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ANALYSIS OF TECHNOLOGIES MARKET IN KAZAKHSTAN

The article considers the scientific and methodological frameworks of the technologies market in Kazakhstan. Its current state is analyzed. Specific factors and methodological issues in overcoming the difficulties encountered in the technologies marketplace are studied.
Keywords: *technologies market; science; Kazakhstan.*

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АНАЛІЗ РИНКУ ТЕХНОЛОГІЙ РЕСПУБЛІКИ КАЗАХСТАН

У статті розглянуто проблеми та науково-методичні основи ринку технологій Республіки Казахстан. Проаналізовано сучасний стан ринку технологій, досліджено специфічні фактори та методологічні питання подолання труднощів, що виникають на ринку технологій.
Ключові слова: *ринок технологій; наука; Казахстан.*
Рис. 2. Табл. 1. Літ. 19.

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АНАЛИЗ РЫНКА ТЕХНОЛОГИЙ РЕСПУБЛИКИ КАЗАХСТАН

В статье рассмотрены проблемы и научно-методические основы рынка технологий Республики Казахстан, а также проанализировано современное состояние данного рынка. Исследованы специфические факторы и методологические вопросы преодоления трудностей, возникающих на рынке технологий.
Ключевые слова: *рынок технологий; наука; Казахстан.*

Problem statement. One of the most topical issues for any national economy is increasing industrial competitiveness by means of technological re-equipment and increase in science-intensive sectors of production which create high added value.

The key priority for any national economy nowadays is the creation of technologies which would significantly increase labour productivity, flexibility of production capacities, save energy and other resources, improve labour conditions, reduce harmful effects on the environment – and overall, would lead to national competitiveness growth. To solve these tasks information and communication technologies are always needed since they significantly save time for the development of new products, help organize production processes more efficiently, and are also widely used in personnel training and retraining.

In this context topical and needed would be the research on the national market of technologies in the Republic of Kazakhstan.

Analysis of the recent research studies on the issue. Theoretical and practical aspects of technologies' markets development have been considered in the works by A.A. Abishev (2011), A. Avdulov and A. Kulkin (2005), U.B. Baimuratov (2005), V.L. Inozemtsev (2000), V.G. Klinov (2006), Z.A. Salzhanova (2002), J. Shumpeter (2007) and many other foreign and Kazakhstani authors.

Research aim is to study the national market of technologies in the Republic of Kazakhstan.

Key research findings. In the contemporary understanding "technology" is the systematized application of scientific organized knowledge for solving practical tasks.

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The notion "technology" includes not only scientific, technical and production knowledge, but also the knowledge related to management and organization. Thus, the notion "technology" covers, first of all, knowledge, in any form presented. This knowledge can be, inter alia, represented as the results of intellectual activity in science and/or production, or as the objects of industrial and/or intellectual property along with related documents (patents, certificates of authorship etc.), as well as knowledge and experience, not protected legally but still falling into the category of "know-how" (Anchishkin, 1989).

There are various approaches to defining technology. However, the most universal and the most simple of them would be: technology is a means of converting an input object into a ready-made product.

The term "technology" in its narrow meaning stands for technical information presented in patents, or technical knowledge, transmitted in a recorded form. In a wider sense, "technology" is determined as a set of skills, knowledge and procedures necessary for the creation and use of economic goods.

Therefore, by analogy with J. Shumpeter's (2007: 24) definition, "technology" is the process of formalization and objectivization of "new combinations of production factors or innovations".

In this context technologies can be divided into technology, embodied in material objects, and technology, not embodied in them.

Also, there can be technologies of production processes (process technologies), technologies of products (product technologies) and technologies of management (managerial technologies). This list can be also added by resource-saving technologies, consumption technologies, information and other technologies which are getting more and more importance in today's world (Avramenko, 2004).

All classifications of technologies have much in common; in particular, all of them differentiate between technologies embodied materially, in economic goods (products, commodities etc.) and the technologies attributive to people (personnel).

Therefore, technology is the combination of technical and organizational decisions, knowledge, skills and abilities. And the development of technology is the engine in economic development. Opportunities for industrial development, basing on new technologies, nowadays are in the center of public authorities' attention due to the urgent need to improve the research and technical infrastructure in the country.

