of economy of the Republic of Kazakhstan.

The Research Method

World Economic Forum (WEF) annually publishes a report on global competitiveness, which is based on more than 100 indicators and grouped into 12 pillars. These pillars fall into one of three groups: "Basic requirements", "Performance enhancers" and "Innovations and business development level". According to WEF Global Competitiveness Report (2017-2018) Kazakhstan's overall level competitiveness fell to 4.35 in 2017 year, from 4.41 compared to 2016 year. Decrease in a number of indicators affected the overall position of the republic in the ranking: it dropped from 53 places among 138 countries to 57 among 137.

Nikonorov (2017) also analyzed negative factors that directly affected the competitiveness of Kazakhstani companies. In 2016, the WEF put Kazakhstan at 97th place in this pillar with an index of 3.6 (out of maximum of 7). A year later, the republic dropped 11 positions, although it managed to maintain its overall rating. At the same time, Kazakhstan has become worse for each of the nine indicators of Business sophistication pillar.

Table 1: Kazakhstan ranking Business sophistication pillar

	Business sophistication indicators	**2016**	**2017**
1	Local supplier quantity	113	114
2	Local supplier quality	97	102
3	State of cluster development	119	126
4	Nature of competitive advantage	90	101
5	Value chain breadth	114	121
6	Control of international distribution	79	99
7	Production process sophistication	70	82
8	Extent of marketing	88	97
9	Willingness to delegate authority	54	72

Source: Authors based on Global Competitiveness Reports 2016 and 2017

In the last year in terms of its innovation potential, Kazakhstan's ranking decreased from 73rd place to 84th place in the world raking with an index of 3.2.

Table 2: Kazakhstan ranking Innovation pillar

	Innovation indicators	**2016**	**2017**
1	Capacity for innovation	73	84
2	Quality of scientific research institutions	63	78
3	Company spending on R&D	61	95
4	University-industry collaboration in R&D	66	75
5	Government procurement of advanced technology products	55	73
6	Availability of scientists and engineers	64	66
7	PCT patent applications	69	68

Source: Authors based on Global Competitiveness Reports 2016 and 2017

In category of company spending on R&D Kazakhstan lost 34 positions, taking its place at the end of the first hundred (leading to a decline in the index from 3.4 to 3). Quality of scientific research institutions has also changed significantly - according to the WEF report, Kazakhstan ranked in 78th place in the world losing 15 positions.

Despite certain changes in the implementation of institutional reforms, innovation is still in vain for Kazakhstan's economy. Key problems are identified in a number of articles, the following are the significant ones among them discussed in Decree of President of Republic of Kazakhstan "On the approval of the Concept of Innovative Development of the Republic of Kazakhstan until 2020" (2013):

1. Lack of understanding of the components of innovation and how to develop innovations in the industry, universities and the public sector. Expenses of technological parks are still higher than their revenues;
2. There is no established mechanism for the demand for innovation, as well as a mechanism for public-private partnerships. Policies on innovative development do not meet the requirements of industries;
3. There is no connection between Kazakhstan's small and medium-sized enterprises with global "value added" chains and the processes of forming industrial clusters.
4. There is no effective mechanism for the protection of intellectual property, resulting in weak participation of the private sector in innovation. The banking sector is not inclined to allocate "long-term" loans.

JSC "National Agency for Technological Development", together with the Ministry of Investment and Development of the Republic of Kazakhstan, developed the Strategy for International Cooperation in Science, Technology and Innovation of the Republic of Kazakhstan until 2020. Despite the government efforts the development of technological innovations in Kazakhstan is not yet a source of economy's modernization and driver of its competitiveness. One of the problems of modernization in the republic is a small share of innovative-active enterprises. According to the Agency of Kazakhstan of Statistics, they accounted for 8.1% of all Kazakhstani enterprises in 2016. The share of innovative products in relation to GDP over a ten-year period remains at a very low level, from 1.27% in 2004 to 0.92% in 2016.

