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ABSORPTION POTENTIAL IN INCREASING INNOVATIVE PERCEPTION OF KAZAKHSTAN ENTERPRISES

Abstract. Currently, for the development of society and economic growth, new technologies built on new ideas and new knowledge play an important role. It should be noted that the potential of existing industries, despite the task of transferring the economy to an innovative development path, currently requires substantial growth in all areas: strategic, managerial, organizational, technical and technological, personnel. Analysis of the current situation by various indicators showed the inertia of the innovative development of enterprises in Kazakhstan. The purpose of the study is to conduct a review of the scientific literature and the development of approaches to increase the innovative activity of enterprises. The results of the study show that one of the factors for increasing the innovation susceptibility and absorption capacity of enterprises, leading to the growth of innovative activity, is the network interaction of enterprises. Channels of network interaction were analyzed and were proposed the expansion of network interaction of enterprises through the development of an informal information channel and human resources channel to increase the absorption capacity of low and medium technological enterprises, and expansion of interaction with universities and scientific organizations through the development of a channel of research projects and consulting to support the development of high-tech enterprises. It is assumed that the development of network interaction will enhance the absorption potential of enterprises, and, accordingly, their susceptibility to innovative solutions and technologies.

Keywords: absorption capacity, innovative susceptibility, innovative activity.

Introduction. Innovative development is proclaimed an important priority of economic policy in all countries of the world. In turn, new knowledge is the basis of breakthrough innovations and serves to the benefit of the development of not only the economy of a single country, but also the entire civilization. First of all, innovative technologies in the production of goods and services for the population have a positive effect on the quality of life of people, allowing them to consume high-quality goods and services, to live in environmentally healthy conditions, to raise the level of education and skills in the most appropriate and comfortable ways.

The beginning of the course on the development of an innovative economy was laid in the Strategy for the Industrial-Innovative Development of the Republic of Kazakhstan for 2003-2015, one of the tasks of which was "to stimulate the creation of knowledge-intensive and high-tech export-oriented industries" As a result of the programs adopted during this period, the main elements of the innovation infrastructure and technology commercialization were created, measures for financial support for innovations were developed and implemented, and the science management system was reformed. Implementation of the State Program of Forced Industrial-Innovative Development of the Republic of Kazakhstan for 2010-2014. together with the measures taken to create a national innovation system, it allowed doubling the share of innovatively active enterprises from 4 to 8.1%. According to the Statistics Committee of the Ministry of National Economy of the Republic of Kazakhstan for 2017, this figure was 9.6%. However, this level is still critically low. In the cost structure of technological innovations, 42% are expenses for the purchase of modern machines, equipment, software and other capital goods, while R & D accounts for

only 5% of all costs [1]. This indicates a weak susceptibility of enterprises to innovations. For comparison, in the USA the share of innovatively active enterprises is 70%, Germany - 67%, Great Britain - 50.3% [2]. In 2014-2016. the innovation activity of Turkish enterprises was 61.5% [3], and in some manufacturing industries the level of this indicator reaches 80% [4].

In this regard, the purpose of the study is to give suggestions on how to increase the susceptibility of Kazakhstan enterprises to new knowledge.

Research methodology. Universal research methods such as observation, synthesis, analysis, analogy, induction, deduction, abstraction, comparison and analogy. A statistical analysis of the sphere of science and innovations was carried out on the basis of the data: the Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan, the World Bank, the World Economic Forum on the Global Innovation Index and the Global Competitiveness Index.

Results. The research results confirm the weak susceptibility of the economy to new knowledge and solutions, which leads to low innovation activity of enterprises in the country.

Thus, the level of innovation activity in Kazakhstan in 2017 amounted to 9.6% or 2974 innovative companies. A significant positive trend in the electricity and water supply sector (7.6% and 1.9%, respectively, in 2013) can be noted. The innovative activity of manufacturing enterprises has decreased by 1.2% compared to 2013 (figure 1).