The leading and the world largest exporter of technologies is the USA, for many years already. Traditionally, the US is taking the leading role in the trade of scientific and technical knowledge in the forms of patents and licenses. Positive balance in this trade also have the UK and Switzerland. Japan which used to be, back in 1950–1980, one of the world leading consumers of technical discoveries, at the end of the last century has created all preconditions for staying in this group of countries for good. The same can be said about Germany.

The central element of the market economy is the market itself. Technologies market is an integral element of it, being in constant close interrelation with various markets of production factors. This is predetermined by the fact that technology and capital as economic categories have much in common: technology, just as capital, is an integral part of production means. However, technology market is a separate mar-

ket due to the specific nature of knowledge and its ability to create a product of absolutely new quality (Kenzheguzin et al., 2005).

Technology market in itself is a combination of economic relations related to the formation of demand and proposition, creation and transfer of technologies, supported by corresponding institutes and mechanisms. The character and the forms of technological exchange are predetermined by the contents of a particular technology and the level of its maturity, and also by sectoral peculiarities of its application, by strategic and tactical goals within the technological policy of the corporate sector and/or national economy, by interests of technology's developers.

Within the framework of one and the same economic system there can coexist several models of markets, each would have its own level of maturity, own market regulation mechanisms, its own place within the markets' hierarchy. And all of this is thus describing a particular market profile. Each of these markets has common factors, attributive to all, and also specific, unique factors of development.

In our case, describing the technologies market we need to emphasize on the range of the following specific factors:

- The level of fundamental and applied sciences development.
- The organizational gap between science and production.
- The technological and structural organization of the economy.
- Available technologies' competitiveness at international markets.
- The level of infrastructure development for technologies' market.
- How developed is the institutional environment of the technologies' market.
- Legal protection of intellectual property.
- Presence of foreign capital at the market.
- How well developed and specific is the technological policy.

Combined, all these factors outline the real opportunities for the formation of the economy of an innovative type, in which technological exchange in its wide sense takes the leading role.

Innovative economy is characterized by a particular set of factors and conditions interacting with it and forming a vital environment for it. Generally speaking, the major factors of the national market of technologies can be divided into: science, economy, the state, business and society. Let us consider each of these factors and their current state in Kazakhstan in particular.

1. Science. Considering science as one of the key factors in economic reforms, we need to pay special attention to the volumes of financing for scientific and technical potential development as compared to other countries, and also – as a share in GDP (two key indicators here: the share of science-intensive production in its total and the share of national expenditures on science development). In general, during the last decade in many countries with developed economies the share of national total spending on research and training of specialists for science has been around 3% of GDP volumes: in Sweden – 3.8%, in Finland – 3.5%, Japan – 3.04%, Switzerland – 2.73%, USD – 2.84%, Germany – 2.44% (Science and innovative activities..., 2014).

As can be seen from Table 1, in 2009 Kazakhstan's spending on R&D was almost 39 mln KZT, and in 2013 – already 61,672 mln KZT. The share of science spending in 2009 was 0.23% of GDP, and in 2013 it was 0.18% of GDP (Isabekov, 2009).

Table 1. **Dynamics of R&D spending in the Republic of Kazakhstan,** *constructed on the data from* (Isabekov, 2009)

Indicators	Years				
	2009	2010	2011	2012	2013
GDP, bln KZT	17,007.6	21,815.5	27,571.9	30,347.0	35,275.2
Spending on R&D, mln KZT	38,988.7	33,466.8	43,351.6	51,253.1	61,672.7
Share of spending on R&D as % of GDP	0.23	0.15	0.16	0.17	0.18

In most countries, known for their science-intensive production, spending on science in general and its share in annual GDP is strictly controlled, taking into account such priorities as tax preferences, low customs duties, various forms of public budget support, preferential leasing projects for research equipment etc. As the experience of such developed countries shows, new technologies, equipment and products in general, that is new knowledge and new solutions, in total give about 70–85% of GDP growth annually. For comparison, the shares of science-intensive national product at the world markets are: the European Union (total) – 35%, the USA – 25%, Japan – 11%, Singapore – 7%, South Korea – 4%, China – 2%, Russia – 0.3% (Philosophy and methodology of science, 2009).

