

Innovation Management in the Kazakhstan Industrial Sector

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Abstract – In the current conditions of the national economy development, the attention is paid to the development of the industrial economy sector, since the competitiveness of domestic enterprises, the different market share, the effectiveness of innovations depend on this economic activity on the scale of the global economy. In our research we give a literature review of domestic and foreign authors, who studied the industrial development patterns and features of different countries, including the Republic of Kazakhstan. As a result of these studies, the theoretical and methodological aspects of the research are systematized and the conclusions are drawn.

Keywords – industrialization, national economy, economic system, state policy, innovation activity, competitiveness, industry.

1. INTRODUCTION

The industrial reforms taking place in Kazakhstan and other CIS countries have many complex theoretical and practical problems. These problems are caused by the specifics of the transition period of the entire economic system, the lack of theory and scientific generalization of world experience in ensuring its functioning and development. The reforming stage of the republic's industry during the transitional period involves fundamentally different laws, specifics and mechanisms concerning the conditions of the developed market, which requires new theoretical approaches and justifications. The lack of in-depth theoretical development of the principles and approaches of reforming the post-Soviet industry leads to slow reform efforts, numerous mistakes and miscalculations. This protracts the economic growth.

Considering the world competition and open economy, the sovereign development of Kazakhstan is possible if the existing economic potential of the republic is

rationaly organized. It must be done within the framework of the Eurasian community and with due regard to its advantages and disadvantages in the international labor division (Tychinskii, 2006; Clarysse et al., 2010; Ovsyannikov and Davydova, 2015). The new industrialization of the country at the historically critical stage of its formation presupposes a new economic system that is receptive to renewal, restructuring, innovation, creation and introduction of new technologies and products that increase the competitiveness of the production (Zinder, 1995; 1996; Armbrrecht et al., 2001). We are talking about the formation of a new national economic system based on new sources and rates of economic growth, the quality of the sector structure, the growth of labor productivity, rational differentiation of the population income, efficiency and quality of public administration. All of the above mentioned criteria should form a competitive national economy with a new strategic approach to the transformation processes in the country and a reorientation

of the state's policy of innovative industrialization and modernization as a general public interest (Kaplan and Norton, 2001; Bigwood, 2004; Bowonder et al., 2005).

State innovation policy is a set of activities aimed at enhancing innovation, increasing its effectiveness and wide use of the results in order to accelerate socio-economic development of the country and satisfy public needs. It includes three stages (Loshchilina, 2007; Vasin and Mindeli, 2011; Kussainov et al., 2015):

- the development of scientifically sound concepts (the system of views) for the development of innovative activity. It is carried out through analyzing the innovation potential of the state;
- determination of the main directions of state support for innovations;
- implementation of practical actions to achieve the goals aimed at increasing innovation activity.

The main direction of the state innovation policy is the creation of favorable economic, legal, organizational, information and social - psychological conditions for the implementation of innovative processes (Leyden, 2016; Krasnyuk et al., 2017; Arkolakis et al., 2018). These conditions and various methods of forming an innovation policy determine the main directions of state support for innovation.

The main direction of public support for innovation include (Drucker, 2014; Martin et al., 2015):

- assistance in scientific research (fundamental, exploratory, applied), mainly in the forward-looking areas;
- staffing of innovation activities;
- formation of innovative development contracts, providing an initial demand for many innovations, which are widely used in the market (internal and external);

- application of fiscal and other tools of state regulation that form stimulating effects of the external environment, which determine the need and effectiveness of innovative solutions for individual firms (enterprises);

- the intermediary role of the state in the organization of effective interaction between various science sectors (academic, industrial, university and factory) and stimulating cooperation in the field of innovative developments between industrial firms (enterprises, joint-stock companies) and higher educational institutions (universities, academies, institutes);

- coordination of regional innovation activities;

- creation of the legal framework for innovation;

The last two areas are important in terms of the extent of state support for innovation.

