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## **Development of enterprises innovative activity in Kazakhstan: analysis of patenting**

### **Abstract**

*Object:* To investigate the state of enterprises innovation activity of the Republic of Kazakhstan.

*Methods:* The general scientific methods, methods of analysis, comparison and systematization have been used.

*Results:* Modern trends in the development of enterprises innovative activities of the Republic of Kazakhstan in particular, quantitative values of the market innovative products in Kazakhstan for 2009–2020 were analyzed. Statistical data on the main indicators of enterprises innovation activity and the dynamics of internal research costs were presented and examined. The features and differences of innovation activity by regions of the country were revealed. The analysis of a number of submitted applications and issued patents for inventions, industrial designs, utility models was carried out. The dynamics of patent activity of national and foreign applicants were shown.

*Conclusions:* Industrial property market of the Republic of Kazakhstan has undergone significant changes during the analyzed period, along with this, there is a positive dynamic of its development. Even though the process of commercialization of intellectual property in the country is not yet sufficiently developed, a stable innovative activity is characterized for most regions of Kazakhstan. The positive dynamics of the licensed trade development in industrial property objects have been revealed, while the predominant number of patents for inventions, industrial designs and utility models belongs to domestic innovators.

*Keywords:* innovations, innovative activity of the enterprises, innovative product, utility models, industrial designs, inventions, patent, R&D, industrial property.

### **Introduction**

In the formation of an innovative economy, the leading factors of economic development are a scientific-technological progress, the use of innovations, also an increasing of economic entities innovation activity. In these conditions, the third five-year plan of industrial-innovative development is being implemented in the Republic of Kazakhstan, within the framework of the existing National Innovation System. During the implementation of the State program of industrial-innovative development of the Republic of Kazakhstan for 2020–2025, also of the Law about government support of innovative activity, there is a tendency of low innovative activity of enterprises from both the public and private sectors of the economy. To ensure the industrial-technical and innovative development of the republic, it is necessary to intensify the activities of business entities in the field of innovation by accelerating the development of intellectual activity, providing the activation of the industrial property market.

Since the modern market of innovative products involve using of the latest developments, unique technologies and know-how, and innovative activity are the key sign of the success of enterprises, the task of creating favorable conditions for scientific research, introduction and production of competitive domestic goods and services become urgent.

The Republic of Kazakhstan is a country with a high scientific potential, however, over the years of independence, the state has faced with the problems of science development and, as a result, the process of effective transformation of scientific results of scientists into the latest technologies and developments is difficult. This was facilitated by certain economic conditions (inflation development, instability of the market economy, high cost of bank credit resources, etc.), including those that broke out against the background of the COVID-19 pandemic, which led to a loss of demand for innovative products in the domestic market. Despite the importance of this prob-

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lem and the close attention to it from the scientific and business communities, most of the problems remain unresolved in this area. Therefore, it has become relevant to analyze in the article the state of enterprises' innovation activity in Kazakhstan, to identify the main problems and directions of increasing its innovation activity.

The authors analyzed the objects of industrial property: security documents for inventions, industrial designs, utility models; determined the level of patent activity of the Republic of Kazakhstan regions. The research was conducted using the data from Bureau of National Statistics of the Agency for strategic planning and reforms of the Republic of Kazakhstan, also of the National Institute of Intellectual Property from 2009 to 2020.

### ***Literature Review***

The problems of the innovative activity of development and the innovative activity of the enterprises are widely covered in the scientific literature. At the same time, it should be noted that research in the field of market analysis of innovative products of the Republic of Kazakhstan are insufficient. Modern trends of innovative development are revealed in the works of A.M. Kozhakhmetova, G.Zh. Zhastylek (2016), R.O. Bugubayeva, E.B. Begezhhanov (2015), A.B. Maidyrova (2019), A.A. Kaigorodtsev, I.V. Bordianu (2016), A.Zh. Sultangazin (2017), A.Sh. Abdimomynova, L.K. Spanova (2015), etc.

The growing interest of scientists to the problem of process enterprises' innovative activity studying, and, consequently, increasing its innovative activity level, can be traced in the scientific works of M.S. Kuvshinov, M.I. Bazhanova, E.A. Sheveleva (2019), A.V. Babkin (2017), A.G. Kadyrov (2011), Ya.V. Panas (2017), Y.A. Dubolazova, Y.Y. Kuporov, K.A. Vladimirovich (2019), M.V. Sharko, O.I. Zaitseva, N.V. Gusarina (2017).

