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ISSUES OF IMPLEMENTATION OF THE STRATEGY OF INDUSTRIAL AND INNOVATIVE DEVELOPMENT OF KAZAKHSTAN

There is a change in technological patterns in the world, a transition to the sixth technological order, and the main global trends in the development of high technologies have been identified. Innovation is still a key factor in technological development and economic growth. Innovation does not generate new value, but redistributes it, but in the process of its «templating», the consumption of innovation becomes part of the newly produced value, and this stage becomes a source of economic dynamics. The choice of priorities for innovative development depends on the level of innovation and industrial and technological development.

The logical-theoretical method, comparative analysis, generalization, and statistical method were used in the work. The article examines the current innovative and technological situation in Kazakhstan in the context of changing technological patterns. The content of the main technological directions allocated by the state as priorities along the path of innovative and technological development of the country is revealed. The world trends in the development of high technologies, factors of innovative development are presented. Startups funded by a domestic venture fund are considered. Recommendations for the implementation of innovative development are proposed, which include strengthening investment and innovation activity. Measures are allocated for the implementation of the National Development Plan of the Republic of Kazakhstan until 2029.

Keywords: technological structure, National Development Plan of the country, innovative and technological development, startups, venture fund, economic growth, investment and innovation activity.

Introduction

The need to move from a raw-material orientation of economic development to an industrial and innovative economy has been justified since the early 2000s.

At the end of 2010, the Program for the development of innovations and the promotion of technological modernization in the Republic of Kazakhstan for 2010-2014 was approved [1]. In its completed form, it manifested itself in the Concept of industrial and innovative development of the Republic of Kazakhstan for 2021-2025 [2].

The Concept of industrial and innovative development of the Republic of Kazakhstan for 2021–2025 provides for priority in the implementation of highly effective innovative projects, observing the openness and transparency of their financing processes. However, significant results have not yet been achieved.

Materials and methods

Conceptual sources of innovation: knowledge as the results of research and development and innovations.

Novation as a prerequisite for innovation is characterized by its potential use, which can be determined by the characteristics of a promising product or process. However, the assessment of the prospects of an novation is always subjective and depends on the positions and immersion in the topic of those who evaluate the innovation. The category of «novation» usually includes documented research results, descriptions of inventions, models and prototypes of devices. The essential difference between novation and innovation is that innovation involves the introduction of an idea, model, method. In this case, enterprises are required to develop a set of measures and costs that ensure the availability of innovations for their processes and for potential consumers.

Types of innovations by objects: product and business process. The business process type of innovation is considered as a «stock», in dynamics as a production process and, accordingly, the presence of subsequent phases of reproduction, which is – «flows», where the consumption phase is the beginning of a new cycle. Quantitative, structural, and qualitative aspects are highlighted in the development of this type of innovation. Innovation does not generate new value, but redistributes it, but in the process of its «templating», the consumption of innovation becomes part of the newly produced value, and this stage is the most important, since it becomes a source of economic dynamics. The level of innovation and industrial and technological development has a significant impact on the choice of priorities for innovative development. The implementation of such a choice is carried out according to the following criteria:

– compliance with the main trends of the scientific and technological revolution;

– improving the effectiveness of the use of scientific and technical potential;

– relevance for ensuring the competitiveness of the country, region, industry, etc.;

– importance for solving social problems, ensuring resource and environmental safety.

Further, using appropriate methods (analysis of statistical data, calculation of indicators, selection of directions, etc.), the process of choosing priorities for the development of scientific, technical, innovative and industrial development is carried out.

Results and discussions

Over the period from 2019 to 2022, the volume of innovative products increased by 1.7 times, but its share in gross domestic product (GDP) in 2022 was only 1.8%. In 2023, Kazakhstan ranked 81st out of 132 countries in the Global Index of the World Innovation Intellectual Property Organization (WIPO), falling into the group of countries with inefficient relationships between costs and results of innovation activity [3].

There are three scenarios of socio-economic development in the long term – inertial, moderate, and optimistic.

According to the data of the National Development Plan of the Republic of Kazakhstan until 2029, the bet is placed on a moderate scenario (Table 1), permanent reforms are planned as opposed to maintaining the status quo. And how to enter the trajectory of innovative development, what changes are required?