Despite the research conducted by economists in the context of theoretical and methodological aspects, the study of the innovation policy with regard to the competitiveness of national economies is insufficient. Thus, it creates ample opportunities for further research.

All this has determined the need of the research on modern approaches and mechanisms of innovation management in the industrial sector of the Republic Kazakhstan.

2. METHODS

The methodological and theoretical basis of the research are the works of foreign and domestic researchers studying the problems of innovative economic development, as well as functioning, transformation and state regulation of the industrial sector.

Scientific research and concepts that summarize the principles and mechanisms

for the transformation of the industrial economy sector in foreign countries were of great importance in the theoretical aspect.

3. RESULTS

At the present stage, a dynamic market economy development of the Republic of Kazakhstan is impossible without the creation of a state mechanism to support and stimulate innovation in the scientific and technical sphere. At present, it is scientific and technological innovations that determine the competitiveness of national goods and the entire economy as a whole in the global system.

It should be noted that state regulation of the innovation sector is connected with the investment policy of the state funding for fundamental research and high risk of innovative projects.

The state innovative policy is a combination of forms, methods, and directions of the state's influence on production with the aim of producing new types of products and technologies, as well as expanding the markets for the sale of domestic goods on this basis. Under the influence of innovation, the economy structure is changing. After all, by increasing the efficiency of the use of resources, some of them are released and redistributed to other activity areas.

Full integration into the world innovative progress is impossible unless the country has an adequate scientific and technological base, as well as mechanisms that ensure the innovation perception from abroad. The level and effectiveness of the country's inclusion into the international labor division are characterized by its position in the world markets of goods and services, as well as by the availability of qualified specialists. These parameters are determined by the exclusive possession of natural resources or other advantages. They are increasingly determined by the use of innovations that ensure the competitiveness of products. The most

important aspect of the national importance of innovation is the dependence of the global competitiveness of the national economy on the innovation development.

There is a need for state regulation of innovation processes not only due to their national significance, but also due to the economic content.

Thus, the need for state innovation management is indisputable. Another problematic issue is the choice of state regulation methods to be used. The main tools of state innovation management include the following:

- socio-economic, scientific and technical state policy forecasts in the field of finance, prices, money circulation, etc.;
- state-administrative, general economic and market regulators;
- state and regional programs, balance and models for economic processes optimization;
- public contracts and modern contract systems;
- regulatory mechanisms of the state enterprises activities, as well as organizations of other ownership forms (Bowonder et al., 2005).

[Figure 1 here]

V.A. Vasin and L.E. Mindel single out the following main functions of the state bodies in the innovation sphere (Table 1):

- accumulation of funds for research and innovation;
- coordination of innovation activities;
- provision of innovative activities ;
- formation of the scientific and innovation infrastructure;
- acceleration of the social innovation status;

- regional regulation of innovative processes (Loshchilina, 2007).

The State Program on Forced Industrial and Innovative Development of the Republic of Kazakhstan for 2015-2019 was developed in accordance with the order of the Head of State and approved by the Decree of the President of the Republic of Kazakhstan No. 874 of August 1, 2014.

The aim of the program is to stimulate diversification and increase the manufacturing industry competitiveness.

The key objectives of the program are:

- extensive development of manufacturing industry;
- efficiency acceleration and increase in value added in the priority sectors;
- assimilation of non-food markets;
- productive employment increase;
- introduction of new technology to the priority sectors of the manufacturing industry and creation of the basis for the future sector development through the formation of innovative clusters.

In 2016, they expected an increase in the value of exports of manufacturing products by 19% compared to 2015. The planned target for 2016 was 86%, but it actually reached 90.2% (Table 1). The labor productivity growth in the manufacturing industry was expected to be 22% in relation to 2015, in fact the productivity growth reached 131.7%, finally in 2016 - the planned growth was 101.3%. The volume of investments in the fixed assets of the manufacturing industry reached 834.1 billion tenge at the end of 2016. It was planned to receive 750 billion tenge. The operational data on reducing the energy intensity of the manufacturing industry at the end of 2016 were not made public. But according to the plan they were 98% in 2014, in 2011 the reduction reached 96%.