Macroeconomic analysis, carried out with the emphasis on science and technical development, shows that in Kazakhstan in recent years the share of scientific and new technical products in GDP, considering only those products which are adequate to the current world advanced level, does not go over 1.1%. The share of enterprises research and inventions activities in the total activities is no more than 2.5%, thus showing, indirectly, that for economic development of Kazakhstan science and research are definitely not the key factors.

Roughly the same is the situation with the activities of public enterprises (0.6%); while private enterprises are a bit more active (though not sufficiently yet, 3.7% only). The best performing are the enterprises with joint property (domestic and foreign) – 5%. In general, we can state that science and research are very much aside from economic reforms in the country.

2. Economy. In 2013 Global Competitiveness ranking (by the World Economic Forum) Kazakhstan got the 50th place (out of 148), thus improving its rank (as compared to 2011) by 22 positions (weforum.org). Since 2012 in the WEF rankings Kazakhstan belongs to the group of countries for which development is determined by efficiency and innovative development.

According to the expert evaluation by the World Economic Forum, the competitive advantages of Kazakhstan for several years have been the following: labour market efficiency (15th place in 2013 as compared to 21st in 2011) and macroeconomic environment (23rd in 2013 as compared to 18th in 2011). The lowest ranks Kazakhstan got for the following positions: financial market development (103rd in 2013 and 121st in 2011), healthcare and high school education (97th in 2013 and 85th in 2011), enterprise competitiveness (94th in 2013 and 109th in 2011) and innovations (84th in 2013 and 116th in 2011) (weforum.org).

During 2005–2013 Kazakhstan's economy, despite generally positive dynamics, was developing twice more slowly than previously. During the last 8 years GDP of the

Republic in its real terms increased by 61%, while the growth rate reduced from 11% in 2006 to 6% in 2012 and 2013 (adilet.zan.kz).

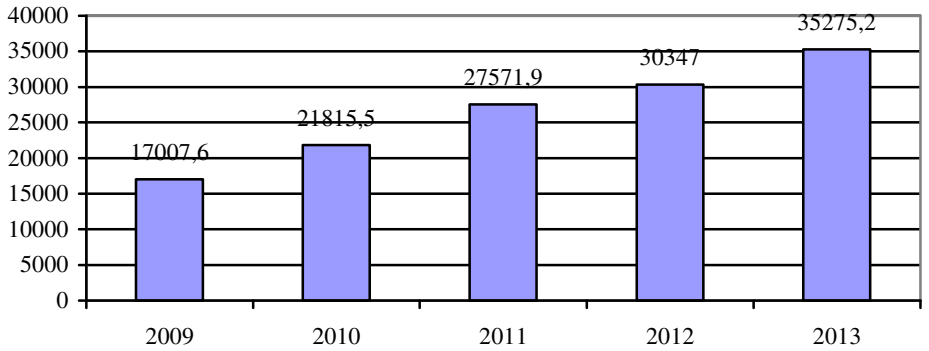

Figure 1. **GDP growth rates in the Republic of Kazakhstan, 2009–2013**, *bln KZT, constructed by the author on the data from* (Industry of Kazakhstan and its regions..., 2014)

As shown in Figure 1, in 2009 Kazakhstan's GDP amounted for 17,007.6 bln KZT, and in 2013 it was already 35,275.2 bln KZT. The key role in the economy's growth in the postcrisis period belongs to the services sector. In 4 years Kazakhstan's GDP in real terms increased by 28%, within which 19% belonged to services. At the same time the contribution of industries into economic growth was falling (by 5.7% during the same 4 years). Noteworthy, change in the share of the construction was, during the same period, very insignificant – 1.2% (Industry of Kazakhstan and its regions..., 2014).