Table 1 – Key national indicators up to 2029 [4]

No	Indicator	2022	2023	2024	2025	2026	2027	2028	2029
1.	GDP (billion US dollars) at current prices	225	264	281	308	341	377	-	430
2.	The rate of real economic growth, % compared to last year	3,2	5,1	5,3	5,6	6,3	6,9	6,7	6,7

3.	The number of Kazakhstan universities in the top 700 of the QS World University Rankings, units.	9 (actual)	6 (actual)	6 (actual)	7	8	9	10	11
4.	Exports of manufacturing products, billion US dollars	27,0	25,3	26,9	29,5	30,8	32,3	35,1	37,9
5.	The volume of exports of IT products and services, million US dollars	337	529,1	700	1000	1200	1400	1600	1800
6.	The level of activity in the field of innovation, %	11,0	11,7	14,5	15,9	17,4	18,9	20,4	21,9
7.	Fixed capital expenditure (in Research and development work), % of GDP	14,7	14,6	15,0	17,0	18,0	19,0	21,0	23,0
8.	The share of external investments in the total volume of fixed capital expenditure (FCE), %	20,7	19,1	20,0	22,0	23,0	25,0	27,0	30,0
9.	Increase in business loans, % (from the level of 2022)	0	17	40	68	92	119	150	185
10.	Gross inflow of foreign direct investment, billion US dollars	28,2	23,4	24,8	25,1	25,5	25,6	25,7	25,8

Forecasting the directions of creation and dissemination of innovations becomes a basic tool that allows you to make the transition to advanced types of strategies and achieve a sustainable competitive advantage in the market. There are trends in the development of high technologies in the world such as:

– artificial Intelligence, ICT, Big Data, 5G, 6G;
– polymer composites;
– new energy sources, energy storage;
– construction and design of aerospace facilities;
– nanotechnology, robotics;
– manufacture of vaccines, antibiotics, neurotechnology;
– genetic editing, biotechnology in the agricultural sector;
– resource-saving technologies and decarbonization and so on.

The following composition of internal and external factors of innovative development is distinguished (Fig. 1).

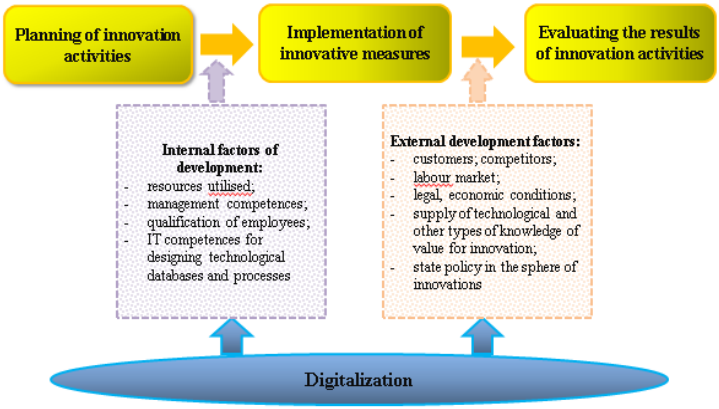

Figure 1 – The scheme of innovative development in the context of digitalization

The implementation of the directions of the national innovation policy has caused the need to adhere to a new approach based on the best practices of technologically developed countries. To date, in Kazakhstan: 65 % of the technologies used belong to the III technological stage, 34 %–to the IV stage, 1 % - to the V stage, 0 % – to the VI stage [5]. Such a spread will require a differentiated approach to the development of priority sectors of the economy, since their levels of development differ. The Concept of Industrial and Innovative Development of

the Republic of Kazakhstan for 2021–2025 [2] emphasizes the need to move away from the practice of supporting entire industries to the formation of a certain critical mass of industrial productions at the early and mature stages of the life cycle.

Currently, such technological directions as MedTech, AgrilTech, GreenTech are distinguished in Kazakhstan (Table. 2), which are cross-sectorial and their use should lead to a multiplier effect in the socio-economic development of the country. Kazakhstan ranks 68th in terms of input indicators and 87 th in terms of output, which indicates the need to improve performance with relatively good input data [6].