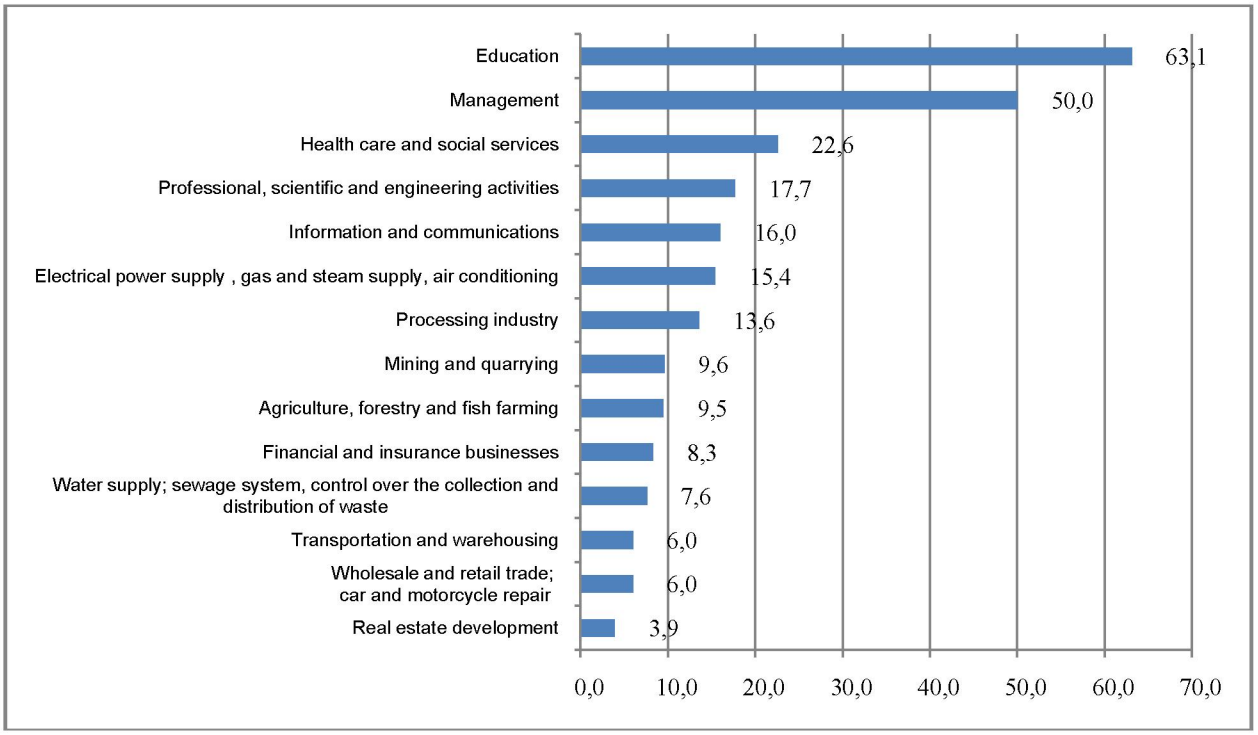

Figure 1 – The level of activity of sectors of the economy in the field of innovation for 2017, in %

In the regional context, the highest innovative activity is observed in the East Kazakhstan region (15.1%) and the city of Nur-Sultan (14.4%). The lowest - in the Mangystau region and West Kazakhstan region (3.5 and 5.3%, respectively).

According to the level of activity in the field of technological (product and process) innovations, the leaders are North Kazakhstan - 9.2% and East Kazakhstan regions - 8.3%. The lowest level of technological innovation is observed in West Kazakhstan (1.5%) and Mangistau (2.5%) regions.

In terms of ownership, state-owned enterprises are leading in technological innovation - 19.7% in 2017. It is noteworthy that the gap between enterprises of public and private forms of ownership is increasing: in 2013-2014 the gap was 2 times bigger, in 2015-2016. - 3 times, and from 2017 - 4 times.

Among private enterprises, the level of activity in the field of technological innovation is increasing at insignificant rates: 2013. - 4.5%, 2017 - 5.6%.

The volume of innovative products produced in 2017 amounted to 1.59% of GDP or 3.18% of industrial production. At the same time, only in 2017 the level of the volume of innovative products in 2006 (1.53%) will be reached. The peak level (1.64% in 2014) has not yet been reached.

In particular, the manufacturing industry produced in the same period 87% of all innovative products of industrial enterprises (figure 2). Other types of innovative products include the production of chemical products, food products, other non-metallic mineral products, etc.