The topic of the research worries many scientists. A.A. Safina, K.S. Kuramshina (2018) revealed the basic principles of innovation analysis and planning, also elements of the integrated analysis system of enterprises' innovative activity in their work. At the same time, they reduce a comprehensive analysis of innovation activity to an in-depth accounting of innovation costs, revenues, forecasting and their ratio.

Special attention should be paid to the Kolesnikov's research et al. (2018), in which the process of innovative development is considered as an incentive for technological modernization of production, increasing its efficiency and developing of new competitive product. The presence of innovative activity, in turn, leads to technological shifts that are carried out with using technologies. In such conditions, the innovative activity of enterprises is an important component and prerequisite for sustainable economic development (Arefieva et al., 2018).

It is important to note that the cooperation of enterprises with organizations and non-profit institutions, such as universities and research centers, has a positive effect on the innovative activity of enterprises (Lapinska & Kadzielawski, 2019); development of business-incubators makes it possible to introduce technologies and commercialize them (M'Chirgui et al., 2018). Enterprises that are intensively engaged in research and development (R&D) have incentives to make their investments in R&D. Given the limited opportunities of external financing in emerging capital markets, innovations and investment in R&D act as a determining factor for economic growth (Liu et al., 2021; Dastory, 2018; Vysochan et al., 2021).

There are financial barriers (lack of financial resources) that lead to the restriction of enterprises innovative activity (Zwolinska-Ligaj & Adamowicz, 2018). Innovation activity is influenced not only by the amount of funding but also by the type of received funding, which is associated with the following main characteristics of innovation: firstly, uncertainty, when financing is characterized by high risks; secondly, long-term nature and cumulateness, in this case, financing should be long-term; thirdly, collectivity, which includes several forms of financing from various sources — public and private (Mazzucato & Semieniuk, 2017). At the same time, there is a close connection between the availability of highly-qualified personnel and the innovative activity of the enterprises. Innovation-active enterprises prefer to create innovations based on patents for industrial designs and utility models, while innovative-passive enterprises prefer to create innovations based on inventions (Golichenko & Balycheva, 2009).

### ***Methods***

The methodological basis of this research is presented by the methods of scientific cognition, which facilitate to reveal the essence of enterprises' innovative activity, barriers hindering its development and the main patterns of innovative activity of enterprises. In particular, the method of analysis and synthesis is used in the research of enterprises' innovative activity for 2009–2020; the method of systematization allows to

identify a disparity in the development of enterprises' innovative activity; for establishing relationships between the considered economic objects, the method of generalization was used. The method of graphic interpretation allows to visually present the obtained results for determining of the investigated object condition.

### Results

For the description of the Kazakhstan's innovative products market, the following indicators were analyzed (from 2009 to 2020):

- dynamics of the number of registered license agreements in respect of which agreements on their assignment and about granting the right of using them have been registered;
- the volume of applications received for the issuance of security documents on industrial property objects (inventions, utility models, industrial designs);
- a number of issued patents for inventions, utility models and industrial designs.

One of the important indicators describing the innovative products market in the Republic of Kazakhstan is the number of registered contracts about the disposal of exclusive rights on intellectual property objects (Figure 1).

