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Assessment of technological development factors of the industry of the Republic of Kazakhstan

In the Message of the President N.A. Nazarbayev to the People of Kazakhstan it is said that «we have begun the Third modernization of the country. Its main task is to form a new model of economic growth that will ensure global competitiveness of Kazakhstan. Therefore, the model of economic growth of the republic, being an important element, cannot but include a strategy for technological development. It is important to focus on support of exporters in the manufacturing sector, and for this it is necessary to create and implement high-end technologies and competitive products in the sectors of the «economy of the future» by strengthening the interaction of science and business that will allow Kazakhstan to create the foundations of a post-industrial economy. Features of the development process of advanced manufacturing technologies and the technical and economic level largely determine the possibilities for the further development of the country, the ability of the industry to restructure itself and respond adequately to changing business conditions, investment and consumer demand. The decisive factor in the functioning of the economy is diversification of production, restructuring and deep and radical modernization of technological base on the basis of the convention of new industrialization. Implementation of this task is, firstly, related to a radical change in the technological basis in traditional sectors of the national economy, which can become a major factor, taking into account trends in development of the world economy. Secondly, it will give impetus to improvement of innovation system and formation of a foundation for the latest scientific and technical breakthroughs and the creation of fundamentally new sectors of the economy.

Keywords: industry, scientific and technical progress, technological development, modernization, fixed assets, innovation, economic growth, competitiveness, digital technology, labour productivity.

The industry of any country is one of the important sectors of the economy. In its turn, the industry of Kazakhstan has a complex diversified structure, which reflects changes in the development of productive forces, in improving the territorial division of social labor, associated with scientific and technological progress. Currently, only an innovative way of industrial development is possible, both at the republican and regional level, which will allow enterprises to provide continuous technical and technological base renewal, create new types of products and services, thereby increasing the efficiency and competitiveness of their production.

The issue of the need to modernize the industry of Kazakhstan and ideas related to the diversification of the economy are often raised. Such discussions have been going on since 2000. During this period, the country's leadership developed the Strategy for Economic Development «Kazakhstan-2030», which not only identified new landmarks and horizons for the development of the country, but also aimed the state and Kazakh society at an economic breakthrough. This strategic document sets forth key directions of state policy in the area of consistent implementation of reforms in all spheres of economic, social and public life [1; 20].

Complex of the systemic organizational, technical, administrative, budgetary and fiscal measures for modernization of the outdated economic structure, stimulation of the growth of innovative industries, increase of the share of intellectual products in industrial production volume are developed in the program documents of the industrial innovation policy of the Republic of Kazakhstan:

– The state program for forced industrial-innovative development of the Republic of Kazakhstan for 2010–2014 [2; 7];

– The Program for the development of innovations and the promotion of technological modernization in the Republic of Kazakhstan for 2010–2014 [3; 21];

– The inter-sectoral plan of scientific and technological development of the country until 2020, sectoral and regional development programs [4; 15];

– The state program for industrial and innovative development of the Republic of Kazakhstan for 2015–2019 [5; 30];

– The concept of industrial-innovative development of the Republic of Kazakhstan for 2020–2025 [6; 218].

Further policy of industrial-innovative development will be implemented in a synchronized state planning system. The program of industrial-innovative development will take into account the long-term goals and directions of development of the country set in the Strategy «Kazakhstan-2050» and on the basis of the initiative of the Strategic Development Plan of the Republic of Kazakhstan until 2025 within the framework of «Competitiveness of sectors of the economy» policy and «Technological renewal and digitalization» reform.

The end result of the industrial-innovative development policy is the competitiveness of manufacturing enterprises in the domestic and foreign markets. The achievement of this result will be confirmed by the development of a new, expansion and «complication» of the existing product range, including consumer goods and products demanded in foreign markets.