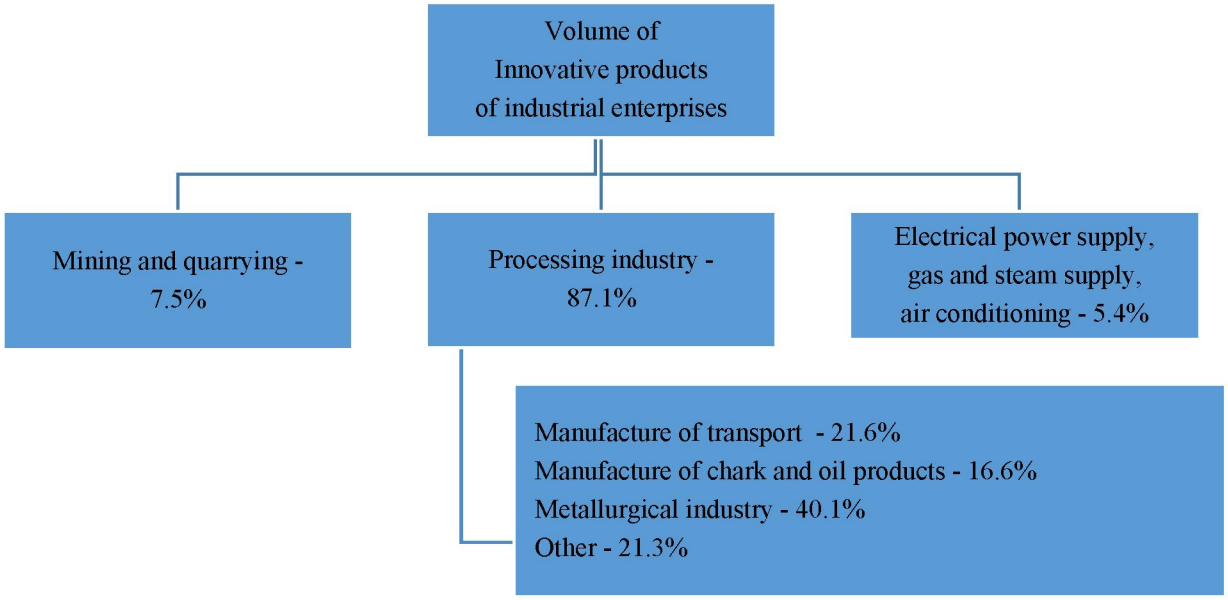

Figure 2 – Distribution of the volume of innovative products (goods, services) by types of economic activity of industrial enterprises for 2017

Of the total volume of sold innovative products in 2017, the volume exported was 10%.

Knowledge intensity is traditionally defined as the ratio of R & D costs to gross value added (GVA) or gross output (VP). Unfortunately, the general knowledge-intensiveness of a country's economy tends to decrease: if in 2002 it was 0.26%, then in 2017 - 0.13%. At the same time, it is noteworthy that almost 70% of R & D is carried out by private enterprises (this figure has not changed much over the past 5 years).

In the industry, the most knowledge-intensive industries remain the mining and metallurgical industry: mining of metal ores - 5.6%, metallurgy - 4.0% (table 1).

Table 1 – Knowledge intensity of the sectors of the economy of Kazakhstan in 2017,%

Economic sector	Research intensity
Activities in the field of architecture, engineering research, technical testing and analysis	6.5
Metal ore mining	5.6
Metallurgical industry	4.0
Crude oil and natural gas production	2.7
Other professional, scientific and engineering activities	1.3
Fabrication of products for chemical industry	0.9
Health care activities	0.7
Coal and lignite mining	0.2
Crop and livestock production, hunting and the provision of services in these areas	0.2
Manufacture of electrical equipment	0.2
Advertising and market research	0.2
Engineering services in the field of mining industry	0.1
Other branches of mining industries	0.1

According to the sub-indicators of the Global Competitiveness Index, a decrease in the availability of venture capital, the availability of scientists and engineers, as well as the volume of foreign direct investment and technology transfer is evident (figure 3).