Table 2 – Technological directions allocated for development in Kazakhstan

No.	Technologies in the sphere	Content
1.	MedTech	Technologies for disease monitoring.
2.	AgrilTech	The application of biotechnology and genetic engineering. The key objectives of increasing the efficiency of livestock production, along with improving the feed base and the introduction of advanced maintenance technologies, are to increase the productivity of breeds, increase and rational use of their genetic potential. These tasks should be solved through the widespread use of modern biotechnologies: methods of accelerated reproduction of valuable breeding animals, technologies for transplantation of cattle embryos, the use of DNA technologies, as well as active management of breeding and breed-forming processes.
3.	GreenTech	Technologies for cleaning up emissions and (or) minimizing their consequences. Renewable energy sources as a key segment of the low-carbon economy. Technological solutions in the field of reducing commercial and technological losses in the transmission and distribution of energy, the introduction of intelligent systems for its control and accounting. Technologies for the production and application of modified compositions in building materials, energy-efficient and energy-saving and energy-saving materials. Technologies for reducing emissions of pollutants from stationary sources, the introduction of waste-free, low-waste and resource-saving technologies.

Another option is possible to select objects for the implementation of innovation policy, for example, in Poland, large companies have been selected as locatives («growth points») of innovative development:

1 The logistics company «BABIK SP. Z.O.O».

2 The company «ANWIL S.A.» in the agricultural sector.

3 The company «LA RIVE SPOLKA AKCYJNA» in cosmetology.

4 «AFLOFARM FARMACJA POLSKA SP. Z.O.O» Pharmaceutical company.

5 «PEPCO POLAND SP. Z.O.O» company (trading network).

Financing of industrial and innovative activities remains a key problem of the domestic economy. Development institutions should meet the following criteria: approved regulatory and legislative goals; financial support for significant and effective projects; implementation of public-private partnership mechanisms; creation of multiplier effects; attraction of external beneficiaries [7].

The Tumar Ventures Fund, an early-stage venture fund, has been created in Kazakhstan, which selects startups to form its investment portfolio. Investment agreements worth 5.6 million US dollars have already been concluded. Table 3 shows the startups that are funded by this fund.

Table 3 – List of startups funded by Tumar Ventures Fund

No.	Startap	Content

1.	Zypl.ai	1) b2b2c credit granting - to help financial institutions successfully adapt to the requirements of the modern market by providing effective solutions for the rapid provision of loans, which, in turn, helps to attract new customers and strengthen the partner's leadership in the industry. 2) guaranteed credit granting - covers part of the risk of default on loans provided by partner financial institutions to their customers. If the borrower declares default, the PFI reimburses the cost of the guarantee at the expense of zypl.ai . Without guaranteed loans, PFI refuse to provide loans to customers. As part of a guaranteed loan zypl.ai covers a certain segment of loans that were rejected by PFI but approved by zypl.score. Guaranteed lending mitigates the constraints that customers face in obtaining financing, especially new customer segments that were not previously covered by PFI. 3) money transfer-based crediting is based on the history of customer money transfers and serves as an alternative to traditional credit assessment indicators (credit history, proof of income, etc.). This will allow new customers to monetize their money transfer data, and partner financial institutions to use existing data for monetization.
2.	CodiPlay	Providing the younger generation with the opportunity to unlock their potential through digital education. The CodiPlay, CodiKit and CodiTeach web platform applications help students and teachers access cutting-edge practical IT knowledge every day.
3.	iTulek	On-line training.
4.	ZanBar Pro	Legal services
5.	JobCannon	Using artificial intelligence to select candidates to offer employers the best options.
6.	Daryn.Online	Access to more than 40 online lessons in the Kazakh language posted on the resource.

The autonomous cluster Fund «Park of Innovative Technologies» (Tech Garden) has financed more than 200 projects of the participants of the Innovation Cluster in the amount of 42.13 million US dollars, including 67 projects in the direction of Industry 4.0 in the amount of 17.4 million US dollars.

Modern innovations are based on the formation of an innovation cycle, which ultimately contributes to their maintenance and dissemination. At the same time, two types of cycle can be distinguished: the first is the movement of production innovation capital (Fig.1), and the second is the movement of venture financial capital.