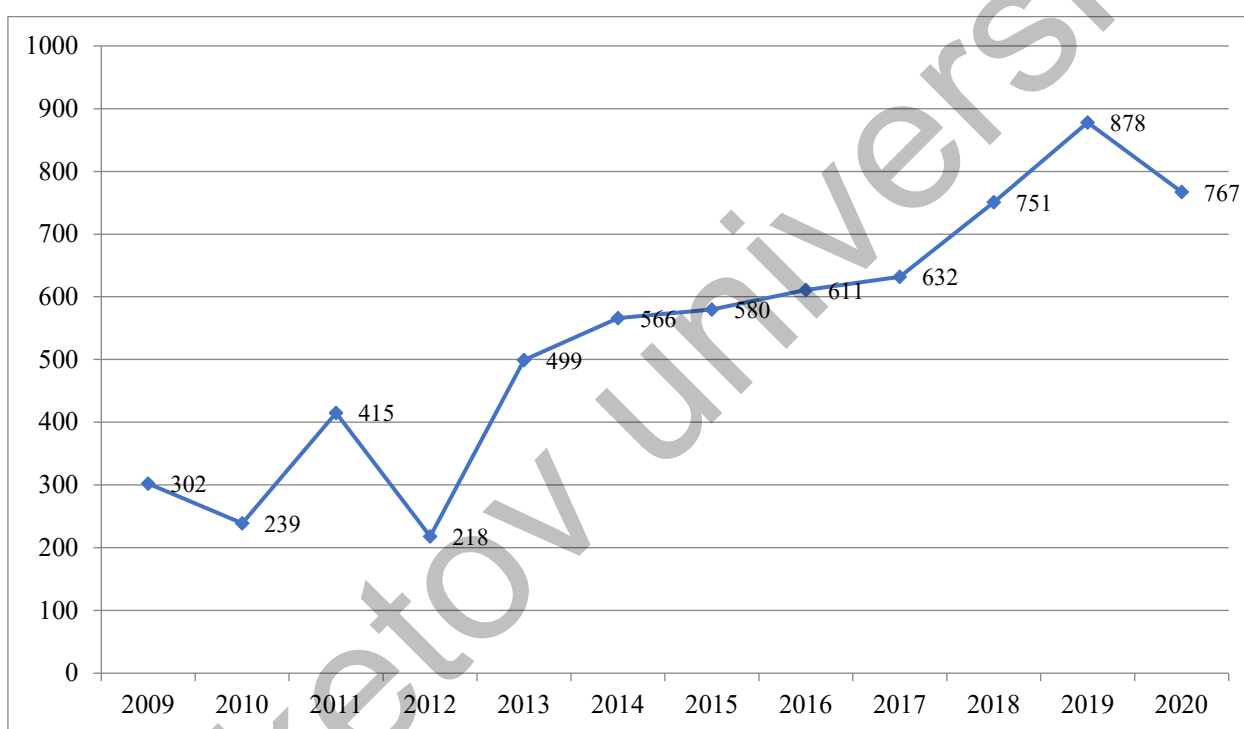


Figure 1. Dynamics of registration of license agreements in the Republic of Kazakhstan

Note — Compiled by the authors based on statistical collections characterizing the intellectual activity of the Republic of Kazakhstan

The analysis of the data of the Figure 1 indicates the positive dynamics of the development of licensed trade by industrial property objects. This process was facilitated by the annual growth in the number of registered license agreements, also patent assignment agreements. Thus, the number of registered contracts in 2019 amounted to 878, increasing compared to the year 2009 at 576 (the average growth rate was 109 %), which means positive changes on the investigated market. However, due to the unfavorable conditions that have developed against the background of the COVID-19 pandemic and the introduction of forced quarantine measures, in 2020, there was a decline in registered contracts by 12,6 % compared to the previous year.

For determining the regularity of the industrial property market development, we consider the general information about the received applications for the issuance of security documents on industrial property objects in 2009–2020 (Figure 2).