By the beginning of the implementation of the second five-year period of industrial-innovative development in 2015–2016, under the influence of the global crisis in Kazakhstan, industrial production declined for the first time in 16 years (by 1.6 % and 1.1 %, respectively) as a result of a decline in the mining sector (by 5 % and 2.7 %, respectively). Retaining of production growth in the manufacturing sector (by 0.2 % and 0.6 %, respectively) was ensured only due to the capacity accumulated over the years of industrialization and has become an evidence of the greater sustainability of the manufacturing sector during the crisis. Market competition, supported by the rapid change of production technologies and intensifying in the context of globalization of the economy, imposes increased requirements for the processes of timely updating of technological equipment in the industry. In modern conditions, an increase in the efficiency of production development can be achieved primarily through the development of innovative processes that receive the ultimate expression in new basic technologies, new types of competitive products.

The formation of an innovative economy in Kazakhstan is a complex economic, social and political task. The most important condition for successful competitiveness of Kazakhstan, ensuring high economic growth, improving the quality of life of the population, the implementation of other innovative priorities is the effective use of research and development results in the real sector of the economy. Under these conditions, development of the management of innovative processes as the basis for the development of Kazakhstani enterprises, determined by a set of relevant technical, production, organizational, marketing, and financial operations, is becoming increasingly important.

There is a number of factors that influence the technological development of industry:

– scientific and technical progress, under the influence of which new areas of industry and manufacturing are formed;

– economic policy of the state, the implementation of which allows to support separate, the most significant economically and socially sectors of industries and thereby affect the pace of their development;

– resource availability. It should be noted that natural resources are an essential, but not mandatory condition for the development of the economy. This is confirmed by the rapid development due to the achievements of scientific and economic progress in countries where the essential mineral resources are not available (Japan, South Korea, Singapore). However, other things being equal, the presence of rich and diverse natural resources gives their owners additional benefits;

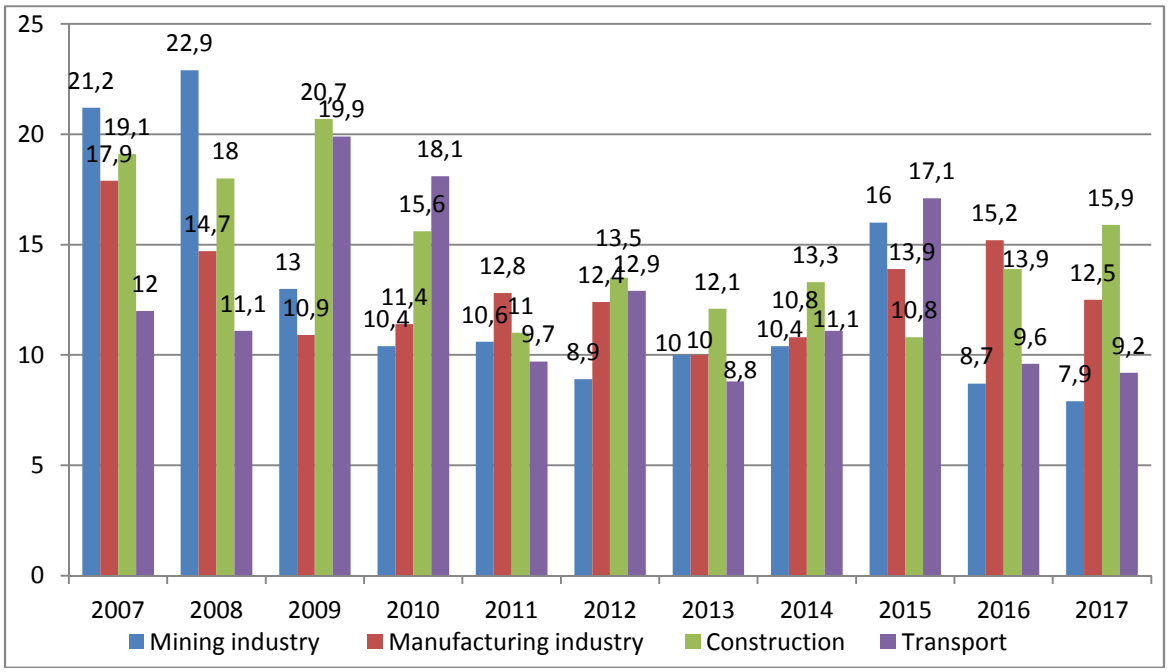
– traditionally established specialization;

– sectoral structure of capital investments financed from various sources. Improvement of efficiency and competitiveness of industry is impossible without technological, organizational and managerial changes that ensure the development and competitive advantage of promising sectors of the industrial complex [7; 27].