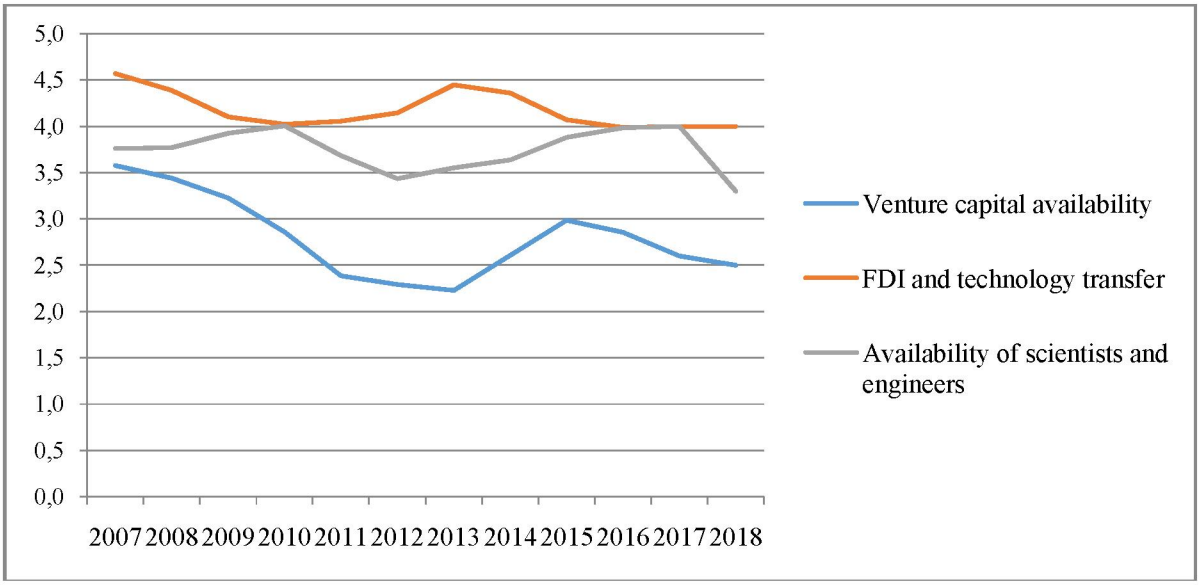

Figure 3 – Dynamics of sub-indicators of the Global Competitiveness Index for the Republic of Kazakhstan, 2007-2018

Facts prove that the field of venture investment in Kazakhstan is very much stalled. Thus, since 2003, 10 domestic venture funds have been created in Kazakhstan in cooperation with local investors. However, an audit of the performance of Kazakhstan's national funds conducted on behalf of the Head of State in 2010 showed that out of 85 projects funded by venture funds of JSC "NATD", only 3 were implemented [5]. As a result, the result was the recognition of project and venture financing as ineffective and the Resolution of JSC NUH Baiterek of September 4, 2013. financing of new innovative projects and new venture funds was suspended. As noted in the Annual Report of JSC NATD for 2013, "a significant part of the income of the Agency's group of companies is net interest income" [6]. This testifies to the high risks of the development of funds allocated by the state to finance innovative projects. Obviously, there is no venture investment ecosystem.

Another negative trend is the decline in the indicator "Accessibility of scientists and engineers" (2010 - 4.0 and 2018 - 3.3). Scientists explain the departure to foreign universities because of weak scientific schools and the lack of creative freedom [7]. Reduced availability of engineers is a consequence of the negative migration balance of skilled labor.

If in the first years of independence, due to the huge "brain drain" abroad, Kazakhstan lost a significant part of the country's intellectual component, then from 2007 to 2011 the picture changed - more people came to Kazakhstan, less actively left, and the external migration balance was positive. However, in 2012 (January-September) the number of arrivals and departures became equal, and in subsequent years the rate of outflow of the population only increased [8]. So, from 2013-2017. there was a huge outflow of personnel to the CIS countries, 35% of the qualified emigrants were technical specialists (figure 4).

The level of emigration mobility of persons with higher education in 2017 was 29.9% (11.290 people) of the total number left Kazakhstan, that is, almost every third emigrant. Of the total number who entered the country, 2.736 people had a higher education, or only 17.5% (every sixth) [9]. As a result, many industries are faced with the difficult problem of a lack of qualified personnel.

The situation is aggravated by the fact that manufacturing enterprises are now in a lower technological structure, whereas for an innovative economy a transition to higher structures is necessary. In the economy of Kazakhstan, the share of the V technological order is less than 1%, the IV technological order is about 35%, and the III technological way is about 65%. In this case, the main line of development is the buildup of the fourth technological order [10, 11].