[Table 1 here]

In 2016, exports of goods and services showed negative results and decreased by 9.18 billion US dollars. The most significant drop was observed in the oil and gas industry, which was 85.6% of the total export fall (7 billion 858 million US dollars). Only 8% of the total export fall accounted for the metallurgical and chemical industries. The main reason for this was the price drop in the world markets by 15-20%. As a percentage, the chemical industry showed a decline by 27.5% at the end of 2016 compared to 2015 (Table 2).

In 2016, the export of the chemical and metallurgical industries significantly increased compared to 2015. The most positive dynamics was observed in ferrochromium and flat steel products. Crude zinc products had negative dynamics. The only product that showed a positive price trend in 2016 was refined lead, all other goods showed a negative price change.

[Table 2 here]

In 2016, it was planned to modernize 9 facilities and expand their production capacity. Table 3 shows the result of it.

The following projects located in Astana have been upgraded: production of soft drinks and production of sanitary-hygienic paper products (Table 3). In the Karaganda region, the project to repair the blast furnace No. 4 of ArcelorMittal Temirtau was completed. In the Akmola region, the project to create a Kazakh-Belarusian industrial and technological park for agricultural and communal machinery was completed, as well as the organization of assembly production of combines. As part of the cooperation expansion in the Caspian region, the West Kazakhstan region has implemented a project for the development of marine shipbuilding to develop new class vessels with a dry weight of up to 600 tons. In the East Kazakhstan region, a dairy farm and a technological equipment production plant of AES Ust-Kamenogorsk

Plant LLP have been modernized. In Almaty, the oil and gas complex, which produces export goods, has been reconstructed and modernized.

[Table 3 here]

In the future, large investment projects will be implemented in accordance with the proposals of business structures. The investment volume will be about 800 billion tenge. In the Almaty region, it is planned to create a production of aluminum profiles with the capacity of 12 thousand tons per year. In the Akmola region, a project to increase the production of rare-earth metals will be implemented. The production volume of the project will be 3000 tons of a bulk concentrate of rare-earth metals per year. In the East Kazakhstan region, there will be a project to develop the Aktogay deposit with the commissioning of new processing facilities for 85,000 tons of copper concentrate and 25,000 tons of cathode copper. The Bakyrchik deposit project on the production of cathode gold will be continued. Currently, people seek for economically viable technology. Investment projects will be implemented to create titanium slabs with the capacity of about 6,000 tons per year and ilmenite concentrate with the capacity of 15,000 tons per year. The production of nickel is now under consideration as it was not previously produced in Kazakhstan. The construction of a metallurgical plant at the Gornostaev deposit of cobalt-nickel ores with the capacity of 40,000 tons of commercial ferronickel is also being considered.

In the Karaganda region, the copper smelting plant is being reconstructed with the transition to a new hydrometallurgical technology. This will allow saving copper production volumes and ensure the mine age extension of the Zhezkazgan deposit with the capacity of 60,000 tons of cathode copper. In the Pavlodar region, the implementation of the Bozshakol development project will continue. In the

Kyzylorda region, the question of vanadium production is under consideration. There are unique vanadium reserves in the Bala-Sauskandyk and Kurumsak deposits. In the South Kazakhstan, East Kazakhstan and Mangistau regions, the issue of creating and placing a pilot production of scandium from uranium solutions with the production volume of up to 2.5 tons of scandium per year is being studied. A project will be developed to increase the production of primary aluminum.

There have been created 17 thousand regular jobs at the operating enterprises. About 7 thousand people have been involved in construction. Annually about 30 billion tenge of tax payments come to the budget from these enterprises.

A large-scale foreign investment influx into the real economy sectors of Kazakhstan determines and plays one of the main roles in the forced industrial and innovative development of Kazakhstan. There is a considerable demand for the innovative development investment among domestic producers. There are not enough public funds and, therefore, foreign direct investment is the main factor of success.