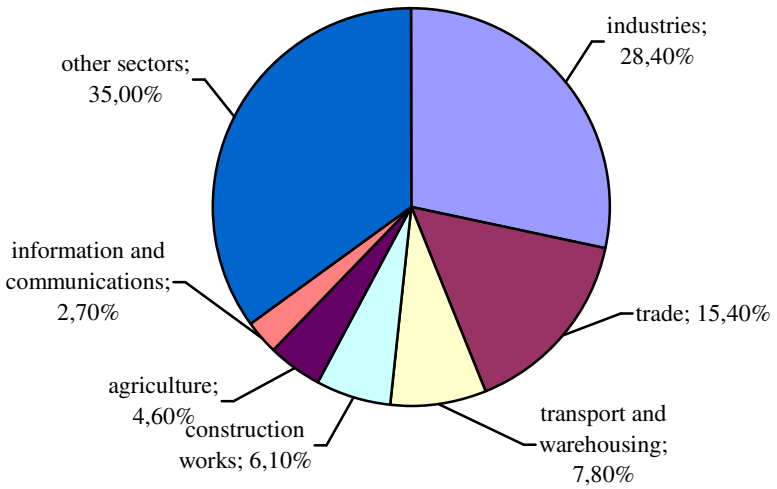

Figure 2. **GDP structure by sectors,** *%, constructed on the data from* (Industry of Kazakhstan and its regions..., 2014)

As seen from Figure 2, in 2013 in the general structure of GDP the share of industry was 28.4%, the share of trade was 15.4%, transport and warehousing – 7.8%,

construction and building – 6.1%, agriculture – 4.6%, information and communications – 2.7%; and all other sectors combined got 35%.

Obviously, the economy of our country is in great dependence from the extraction subsectors. Consequently, the whole economy is under the strong influence of external factors. During 2008–2013 the share of processing sectors in the general structure of GDP fell from 11.8% to 10.5%, and at the same time the share of non-raw materials exports reduced from 27.8% to 23.2% (Industry of Kazakhstan and its regions..., 2014).

Investments have to become the key factor supporting national economy's growth. State investments in the implementation of large-scale industrial and infrastructure project would positively influence the dynamics of internal demand. As of this year, the annual growth rate of investment is expected to be around 4.6%. Capital accumulation rate during 2014–2018 will stabilize at the level of 21.5% to GDP which is noticeably lower the same indicator in the precrisis period and which is obviously insufficient for the implementation of industrialization policy (On the State program of forced industrial innovative development..., 19.03.2010, # 958).

3. State. Active and permanent use of scientific potential is vital for the country decision-making at both state and regional levels. Also, academia and professional experts should be engaged for unbiased expertize and analysis of future state programs, projects and legislation.

4. Business. The indicator of innovative activity in the country grew from 4% in 2009 to 7.6% in 2012. In 4 years spending on technologies innovations increased 10.5 times, from 313 bln KZT in 2009 to 326 bln in 2012, thus reaching the level of 1% of the country's GDP (On the approval of the Strategy..., 18.06.2014, # 674). Foreign investments in technological innovations increased 4 times – from 2.1 to 8.1 bln KZT, and thus their share in the total investment volume reached 2.5%. The total volume of innovative production also grew significantly – from 142.1 bln to 379 bln KZT. In 2012 the share of innovative products in the gross domestic product of Kazakhstan was a little bit less than 2%. To compare, in China the share of new products in the total volume of gross industrial production is 9.94%, however, in high-tech industries it reaches 20.3% (On the approval of the Strategy..., 18.06.2014, # 674).

Interaction of business, industries and science is getting closer during these years. The quantity of joint projects in R&D field grew from 235 in 2009 to 411 in 2012, that is by 75%. Noteworthy, the quantity of joint projects with research organizations grew more than twice – from 60 to 98, and the share of these projects in their total quantity is 23.8%. Also, the quantity of projects involving universities grew from 15 to 33, thus their share increased from 6.4% to 8% (Science and innovative activities..., 2014).

Support for innovative business also increased. During the period 2003 to 2009 about 180 innovative projects were supported, while in the period of 2010–2012 already more than 400 projects were supported (On the approval of the Strategy..., 18.06.2014, # 674).

Therefore, we can note that the state is taking action on the development of innovative economy. However, at present the national economy still has rather low

level of innovativeness, and thus further and more active state actions are needed, for stimulation of innovative entrepreneurship in particular.