There are various methodological approaches to assess the level of development of the innovative economy, in particular, the methodology for assessing the index of the scientific and technical potential calculated by WEF, the system of indicators for assessing innovation activities of the Commission of the European Communities, the system of OECD indicators, etc. All methods for assessing innovation capacity or the level of development of innovative economy distinguish such a quantitative feature of the innovative economy as the share of innovative enterprises and innovative products in total production or in the structure of foreign trade. And this is not accidental. Corporations play a significant

role in the development of the innovation economy. Government investment in innovation can't be compared with corporate investments in terms of costs, the number of scientific personnel, the number of patents received, and the flow of technical innovations in the form of products, processes and services. According to experts from CompTek (2017), the share of corporate expenditures on research and development in the total volume of national R & D exceeds 65% in most developed countries.

The task of forced industrial and innovative development of economy and the transition from raw materials dependent economy to industrial-innovative economy requires an improvement in the quality of human capital.

Table 3: Indicators of the current state and development of science in Kazakhstan

SCIENCE	2000	2010	2015	2016
Internal costs of research and development work, (in million Tenge, current prices)	4 706,8	33 466,8	69302,9	66600
Number of enterprises that work on R & D, including:	257	424	390	383
– government	151	95	78	100
– higher education	59	121	112	103
– private profit sector	40	108	110	149
– private non-profit sector	7	100	41	31
Number of employees engaged in R & D, people	14 756	17 021	24735	22985

Source: Authors based on data from Agency of Kazakhstan of Statistics

To implement large-scale innovation projects, highly skilled specialists, scientists-innovators, who create and generate innovations, are needed. Lack of highly qualified specialists requires effective and aimed support from the state in the field of scientific personnel training.

The urgent problem on the agenda of Kazakhstani science is how well enterprises are equipped with modern devices and equipment. In regards to this issue, it is necessary to increase the financing of acquisition of new scientific equipment for universities and research institutes. In addition, a monitoring system on the development of Kazakhstan's technological base and its condition is needed.

The technological backwardness of many enterprises and sectors of the economy is explained by extremely weak research activity on the creation of new science-intensive technologies. It is necessary to improve the system of state management of the scientific and technical sphere. It should correspond with goals of innovation, modernization and technological re-equipment of the real sector of the country's economy. An approach that has become widely known in the global market as a "project management" should be introduced.

Developing countries need to develop greater technological capacity and greater flexibility to succeed in these complex and asymmetric global conditions. Unfortunately, most developing economies do not have necessary recourses to compete with developed countries. In general, Dahlman (2006) suggests that the world will be better off if developing countries would focus on expanding their education, infrastructure and technological capabilities.

Estimation Results

The current state of Kazakhstan's economy shows that the structure of the economy requires diversification, because it is still at the stage of pre-industrial and industrial development. The country is dominated by extractive industries; there is a technological and innovative backwardness of the majority

of economic entities, especially small and medium-sized ones. The excessive monopolization of strategic facilities is another problem. A serious lag in the renewal of the production capital of the main industries that determine the country's innovation reserve, as well as structural disproportions of the economy, hinders the formation of a modern technological structure and the corresponding innovation environment.

Cyclic fluctuations and unfavorable conjuncture in commodity markets are accompanied by a further fall in domestic production. Bukeeva et. al. (2016) shows statistical data to justify their concerns, GDP growth rate ¬ from 2015 to 2016 was 1.0% (0.6% for 10 months in 2016, 0.8% for 11 months in 2016). After 3 years of instability economic situation is stabilizing with synchronous improvement in almost all segments of economic activity According to the preliminary results published by Forbes Kazakhstan (2018) GDP growth in 2017 was 4.0%.

The global financial crisis has literally brought down the value of the national currencies in a number of developing countries, including the Kazakhstani tenge. This was accompanied by a sharp decline in lending activity of commercial banks. Change of the National Bank's monetary policy to the inflation targeting, which implied transition from fixed to flexible exchange rates, in essence, delayed or dropped the implementation of many investment projects. The currency component in financing of these projects was high. Many of the initiated projects were frozen because of new policy changes. For example the projects in the field of development of renewable energy sources (RES) were halted.