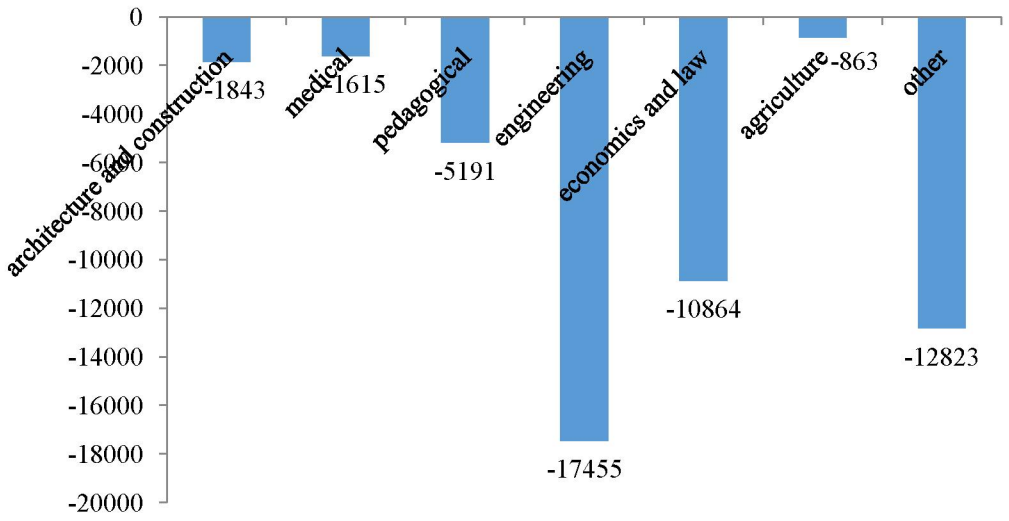

Figure 4 – The balance of migration of the population over 15 years old by specialties (CIS countries), 2013-2017

The analysis of the development of innovative activity of economic entities confirms the assumption of the weak susceptibility of the economy and industry to new knowledge and solutions.

To increase the susceptibility of a country's enterprises to innovations, it is necessary to increase their ability to determine, assimilate, transform and use external knowledge or the absorptive capacity of an enterprise [12]. Absorbing or absorbing ability of an enterprise is a complex of organizational rules and processes by which a firm acquires, assimilates, transforms and exploits knowledge to create flexible organizational capabilities [13].

The absorptive capacity of a company depends on the availability of various network connections, which give access to new knowledge, social capital and social assets in the form of participation in various meetings, associations and networks, personal acquaintance with technological development agents [14]. The strength of a firm's network interaction is revealed when its networks provide access to new knowledge, while the absorption potential of a firm is determined by the absorption and use of this knowledge [15].

Network interaction encourages firms to make decisions about the introduction of innovations and the degree of their radicalism. Radical innovation - the degree of change made in the development and improvement of products and production processes. In particular, it was revealed that one of the factors of radical innovation is cooperation with universities [16].

Thus, network interaction affects the innovative activity of an enterprise by increasing access to new knowledge, making decisions about introducing innovative changes and the degree of radical change.

Innovative environments of a mature medium and low-tech industry and a developing high-tech industry differ significantly in the characteristics of the necessary knowledge (table 2).

The data in table 2 show that different sources of knowledge are prioritized for mature and developing industries. For developing high-tech industries, proximity of universities and suppliers as sources of hidden and non-material knowledge for developing new technologies and products is important, while information from consumers and competitors in the form of codified knowledge for developing non-core competencies is important for mature middle-technology industries.

The share of formally high-tech enterprises in Kazakhstan is low. To ensure their real compliance with the criterion of high manufacturability, it is necessary to feed these industries in the form of more intensive use of scientific knowledge generated in scientific organizations and universities in the country, or by developing their own units implementing R&D.

Scientists confirm that the most important innovations, which are key to economic growth, arise when universities, industry and government research institutes interact [18, 19] to find solutions to common problems. The positive effect of the interaction of universities and industry on the innovation activity of firms has been revealed [20, 21]. And this is justified by the fact that links between industry and universities accelerate the transfer of knowledge between scientists and industrial researchers, which allows firms to benefit from savings in specialization without investment [22].