4. DISCUSSION

The innovation management modeling involves the organization of researchers' work and investment resources, which will focus on definite results and reduce costs at the established values of the organizational and economic constraints.

Innovation activity acts as an object of management. It is characterized by the implicit variables that cannot be directly measured, fixed or controlled.

The introduction of innovation in an industrial enterprise affects 4 basic elements of its functioning: technical process, finance, marketing and personnel. In turn, each of these elements can

facilitate or discourage the introduction of innovation. Innovations in the technological process may not be perceived by the personnel. Their implementation may also be refused due to the lack of financial resources. Innovation can be generated by the marketing needs of the enterprise or by an initiative group of employees. The personnel potential of the enterprise is a prerequisite for the implementation of innovations. Also, the success of innovation has a strong connection with how "the innovation will fit into the technological processes of the enterprise, whether it will promote synergetic development and not block the enterprise performance. Thus, the elements of the developed system model of industrial management are technical process, finance, marketing and personnel (Figure 2).

[Figure 2 here]

The model described above is similar to the BSC (Balanced Scorecard) model (Kaplan and Norton, 2001). In this model most companies take into account such elements as internal business processes, customers, finance, training and development (Loshchilina, 2007). The main difference is that the BSC model is primarily designed to implement the enterprise strategy. All elements in the BSC model have their own goals. They are interlinked with the main strategic goal of the enterprise.

Let's consider the links between the elements of the system model in more detail. They reflect the mutual influence of the identified factors on innovation management.

Technological process - personnel. The technological process determines the requirements for knowledge, skills and professional quality of the personnel. It creates the conditions for the development of the personnel competence. Also, the technological process determines the requirements for interaction and forms

relationships between people and structural units in performing work functions.

Personnel - technological process: the personnel potential determines the possibility of implementing technological processes. It also reveals the possibilities for improving the technology and products of the enterprise or limits these possibilities to simplify the process.

Technological process - finance. This technological process determines the requirements for resources. It is the basis for financing. The length of technological processes determines the possibility of splitting financing into stages. It also affects the return on investment.

Finance - technological process. The provision of financial resources determines the possibility of a more complex process, the use of quality and innovative resources, the possibility of automation, improvement of technology, products and materials.

Finance - marketing: financing of prospective research and the analytical service maintenance allows obtaining up-to-date information. This prepares the enterprise for any market conditions.

Marketing - finance: successful planning of commodity strategies and the promotion of innovation in the sales markets ensure the financial stability of the enterprise.

Marketing - personnel: market needs, identified by the marketing department, determine the characteristics of the products. The ability to produce products of the required quality reveals the requirements for knowledge and skills of the personnel.

Personnel - marketing: high qualification of the marketing service personnel is the most important aspect of the company's successful entry into the market.

Technological process - marketing: the search for resources to implement the technological process is impossible

without the services marketing. In addition, the technological process determines the quality of products. This affects the positioning of the product and its relevance in the market.

Marketing - technological process: requirements to improve the quality of final products stimulate the improvement of the technological process.

Personnel - finance: the high competence of the personnel reduces costs for retraining, losses due to the irresponsible approach to the development and implementation of innovations, etc.

Finance: financial stability of enterprises and financial incentives increase personnel performance.

Summarizing the selected factors, it is necessary to note that they are interconnected and interdependent.

Considering the innovation management process in industrial enterprises, it is also necessary to highlight the goal and the expected result of the innovation management process. The definition of the innovation management goal is impossible without identifying a problem that necessitates the introduction of innovations. The result of the innovation management system functioning predetermines the effect of solving the enterprise problems.

The problems for which innovations are developed and introduced in industrial enterprises are:

- the need for the state development;
- technology race;
- expanding consumer needs;
- lack of resources.