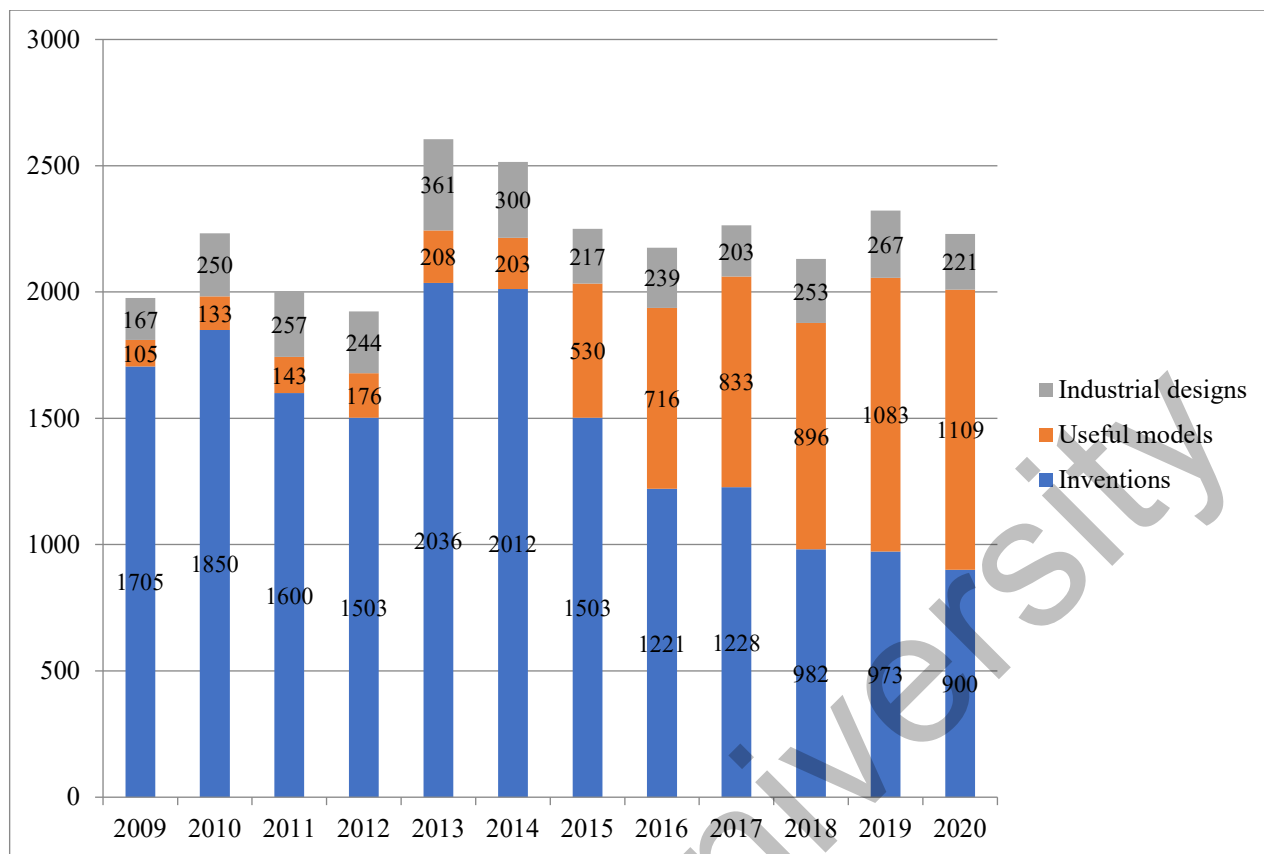


Figure 2. Dynamics of received applications for the issuance of security documents for industrial property objects in 2009–2020

Note — Compiled by the authors based on statistical collections characterizing the intellectual activity of the Republic of Kazakhstan

Within the framework of the economic situation in 2020, there was a decline in the filing of applications for registration of industrial property objects. In this regard, there is a decrease of 17 % in the issuance of protection documents for industrial designs and 7,5 % for inventions. However, a slight increasing in the issuance of security documents for utility models reached up to 2,4 %.

The indicators show the increase in received applications of 2020 compared to 2009 (11,4 %). The unstable character is observed in the process of filling applications for the issuance of security documents for industrial designs: there was a decrease of 17 % compared to 2019.

Over the past 12 years, there has been a positive trend in the submission of applications. A steady increase is observed in the submission process of the utility models, that is, the number of applications received has increased by more than 10 times. As for inventions, there is oscillatory character of filing applications for their registration. The largest number of applications was submitted in 2013, then, starting from 2015 there is a gradual decrease by 40 % to the level of 900 in 2020, which is explained by the development of the financial and economic crisis in the country.

The main share of received applications (17513 units) during the analyzed period is the inventions — 65,8 % from the total amount of submitted applications. Compared with 2009 year, the total number of received applications in 2020 increased by 253 or 13 %, the growth rate was 3 %.

For a full description of the state of the innovation market, it is necessary to analyze the patent activity of the economic entities (Figure 3).