Table 2 – Characteristics of the necessary knowledge
for a mature medium and low-tech industry and a developing high-tech industry

Indicators	Medium-tech industry/low-tech industry	Hi-tech industry
Role of interaction and collaboration	External sources of knowledge are important for developing secondary competencies	Interaction and collaboration are important for accessing resources and seeking knowledge in order to develop specific new technologies and products
Characteristic of necessary knowledge	Embodied and codified knowledge	Hidden and non-embodied knowledge
Territorial proximity	Not important	Important
Source of knowledge	Consumers, competitors	Universities, suppliers
Goals of cooperation with universities	Expanding general knowledge and promoting a higher level of integration of technologies with embodied knowledge	Activation of the development of new knowledge and the acquisition of scientific support for the development of new products
Note: based on [17].		

Scientists identify the following channels of interaction between universities and industry - the information channel (Info Channel), the human resources channel (HR Channel), the research project channel (Project Channel), the intellectual property rights channel (IPR Channel) [23].

Their analysis shows that more developed countries use integrated channels, combining primarily channels of human resources and research projects and consulting. Scientists have long found that in the early stages of a developing industry, new knowledge and university research can enhance the agglomeration of innovation, while new knowledge embodied in qualified employees contributes to clustering at all stages of industry development [24].

The factor of weak channels of cooperation between science and industry is the reason for the weak effectiveness of technology transfer grant programs in Kazakhstan. So, in particular, the grant for industrial research, which was implemented by JSC NIF (later renamed as JSC NATD) earlier, as a channel of research projects cannot be widely demanded in conditions of low technological effectiveness of industries. In this case, the development of an information channel and a human resource channel – informal knowledge transfer channels – is recommended. The situation is aggravated by the distrust of enterprises in the university sector, which has developed as a result of the gap between the mutual expectations of employers and university graduates [25].

Even on the example of the highly developed Stanford environment, where both the industrial and scientific communities are quite developed and closely interact, it is revealed that the transfer of technology from universities occurs through informal networks of scientists and industrial companies, and not through the formal channels of the technology transfer department. Scientists and industrial corporations are part of the same scientific knowledge sharing networks in a non-codified form, and the formal transfer of explicit, codified knowledge is the result of informal relationships [17]. Moreover, scientists argue that low absorptive capacity makes firms dependent on personal contacts for the absorption of external codified knowledge that is not their core competency [17]. Consequently, informal relationships and staff mobility may be more important to influence the environment than formal technology transfer [26].

Thus, since “formal transfer of explicit, codified knowledge” means the transfer of technologies in the form of transfer / assignment of a patent and (or) making it into the authorized capital of an innovative enterprise being created (channel of intellectual property rights), the commercialization of the results of scientific developments is a consequence of the development of informal relationships that can be developed through channels such as the information channel and the human resource channel. Consequently, networks make a significant contribution to the innovative abilities of firms, tuning them to new sources of ideas, quick access to resources and enhancing knowledge transfer [27, 28].

In 2010-2014 in terms of science-intensiveness, Korea ranked first in the world, in terms of research infrastructure and quantitative indicators, such as the total number of research personnel, scientific articles, patent applications and patents received - 5-9th places. However, in 2014, in terms of overall competitiveness, Korea dropped to 26th place. The researchers explain this by saying that government policies to improve the relationship between the actors of the "triple helix" (science-business government) failed in

terms of creating synergies from the cooperation of the participants of this model in research networks [29]. Research in the field of science, technology and innovation has widely recognized that the "innovation potential" of a nation depends not only on the power of individual players (firms, universities, state scientific laboratories), but, more importantly, on the connections between these "players" [30].

Conclusion. Based on the analysis carried out to increase the innovation activity of companies, the policy of innovation and technological development of the economy should be focused on the development of the absorption potential of enterprises by:

– expanding the network interaction of enterprises through the development of an informal information channel, which implies the development of relations through the organization of meetings, seminars, exhibitions, conferences, and a human resource channel (hiring graduates and mobility of researchers) to increase the absorption capacity of low and medium technological enterprises;

– expansion of interaction with universities and scientific organizations through the development of a formal channel - a channel of research projects and consulting to support the development of high-tech enterprises.