Assesment of indicators of technological progress in individual industries as well as in the economy as a whole is one of the most important tasks in the theory of growth. Having considered the evolution of economic growth models in the context of globalization, J. Davilbekova and S. Zhanyrbaeva believe that the formation of a new technological base is the only source of sustainable economic growth. And for the introduction of new technologies, the following conditions must be met: an increase in the share of accumulation, a decrease in the pace of aging of fixed assets, the addition of endogenous technological progress to exogenous, an increase in the accumulation of knowledge and human capital, an increase in imports of foreign capital [8; 28].

In Kazakhstan, despite the systematic growth of investment in fixed assets, a steady downward trend in the degree of depreciation of fixed assets in the economy as a whole is not observed. In 2017, the depreciation of fixed assets in the whole economy amounted to 36.0 %, with a significant differentiation of this indicator by sectors of the economy. At the same time, the economy showed an increase in the rate of

renewal of fixed assets, which in the republic as a whole increased from 13.8 % in 2001 to 16.7 % in 2017. The rate of renewal of fixed assets in the mining industry in 2017 was 7.9, in the manufacturing industry — 12.5, in construction — 15.9, and transport — 9.2 (Fig. 1).



Note. Used source [9].

Figure 1. The renewal coefficients by types of fixed assets in the context of economic activity, %

If we consider these indicators in the context of regions (oblasts), we get the following picture (Table 1).

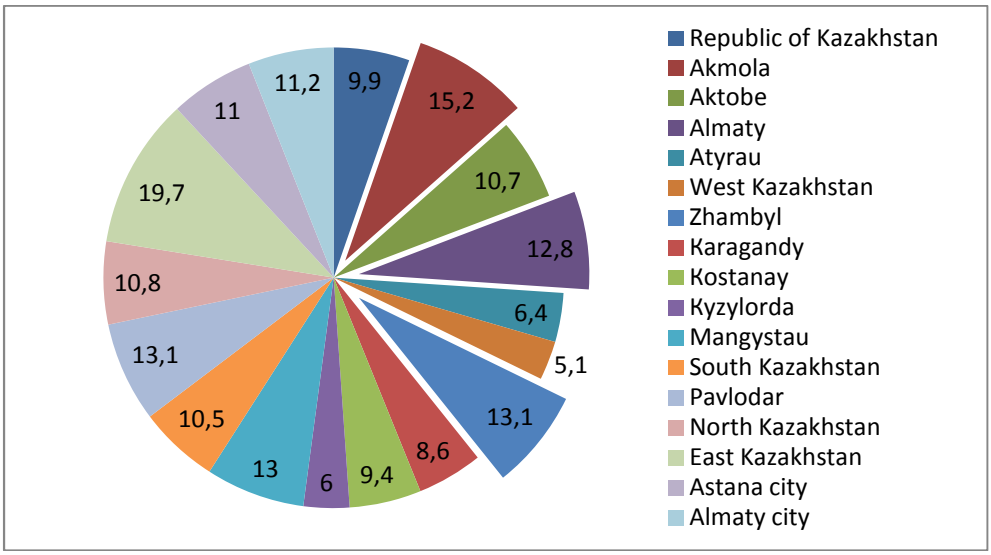
Table 1

The renewal coefficient of fixed assets in the context of regions for years 2007–2017, %