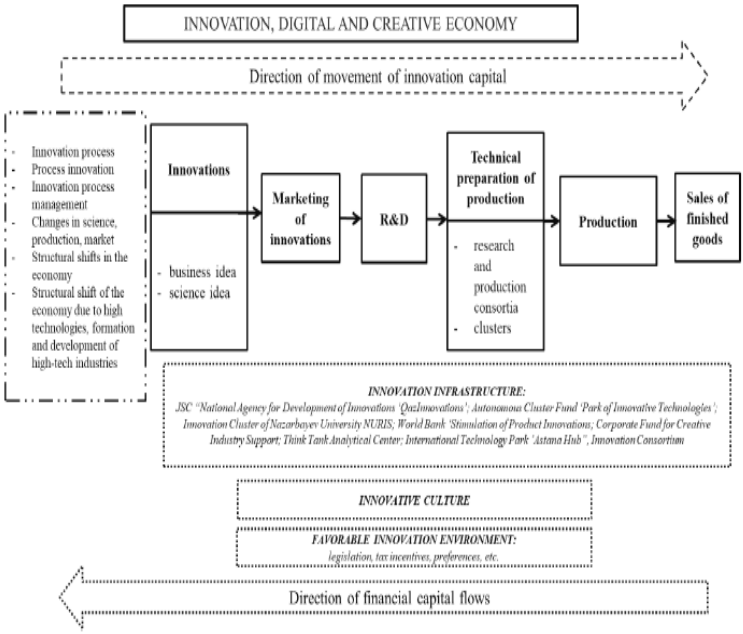

Figure 2 – Movement of productive innovative capital by individual stages

Increasing investment activity remains the main issue of transforming the strategy of industrial and innovative development into a long-term strategy for the development of science, technology and innovation.

Gaining a leading position in global economic competition is based on increased labor productivity, more efficient use of resources and export diversification. This implies expansion by increasing the rate of savings and accelerating scientific and technological progress. Why has this goal not been achieved?

The answer is that the economy is growing at an average annual rate of 3.7 %, which is not enough to achieve the set goals in a sustainable development environment. As noted earlier, in the National Development Plan of the Republic of Kazakhstan until 2029, the growth rate is set at 5.3- 5.6 % for 2024–2025 per year, which is impossible without serious structural changes in the industrial sector. The analytical center Halyk Finance notes that GDP growth in the six months of 2024 amounted to 3.3 % [8]. There is a forecast of economic growth in Kazakhstan for 2024-2025. The Ministry of National Economy of the Republic of Kazakhstan and international

financial institutions (Table 4). As can be seen, the Government of the Republic of Kazakhstan predicts economic growth of 6 %.

Table 4 – Forecasts of economic growth of the Republic of Kazakhstan for 2025

No.	Organization	2025
1	Halyk Finance	5,1
2	International Monetary Fund	4,6
3	The World Bank	4,7
4	Asian Development Bank	5,3
5	Eurasian Development Bank	5,5
6	Government of the Republic of Kazakhstan	6,0
7	National Bank of the Republic of Kazakhstan	4,8-5,8
Source: Ministry of National Economy, International Financial Institutions		

Such sources of financing for innovative development as foreign investments, development institutions, and the National Fund of the Republic of Kazakhstan have not fully worked. It was decided to introduce a new mechanism for financing science from the part of subsoil users: deductions of 1 % of production costs to the republican budget are expected from them.

It is also important to note that the share of development work in research and development work is 7.2 % (this is only 2.4 billion KZT). Two thirds of all research and development work costs are spent on design and technological work, and directly on the manufacture of samples and products themselves, new products – only 1/3 or 3 billion KZT. One of the reasons for this situation was the reduction in the availability of modern devices and scientific equipment, and the gap between the quality of research in the country and the leading countries of the world is growing. Table 5 shows the internal research and development work costs in 2022–2023 [9].

Table 5 – Internal Research and development work costs in 2022-2023, billion tenge

No.	Directions	2022	2023
1	R&D	53,1	80,0
2	Higher Education Sector	28,6	57,9
3	Activities in the field of architecture, engineering surveys, technical testing and analysis	11,0	10,1
4	Health care activities	2,1	2,5

5	Production of chemical industry products	1,1	2,0
6	Metallurgical production	1,8	1,5
7	Mining of metal ores	0,3	0,6
8	Production of electrical equipment	0,3	0,6
9	Production of machinery and equipment not included in other groupings	8,6	0,2
10	Production of computers, electronic and optical equipment	0,4	0,2
11	Other professional, scientific and technological activities	10,5	12,3

Thus, the pursuit of technological superiority through active support of knowledge-intensive industries, accelerated commercialisation of scientific research results [10], is a basic priority in the development of the socio-economic system of the country.

Conclusions

The formation of a productive innovation cycle, which is necessary for the origin and distribution of innovations, requires maintaining a high level of research and development work spending. Currently, most innovations exist in reporting, but do not exist in economic reality.