The programs for promoting the commercialization of scientific research, specified in the Law of the Republic of Kazakhstan "On the commercialization of the result of scientific and technical activities" as a commercialization mechanism, should serve the regional authorities at the initial stage as a tool to increase the absorption potential of enterprises in the region. At the mark level, these programs can be managed by the Kazakhstan Industry Development Institute, which since 2019 has been assigned to operate with grants for the technological development of industries and enterprises.

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ҚАЗАҚСТАННЫҢ КӘСІПОРЫНДАРЫНЫҢ ИННОВАЦИАЛЫҚ СЕЗІМТАЛДЫҒЫН АРТТЫРУЫНДАҒЫ СІҢІРУ ҚАБІЛЕТІ

Аннотация. Қазіргі уақытта қоғамды дамыту және экономикалық өсу үшін жаңа идеялар мен жаңа білімге негізделген жаңа технологиялар маңызды рөл атқарады. Экономиканы инновациялық даму жолына ауыстыру міндетіне қарамастан қолданыстағы салалардың әлеуеті қазіргі уақытта барлық салалардағы: стратегиялық, басқарушылық, ұйымдастырушылық, техникалық және технологиялық персоналдың айтарлықтай өсуін талап ететінін атап өту керек. Ағымдағы ахуалды әртүрлі көрсеткіштері бойынша талдау Қазақстандағы кәсіпорындардың инновациялық дамуының инерттілігін көрсетті.

Зерттеудің мақсаты – ғылыми әдебиеттерге шолу жасау және кәсіпорындардың инновациялық белсенділігін арттыру тәсілдерін дамыту.

Зерттеу нәтижелері, кәсіпорындардың өзара желілік әрекеттестігі, кәсіпорындардың инновациялық сезімталдығы мен қабылдау қабілетін арттыру және кәсіпорындардың сіңіру қабілеттері, инновациялық өсу белсенділігін арттыру факторларының бірі болып табылатынын көрсетті.

Желілік өзара әрекеттесу арналары талданып және бейресми ақпараттық арнаны дамыту арқылы кәсіпорындардың желілік өзара әрекеттесуін кеңейту және өнімділігі төмен және орта кәсіпорындардың сіңіру қабілеттілігін арттыру үшін адам ресурстарының арнасын, және университеттермен және ғылыми ұйымдармен өзара әрекеттесуді ғылыми- зерттеу жобаларын дамыту арқылы және өнімділігі жоғары кәсіпорындардың өзара әрекеттестігін күшейту.

Желілік өзара әрекеттестікті дамыту кәсіпорындардың сіңіру әлеуетін арттырады, және, тиісінше, олардың инновациялық шешімдер мен технологияларға бейімділігін арттыратыны болжанған.

Түйін сөздер: сіңіру қабілет, инновациялық сезімталдық, инновациялық белсендік.

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АБСОРБЦИОННЫЙ ПОТЕНЦИАЛ В ПОВЫШЕНИИ ИННОВАЦИОННОЙ ВОСПРИИМЧИВОСТИ ПРЕДПРИЯТИЙ КАЗАХСТАНА

Аннотация. В настоящее время для развития общества и экономического роста новые технологии, построенные на новых идеях и новых знаниях, играют важную роль. Следует отметить, что потенциал существующих производств, несмотря на задачи перевода экономики на инновационный путь развития, в настоящее время требует существенного роста во всех направлениях: стратегическом, управленческом, организационном, технико-технологическом, кадровом. Анализ текущей ситуации по различным показателям показал инертность инновационного развития предприятий Казахстана. Целью исследования является проведение обзора научной литературы и выработка подходов к повышению инновационной активности предприятий. Результаты исследования показывают, что одним из факторов повышения инновационной восприимчивости и абсорбционной способности предприятий, ведущей к росту инновационной активности, является сетевое взаимодействие предприятий. Проанализированы каналы сетевого взаимодействия и предложено расширение сетевого взаимодействия предприятий путем развития неформального информационного канала и канала человеческих ресурсов для повышения абсорбционной способности предприятий низкой и средней технологичности, и расширение взаимодействия с университетами и научными организациями через развитие канала научно-исследовательских проектов и консалтинга для поддержки развития высокотехнологичных предприятий. Предполагается, что развитие сетевого взаимодействия усилит абсорбционный потенциал предприятий, и, соответственно, их восприимчивость к инновационным решениям и технологиям.

Ключевые слова: абсорбционная способность, инновационная восприимчивость, инновационная активность.

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