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2017/ 2007
Republic of Kazakhstan	17,5	18,6	16,1	13,7	13,4	13,6	12,6	10,9	16,4	10	9,9	5,6
Akmola	15,2	21,1	38,1	14,7	11,5	13	12,1	11,7	12,7	11,4	15,2	1
Aktobe	14,7	23,7	17,9	19	13,7	13	15,1	11	13,7	9,8	10,7	7,2
Almaty	19,1	24,8	18,7	16,6	19,7	16,6	17,2	13,7	13,7	15,1	12,8	6,7
Atyrau	25,9	19,4	9,8	6,3	4,9	8,6	4,1	5,9	26,5	6,2	6,4	2,4
West Kazakhstan	7,4	7,4	7	9,7	16,2	7,5	9,5	15	40,6	17	5,1	6,8
Zhambyl	7,4	15,7	14,7	13,4	20,1	13,7	15,9	15,6	12,8	14	13,1	1,77
Karagandy	9,9	14,6	12,4	9,8	8,4	13,2	11,5	13	7,8	10,7	8,6	0,86
Kostanay	20,3	27,2	20,8	17,1	18,4	16,7	13,2	13,8	10,8	8,5	9,4	0,46
Kyzylorda	16,7	20,7	20,7	12,8	11,8	14,7	9,9	8,6	9,8	9	6,0	0,35
Mangystau	22,7	27,4	22,4	14,8	12,9	14,4	17,2	15,5	11,8	9,4	13,0	0,57
South-Kazakhstan	18,1	21,9	17,3	18,4	19,6	22,1	15,8	16,9	16,2	11,4	10,5	0,58
Pavlodar	16,4	12	10,3	9,9	12,6	9,6	10,8	5,4	7,7	14,6	13,1	0,79
North-Kazakhstan	17	20,1	14,7	13,5	15,9	15,6	13,3	12,1	12,6	11,4	10,8	0,63
East Kazakhstan	11,3	15,2	11,5	10,1	16,7	12	12,5	12,1	11,4	10,2	19,7	1,74
Astana	13,1	15,3	10,1	15,3	20,2	20,6	17,6	12	9,1	10,7	11,0	0,83
Almaty	21,7	20,4	27	20,5	12,7	13,3	14,4	11,2	14,3	9,9	11,2	0,5

Note. Used source [10].

As can be seen from the data of table 1, the coefficients of renewal of fixed assets in the context of regions show that in some areas this indicator is lower than the republican level. These regions include Atyrau — 6.4 % and West Kazakhstan — 5.1 %. Conversely, higher than the national indicator have regions such as Akmola — 15.2 % and East Kazakhstan — 19.7 % (Fig. 2).



Note. Used source: [9].

Figure 2. The dynamics of the renewal coefficient of fixed assets in the context of regions for 2017, %

Compared to the EAEU partners, analysis of competitiveness of processing industry of the Republic of Kazakhstan showed the following values (Table 2).

Table 2

Analysis of indicators of competitiveness of the processing industry of the Republic of Kazakhstan within the EEU countries in 2016

Country	Share of investments in fixed capital to GVA	Labour productivity in the processing industry (thousand dollars per employed person)	The number of existing enterprises in processing industry per 1000 people of economically active population	Place in the index of economic complexity
Russia	2,0 %	15 %	3,49	48
Kazakhstan	16,5 %	27,40 %	0,91	84
Belarus	21,1 %	11 %	2,25	31
Kyrgyzstan	13,1 %	5,80 %	0,48	57
Armenia	2,2 %	13 %	2,10	-

Note. Used source [9].

As can be seen from table 2, Kazakhstan is significantly inferior to Russia and Belarus in terms of the ratio of investments in fixed capital to GVA and the number of enterprises per 1000 people of economically active population. The index of economic complexity is the lowest in Kazakhstan. Although in terms of labor productivity, Kazakhstan is far ahead of all the EAEU countries.