Low rates of economic growth, blocked market redistribution of financial resources, non-functioning capital flow hinder the implementation of the strategy of innovative and industrial development of Kazakhstan. The expenses of mining companies for research and development work involve amendments to the legislation. The reproduction of innovative productive capital will be the trigger for the emergence of venture capital. Without sufficient investment of financial resources in innovation, it is difficult to move to the stage of creating radical innovations.

To become one of the countries with the sixth technological order, Kazakhstan needs to "jump over" the fifth by 2040, since it is difficult to repeat the path of catching up development in the current conditions. To do this, it is necessary to focus resources on breakthrough areas, significantly strengthen innovation and investment activity, and significantly improve the quality of government regulation.

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ҚАЗАҚСТАННЫҢ ИНДУСТРИЯЛЫҚ-ИННОВАЦИЯЛЫҚ ДАМУ СТРАТЕГИЯСЫН ІСКЕ АСЫРУ МӘСЕЛЕЛЕРІ

Әлемде технологиялық құрылымдардың өзгеруі, алтыншы технологиялық құрылымға көшу байқалады, жоғары технологияларды дамытудың негізгі әлемдік трендтері анықталды. Инновация әлі де дамудың технологиялық және экономикалық өсуінің негізгі факторы болып табылады. Инновация жаңа құнды тудырмайды, оны қайта бөледі, бірақ оны «шаблондау» процесінде инновацияны тұтыну жаңадан өндірілген құнның бір бөлігіне айналады және бұл кезең экономикалық динамиканың көзіне айналғандықтан едәуір маңызды болып табылады. Инновациялық дамудың басымдықтарын таңдау инновациялық және өндірістік-технологиялық даму деңгейлеріне тәуелді.

Жұмыста логикалық-теориялық әдіс, салыстырмалы талдау, жалпылау, статистикалық әдіс қолданылды. Мақалада технологиялық құрылымдардың өзгеруі жағдайындағы Қазақстандағы ағымдағы инновациялық-технологиялық жағдай қарастырылған. Мемлекет елдің инновациялық-технологиялық даму жолында басым бағыттар ретінде бөлетін негізгі технологиялық бағыттардың мазмұны ашылады. Жоғары технологияларды дамытудың әлемдік трендтері, инновациялық даму факторлары келтірілген. Отандық венчурлық қор қаржыландыратын стартаптар қарастырылды. Инвестициялық-инновациялық белсенділікті күшейтуді қамтитын инновациялық дамуды іске асыру бойынша ұсыныстар ұсынылады. ҚР-ның 2029 жылға дейінгі ұлттық даму жоспарын іске асыру үшін шаралар бөлінеді.

Кілтті сөздер: технологиялық құрылым, елдің ұлттық даму жоспары, инновациялық-технологиялық даму, стартаптар, венчурлік қор, экономикалық өсу, инвестициялық-инновациялық белсенділік.

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ВОПРОСЫ РЕАЛИЗАЦИИ СТРАТЕГИИ ИНДУСТРИАЛЬНО-ИННОВАЦИОННОГО РАЗВИТИЯ КАЗАХСТАНА

В мире наблюдается смена технологических укладов, переход к шестому технологическому укладу, определены основные мировые тренды развития высоких технологий. Инновации, по прежнему, ключевой фактор технологического и экономического роста развития. Инновация не порождает новой стоимости, а перераспределяет ее, но в процессе ее «шаблонизации» потребление инновации становится частью вновь произведенной стоимости, и эта стадия наиболее важная, так как становится источником экономической динамики. Выбор приоритетов инновационного развития зависит от уровней инновационного и производственно-технологического развития.

В работе были использованы логико-теоретический метод, сравнительного анализа, обобщения, статистический метод. В статье рассмотрено текущее инновационно-технологическое положение в Казахстане в условиях смены технологических укладов. Раскрывается содержание основных технологических направлений, выделяемых государством как приоритетные по пути инновационно-технологического развития страны. Приведены мировые тренды развития высоких технологий, факторы инновационного развития. Рассмотрены стартапы, финансируемые отечественным венчурным фондом. Предлагаются рекомендации по реализации инновационного развития, которые включают усиление инвестиционно-инновационной активности. Выделяются меры для реализации Национального плана развития РК до 2029 года.

Ключевые слова: технологический уклад, Национальный план развития страны, инновационно-технологическое развитие, стартапы, венчурный фонд, экономический рост, инвестиционно-инновационная активность.

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