5. Society. Population of the country needs to support science development and implementation of the most advanced technologies in real life practice.

Public support for science development in its various forms means that academia would get funds and other resources necessary for its reproduction and development:

- Financial resources – funds which the state, corporations and private persons are ready to allocate for R&D.
- Material resources (land, building, equipment, materials, energy) needed for carrying out research activities;
- Intellectual resources – any research activity is possible only when the society is able to provide the inflow of educated youth into science, and the level of professional training of this group of young people should be at least over the population average. Intellectual resources can be also refilled not only by young people. For example, in the USA the profession of a researcher is not that popular and financially rewarding as of businessman, lawyer or doctor, thus the most talented youth tend to choose other career options. However, American society is rich enough to compensate for this by means of attracting "research brains" from other countries, usually the developing ones. This phenomenon is known globally as "brain drain".

And finally, there is one more important resource which unlike the mentioned above cannot be measured or calculated, however, it is still of vital importance. This resource can be called symbolic, however, its meaning for science is not symbolic at all. And this is the public status of science as such, its prestige as a career option, public understanding of science as a necessary field of activities. In other words, society needs to appreciate the value of science, with its supreme goals being far more important that financial and reproductive ones. Formation of such a public attitude to science is an essential feature in the process of science institutionalization (Kuptsova et al., 2009).

In Kazakhstan it is obvious that public interest in science is low. To increase it, first of all, it would be necessary to make science-related professions more prestigious. Today living conditions of many scientists in the country leave much to be desired, and this issue needs to be taken care of.

Kazakhstan still have chances to join the leaders of global technological development in its most prospective directions. First of all, the country still has the fundamental scientific potential, needed for a technological breakthrough. The country's in-process stock still has technical and technological novelties which have the potential to become basic innovations to form the next technological mode of the country's development. Secondly, Kazakhstan generally has rather high level of population general education. Thirdly, vast territory of the country and versatility of its natural resources create favourable environment for the development, implementation and popularization of new technologies. Kazakhstan is still at the very initial stage of adapting to global technological and industrial integration, however, global innovative environment has already become an important factor in the country's development and introduction of high-tech innovations.

To sum up this study on the national market of technologies in Kazakhstan we can make the following **conclusions**:

1. In today's interpretation "technology" is the systematized application of scientific and organized knowledge for solving practical problems. The notion "technology" covers not only scientific, technical and/or production knowledge, but also knowledge of organizational and managerial nature.

2. Technologies market essentially is the unity of economic relations on the formation of demand and supply, creation and transfer of technologies, supported by the corresponding institutes and mechanisms. The nature and the forms of technological exchange are predetermined by the contents and the maturity level of technologies, sectoral specific features of their application, strategic and tactical goals of technological policies in the corporate sector and of the national economy, and also by the interests of technologies' developers.

3. In Kazakhstan in 2009 the R&D spending amounted to 38,988.7 mln KZT, and in 2013 it already amounted to 61,672.7 mln KZT. The share of spending on science in 2009 was 0.23% of GDP, and in 2013 it was 0.18% (Industry of Kazakhstan and its regions..., 2014).

4. During 2005–2013 Kazakhstan's economy, despite the positive dynamics, was developing twice more slowly, than before the crisis. During the last 8 years GDP of the Republic in real terms increased by 61%, and the growth rates were gradually getting more slowly, from 11% in 2006 to less than 6% in 2012 and same in 2013 (Industry of Kazakhstan and its regions..., 2014).

5. The interaction of business, industrial production and science is expanding and strengthening. The quantity of joint projects related to R&D grew from 235 in 2009 to 411 in 2012, that is by 75%. At this, the quantity of joint projects with science institutions grew more than twice – from 60 to 98, and thus the share of such projects in the total quantity of joint projects reached 23.8%. Also, an increase has been observed for the quantity of joint projects with higher education institutions (from 15 to 33), the share of joint developments with higher education institutions grew from 6.4% to 8% (Isabekov, 2009).

6. The state is taking serious actions on the development of innovative economy. However, as of today the national economy is still characterized by low level of innovative activity, thus the situation demands further state actions on innovative entrepreneurship stimulation.

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Стаття надійшла до редакції 27.05.2015.