High level of productivity in Kazakhstan is mainly related to the prevalence in the industrial production of base metals ($ 63 thousand per person in 2017), as well as chark and oil products ($ 145 thousand). For comparison, in the production of food — 27.6 thousand US dollars per person, engineering — 12 thousand US dollars, production of non-metallic mineral products — 15.3 thousand US dollars, chemical industry — 24.4 thousand US dollars, light industry — 6,2 thousand US dollars.

Main part of investments in the manufacturing industry was provided by two basic industries — metallurgy and oil refining — through the implementation of large projects for modernization and expansion

of existing assets. Given the completion of the modernization cycle, compared with existing enterprises a decrease of investment activity in these sectors is expected.

Distribution of investments is related to the traditional location of large enterprises in the basic branches of metallurgy and oil refining, which are attracted to the sources of raw materials or energy. As a result, half of all investments in fixed assets of the manufacturing industry account for three regions: Pavlodar region (metallurgical and oil refining capacities), Atyrau region (oil refining capacities and developing petrochemical park), Karaganda region (non-ferrous and ferrous metallurgy).

Investments in other sectors of manufacturing industry, with the exception of metallurgy and oil refining, are concentrated in regions with large urban areas or large populations. Thus, about 40 % of such investments are accounted for Almaty (8 %), Almaty region (16 %) and South Kazakhstan region (15 %), Astana (7 %), Akmola region (9 %) and Karaganda region (8 %).

Similarly, in 2017, Karaganda region (21 %), Pavlodar region (11 %) and East Kazakhstan region (12 %), where metallurgical production is concentrated, account for 44 % of the value added of the entire manufacturing industry. Most medium-sized enterprises (except metallurgy) and high-tech industries are concentrated in urban «growth points». Industries related to final consumption (production of food, beverages, clothing, furniture, etc.) are concentrated around major cities of republican significance and regional centers. Thus, more than half (56 %) of the gross value added of industries producing consumer goods are generated by enterprises located in Almaty, Almaty region and South Kazakhstan region.

At the moment, the pace of development of the latest technological solutions in industries is dictated by their scientific and technical development.

The share of GDP of the Republic of Kazakhstan spent on research and development currently stands at 0.17 % (if we consider these costs in developed countries, they are higher: China — 2.08 %, USA — 2.73 %, South Korea — 4, 15 %, Israel — 4.21 %).

As a result of the formation of a long-term industrial innovation policy and the development of a program until 2025, the main development trend in the manufacturing industry of Kazakhstan is technological development based on digitalization.

In the modern economy, digital technologies are becoming an organic part of advanced management systems, manufacturing, inventory, and communications.

These technologies also transform the material basis of modern production and distribution. Thus, these technologies allow the transition from market to predictive development models acting on the basis of big data analysis, demand and supply forecasting and planning, on this basis new needs for goods and services appear. The growing role and importance of digital technology is changing not only the economy, but the society itself.

Digital technology is increasingly pushing aside traditional factors of production — capital, labor, and land. It is in connection with this that digital technologies act as a new way of production, which leads to economic growth and significantly increases the added value. These technologies also lead to qualitative changes in the economy and gain additional acceleration over time. Following this, the innovative progress is also accelerated in the economy itself.

Thus, digitization of Kazakhstani economy will facilitate the process of qualitative improvement of the fixed capital of its constant updating on a modern technological base. As a result, along with the emergence of new products, processes and industries, technological modernization of traditional industries is accelerating and conditions are created for the emergence of breakthrough technologies, i.e. digital technology. Based on the introduction of these technologies: the Internet of things, 3D printing, technologies in the framework of artificial intelligence, big data analysis, the digital economy is developing.

The President of the Republic of Kazakhstan, in his Message to the People of Kazakhstan of January 31, 2017, announced the Third Modernization, the basis of which is digitalization. The Digital transformation of Kazakhstani economy is becoming one of the strategic directions of its development. Such countries as China, Singapore, South Korea, Japan, Denmark, Hong Kong, Great Britain, India, and Russia adopted a strategy for the development of digital economy.