Accordingly, the goal of developing and introducing innovations in industrial enterprises is to increase the efficiency of the long-term development of the enterprise and the state as a whole.

When the stated goal is achieved, the result of innovation management at an industrial enterprise will be a successful long-term enterprise development.

If the expected result is not achieved, the innovation management process must be adjusted. In this case, the effect of solving the problem will be:

-cost reduction and ensuring the production process with sufficient resources;

-outracing competitors in the technology race;

-qualitative satisfaction of the expanding consumer needs;

-successful state development.

5. CONCLUSIONS

The innovation activity management is very important in modern life. It has a significant impact on the strategy, goals and methods of company management. Innovative activity creates not only the future form of the company, defining its technologies, products, potential consumers, environment, but also the basis of its competitive position. It also determines its strategic position in the market.

Effective innovation management, which ensures the success in the global competition of Russian companies, requires the use of modern heuristic iterative and adaptive approaches, methods and algorithms. It needs the research and generalization of the experience of successful companies operating in the global market.

We have identified the main problems that generate the need for innovation. We have formulated the goal of innovation management in industrial enterprises and highlighted the expected result and the solution of the problems.

The main factors influencing the introduction of innovation in an industrial

enterprise have been identified. Their mutual influence and the prerequisites for creating a synergetic effect in the innovation management have been considered.

The scientific novelty of the research is the creation of a system model, taking into account the above mentioned factors.

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Table 1: Targets of the state program for industrial and innovative development in 2016

No.	Target	Units	Planned indicator 2016	Factual indicator 2016	Improvement
1	The increase in the value of exports of manufacturing products by 19%	% by 2015	86	90.2	+
2	Labor productivity growth in the manufacturing industry by 22%	% by 2015	101.3	131.7	+
3	The volume of investments in the fixed assets of manufacturing industry	billion tenges	750	834.1	+
4	Reduction of the energy intensity of the manufacturing industry by 7% ***	% by 2014	98	-	

Table 2: Export fall in Kazakhstan and indicators of the chemical and metallurgical industries.

Exported goods	2015, thousands of tons	2016, thousands of tons	2015, thousands of tons	2016, millions of dollars	Price change, %
Refined copper (copper cathodes)	290.58	40.33	1562,31	-53.47	- 15.19
Refined copper	61.14	3.84	345.03	-53.61	- 20.53
Crude zinc	272.32	-4.9 8	539.10	-34.75	- 4.70
Refined lead	110.25	13.73	187.00	33.61	+ 4.91
Unalloyed aluminum	196,86	14.76	364.62	-30.52	- 14.76
Flat-rolled iron products	237.23	204.45	102.28	56.37	- 16.69
Ferrochrome	974.68	202.93	1128.69	0.88	- 17.17
Yellow phosphorus (white)	70.60	-19.71	218.28	-77.98	- 10.83
Oxides and hydroxyls of chromium	30.33	2.30	58.35	-10.80	- 24.24
Mineral or chemical fertilizers (nitrogen and phosphorus)	49.49	22.28	19.84	-0.66	- 33.33

Table 3: SPIID results for 2016

No.	Name	Units	Planned indicator,	Factual indicator,
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			2016	2016
1	Number of projects for modernization and expansion of existing production capacity	units	9	10
2	Number of new large projects	units	5	6
3	Number of attracted investors from the list of companies included into Global-2000	units	7	7
4	Number of people working in the manufacturing industry (excluding the self-employed population)	thousands of people	515.3	529.3 *
5	Number of exported Kazakh brands	units	2	3
6	Number of enterprises that received state support aimed at increasing labor productivity of industrial and innovative activity entities	units	29	46
7	Number of implemented production technologies	units	2	2
8	Number of projects aimed at solving technological problems of industries	units	2	0
9	Number of established technology development centers	units	1	0
10	Number of new technology companies incubated in the cluster to become the "PIT" FEZ participants	units	7	8