The topics of re-activating banks' long term financing of the real economic sector and "lifting" the current currency restrictions are widely discussed in the scientific and expert community of Eurasian economic union (EAEU) member countries. In order to solve the problems of shortage of money in the economy and high interest rates on loans, the President set the task of "resetting" the financial sector of the country.

Further industrial and innovative development of the economy of the Republic of Kazakhstan requires the accelerated development of engineering centers, national laboratories, and technological parks within the framework of research universities.

One of the main sources of innovation creation is small innovative businesses. The number of small enterprises as of January 1, 2018 amounted to 1145 thousand (Table 4). During the last years number of SMEs is decreasing. Despite the fact that the number of small and medium-sized enterprises increased over the past 10 years, but their contribution to the economy remains relatively small. For comparison, in the economic and social life of industrialized countries small businesses play an exceptionally important role. In the European Union, about 20 million of small and medium enterprises provide employment for about 70% of the population, and contribute to more than 60% of GDP. In the US, more than 15 million small enterprises produce over 40% of the gross national product, employing more than 50% of the population.

Table 4: Number of operating SMEs in Kazakhstan

As of 1 January	**2014**	**2015**	**2016**	**2017**	**2018**
Number of operating SMEs	871 497	899 968	1 289 683	1 186 629	1 145 994
% change		3%	43%	-8%	-3%

Source: Authors based on data from Agency Statistics RK

Among the all measures taken by the government to support small and medium business in the country, it is worth noting the implementation of the Business Road Map 2020 program. The program aims to ensure sustainable and balanced growth of regional entrepreneurship in non-primary sectors of the economy, as well as maintaining existing and creating new permanent jobs.

Within the framework of this program the following actions are considered: the reduction of tax burden; legalization of property and assets; simplification of administrative procedures and permits; protection from bureaucratic obstacles, facilitating access to getting credit resources. Considering the problem of expanding entrepreneurs' access to financial and credit resources, it should be noted a decrease in lending rates. The Entrepreneurship Development Fund "DAMU" was established for the purposes to provide financial support for the development of small and medium-sized businesses. According to news published on Customs Information Portal (2018) it constantly works on improving financing instruments, including the development of microcredit instruments.

Developing countries should work to get as many benefits as possible from this demanding globalised world. Dahlman C. (2006) stated four main actions to be taken. First, more investments should be poured into human capital. The author emphasizes the importance of secondary, technical and higher education and a system of life-long learning. Second, the countries should invest more in physical and information and communication technology (ICT) infrastructure. Traditional physical infrastructure like roads, ports and airports is needed to be connected with other economies. The role of ICT infrastructure is increasing and it is already very important for competition in the new real-time world. Third, improvements in the economic and institutional regime is required – the rule of law, the efficiency of capital and labour markets. Fourth, improvement in governance support – the government should be able to help its citizens and entities to respond successfully to the new challenges and to help when they are struggling.

Thus, it should be noted that modern technological modernization and innovations in Kazakhstan are at the initial stage of its development. Today, this market is formed through the transfer of technology, the creation of state development institutions, the participation of businesses, research centers and universities in innovative projects. When the state and society are oriented towards an innovative way of development, then there is no other source of innovation than interaction and support of science, education and business in solving these problems, unless it becomes completely dependent on the importing of ideas, concepts and technologies. In solving the set of tasks on the way of modernization and innovative development of the society, the main goal should be the desire to create an economy based on systematic interaction and integration of science, education and production, as well as entrepreneurial activity of business structures. At the same time, it is extremely important to use reasonable government support to ensure that innovations and new technologies become an effective factor in the economy's recovery.

Conclusion

An effective national innovation system requires the development of a national innovation policy that coordinates innovation activities and determines strategic priorities such as:

- Creation of a legal framework for innovative processes and compliance mechanisms
- Formation of the institutional and information infrastructure in the field of innovation;
- Support of the innovation process with the necessary resources, scientific, technical and personnel;
- Creation of mechanisms for stimulating and encouraging innovation; attraction, accumulation and distribution of financial resources.

Regardless of the scale of their implementation system transformations require a clear action plan. Therefore, to transit the economy to an innovative way of development, the government needs to develop a strategy that will regulate the sequence of ongoing reforms in the framework of technological modernization of the national economy

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