Formation and development of fundamentals of digital economy is one of the priorities of Kazakhstani Industry 4.0. It is in this segment that the main conditions and resources of state support of the economy should be concentrated within the framework of the «Digital Kazakhstan» State Program [9; 23].

Regarding the economic policy of the state, it can be noted that the state directly or indirectly controls and regulates the extraction of raw materials, production of the first processing and production factors related to infrastructure.

Kazakhstan has a high level of provision with basic mineral resources. The state, directly or through «Samruk-Kazyna» JSC, has shares in a number of companies producing goods for the first redistribution. This creates an opportunity to stimulate the provision of new manufacturing projects with raw materials and basic semi-finished products.

On another hand, the state has significant reserves for improving the efficiency of resource use and weaknesses in the conduction of industrial innovation policy, which requires concentration and additional resources.

1) The problem with the efficiency of resource use.

There is a problem with the use of funds for development of the manufacturing industry. The allocated financial resources are characterized by a high concentration on a limited number of enterprises. In addition, a significant part of the financing of the manufacturing industry is distributed outside the stated priorities and criteria of industrialization.

Insufficient financing of the manufacturing industry remains an important problem. In the state budget expenditures of 2017, only 0.2 % was allocated to the manufacturing industry, while mining expenditures were 1.1 %, agriculture 3.8 %, and the arts and recreation sector 3.2 %, respectively.

Volume of the tax industry significantly affects the growth of tax revenues to the budget and the increase in GVA. For example, the increase in the production of manufacturing industry (in 2015 by 62 % or 600 billion KZT) had a positive effect on the level of GVA (growth in 2016–2017 by 36 % or 1.6 trillion KZT) and the amount of tax revenues (in 2016–2017, an increase of 51 % or 505 billion KZT).

In general, there is a need for faster growth of investments in fixed assets (at the level of developed countries) in the manufacturing industry. If we compare the share of developed countries to GVA in Russia and OECD countries, there is a significant lag. For example, the share of investments in GVA in Kazakhstan is 16.5 %, while in Russia the indicator is at the level of 20 %, and in OECD countries — 26 %.

2) Lack of effectiveness of the system of development institutions.

The activities of development institutions in the field of industrial innovation are partially duplicated and poorly coordinated. Decentralization of support functions for industrial innovation led to the implementation of poorly coordinated strategies by development institutions, which significantly reduced potential effects.

3) Insufficiently effective monitoring system and feedback mechanisms in the implementation of industrial innovation policy.

There are significant difficulties associated with an objective assessment of the implementation of the policy of industrial-innovative development, including the achieved direct and final results and the effectiveness of support tools. One of the mechanisms for improving the effectiveness of industrial innovation policy is to ensure qualitative monitoring and, on its basis, analyze the effectiveness of the applied support tools, including quantitative and qualitative assessment.

In general, the taken measures will increase the stability of the domestic economy and will contribute to the growth of the welfare of Kazakhstani people.

In the context of the concept of a technological revolution, determining the required for this structural maneuver in the economy and social system should be one of the main goals of Kazakhstan. To change the situation, the deformed structure of the country's economy should be corrected and the investment flows should be redirected to enterprises producing investment products with high value added. At the same time, the growth rates of labor productivity must be such as to reach the level of OECD countries. Meanwhile, at present, the levels, trends and structure of financing science and technology do not correspond to the current needs or the strategic task of overcoming the backlog of OECD countries. As a result, currently in Kazakhstan there is an insufficient level of innovation potential, low productivity of scientific and technological activities. Hence, the innovation and technological positions of our country against the background of changes occurring in OECD countries are weak. Under these conditions, when building the foundations of the digital economy, priority in choosing development directions should, firstly, support the formation of new industries and sectors of the economy, and secondly, contribute to profound technological and organizational changes in the traditional sectors of our economy.