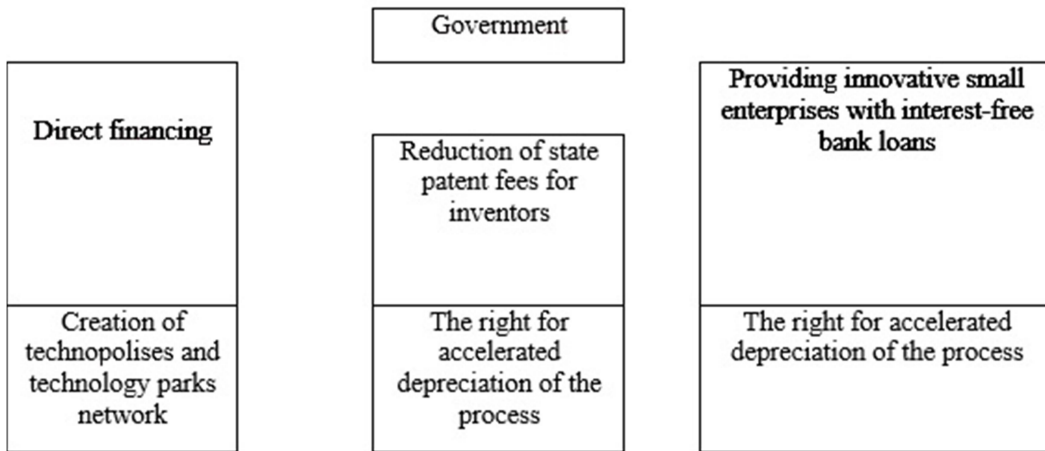


Figure 1: Forms of state support for innovation activities

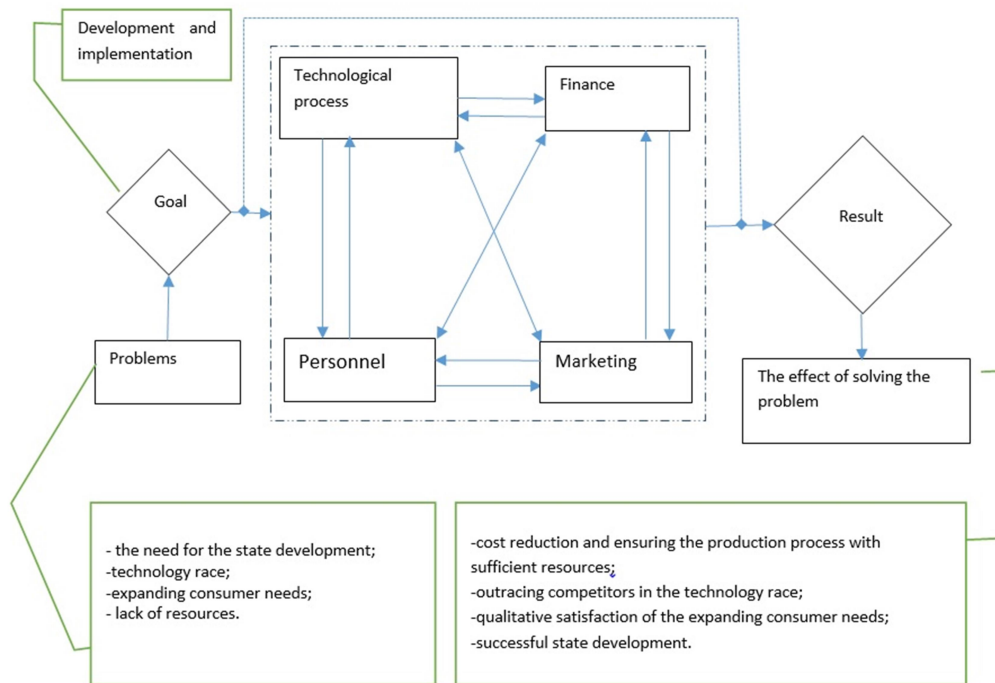


Figure 2: System model of innovation management at industrial enterprises of Kazakhstan