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Қазақстан Республикасы өнеркәсібінің технологиялық даму факторларын бағалау

Елбасы Н.Ә. Назарбаевтың Қазақстан халқына Жолдауында: «Біз елдің үшінші жаңғыртуына кірістік. Оның басты міндеті — Қазақстанның жаһандық бәсекеге қабілеттілігін қамтамасыз ететін экономикалық өсудің жаңа моделін қалыптастыру. Сондықтан республиканың экономикалық өсу моделі маңызды элемент ретінде Технологиялық даму стратегиясын қамтымайды. Өңдеуші секторда экспорттаушыларды қолдауға баса назар аудару маңызды, ал бұл үшін ғылым мен бизнестің өзара іс-қимылын күшейту арқылы «болашақ экономикасы» секторларының ғылымды қажетсінетін технологиялары мен бәсекеге қабілетті өнімдерін құру және енгізу Қазақстанға индустриядан кейінгі экономиканың негізін құруға мүмкіндік береді. Алдыңғы қатарлы өндірістік технологияларды дамыту процесінің ерекшеліктері мен техникалық-экономикалық деңгей көп жағдайда елдің одан әрі даму мүмкіндіктерін айқындайды, өнеркәсіптің шаруашылық жүргізудің өзгермелі жағдайларына, инвестициялық және тұтыну сұраныстарына ұтқыр түрде қайта құрылып, дұрыс жауап беру қабілеті. Жаңа индустрияландыру конвенциясы негізінде өндірісті әртараптандыру, құрылымдық қайта құру және технологиялық базаны терең және түбегейлі жаңғырту экономиканың жұмыс істеуінің айқындаушы факторы болып табылады. Бұл міндетті іске асыру, біріншіден, әлемдік экономиканың даму трендтерін ескере отырып, маңызды фактор болуы мүмкін ұлттық экономиканың дәстүрлі салаларындағы технологиялық негіздің түбегейлі өзгеруімен байланысты. Екіншіден, инновациялық жүйені жетілдіруге және соңғы ғылыми-техникалық серпілістер үшін негіз қалыптастыруға және экономиканың қағидатты жаңа салаларын құруға түрткі болады.

Кілт сөздер: өнеркәсіп, технологиялық прогресс, технологиялық жағдай, жаңғырту, негізгі қорлар, инновация, экономикалық өсу, бәсекеге қабілеттілік, цифрлық технология, еңбек өнімділігі.

А.А. Алимбаев, Г.М. Филюк, Г.А. Кенешева

Оценка факторов технологического развития промышленности Республики Казахстан

В Послании Президента народу Казахстана Н.А. Назарбаева сказано, что Казахстан приступил к Третьей модернизации страны. Его главная задача — создать новую модель экономического роста, которая обеспечит глобальную конкурентоспособность Казахстана. Поэтому модель экономического роста республики как важный элемент не может не включать в себя стратегию технологического развития. Важно акцентировать внимание на поддержке экспортеров в обрабатывающей промышленности, а это требует создания и внедрения наукоемких и конкурентоспособных продуктов отраслей «экономики будущего», через укрепление сотрудничества между наукой и бизнесом, что позволит Казахстану создать основы постиндустриальной экономики. Особенности процесса развития передовых производственных технологий и технико-экономический уровень во многом определяют возможности дальнейшего развития страны, способность промышленности мобильно перестраиваться и адекватно реагировать на меняющиеся условия хозяйствования, инвестиционный и потребительский спрос. Определяющим фактором функционирования экономики являются диверсификация производства,

структурная перестройка и глубокая и радикальная модернизация технологической базы на основе конвенции новой индустриализации. Реализация этой задачи связана, во-первых, радикальным изменением технологической основы в традиционных отраслях национальной экономики, которая может стать важнейшим фактором, учетом трендов развития мировой экономики. Во-вторых, даст толчок к совершенствованию инновационной системы и сформировать основу для последних научно-технических прорывов и созданию принципиально новых отраслей экономики.

Ключевые слова: промышленность, научно-технический прогресс, технологическое развитие, модернизация, основные фонды, инновация, экономический рост, конкурентоспособность, цифровая технология, производительность труда.

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