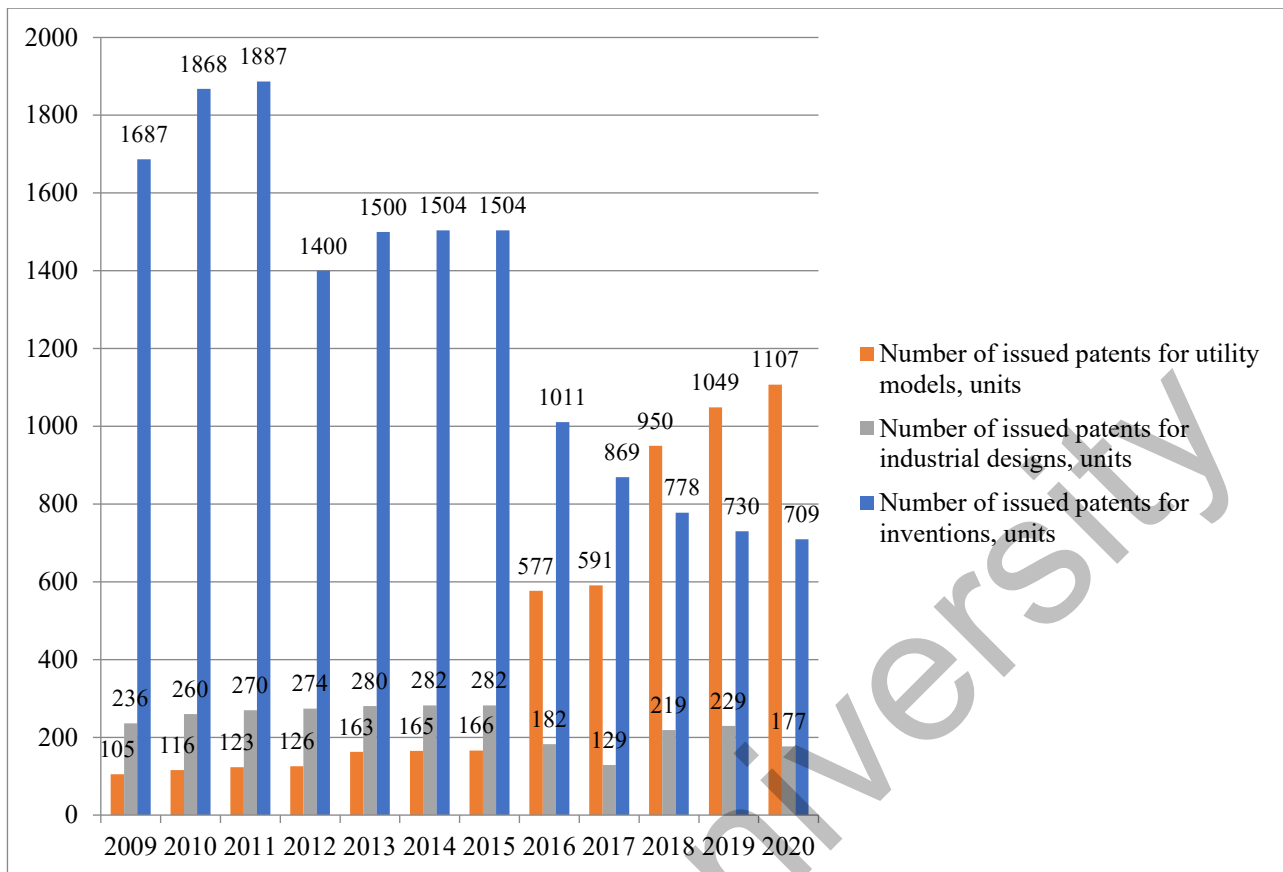


Figure 3. Dynamics of issued patents for utility models, industrial designs and inventions, 2009–2020

Note — Compiled by the authors based on statistical collections characterizing the intellectual activity of the Republic of Kazakhstan

It should be noted that there is a tendency of decreasing patent activity by market entities. If in 2009-year 1687 patents were issued for inventions, then in 2020, their number almost halved. The maximum number of patents was issued in 2010, 2011, which is associated with the activation of innovation processes in Kazakhstan. Since 2015, there has been a sharp decline of inventive activity, which was influenced by the intensification of the emigration process among specialists in the field of science and technology.

Considering the dynamics of issuing certificates for industrial designs and utility models for the period 2009–2020 enables us to conclude that there is a positive trend of the issuance. Since 2016 there has been a steady growth where the volume of patents issuance for the utility models has increased 5,5 times compared to 2009, and by the end of 2020 more than 10 times. The growth rate in 2020 was 106 %, the average growth rate for the research period was 954 %. The basic absolute increase in 2020 amounted to 1002 utility model patents. This means that the subjects of SMEs have begun to show high activity in the using of utility models in the implementation of their activities.

Having analyzed the number of the protection documents for industrial designs, it should be noted that the positive dynamics was traced until 2020. This is primarily due to the applicants' desire to preserve their rights to development through their state registration (patenting), which is the most reliable means of protection. In 2017, the smallest number of patents for industrial designs (129) was issued, whereas this indicator increased by 78 % in 2019. Nevertheless, due to the current situation associated with the introduction of quarantine measures, the number of patents granted for industrial designs in 2020 decreased by 23 % and amounted to 177.

The research of the state of innovation activity in the regions of the Republic of Kazakhstan showed that the most active regions in terms of the patent number for inventions, utility models and industrial designs are the cities of Almaty (738 / 44,3 %), Nur-Sultan (233 / 14 %), Karaganda (161 / 9,7 %), and Almaty region (85 / 5,1 %), where the largest number of scientific organizations are concentrated; also these are the regions that have the prospect of becoming centers of innovation activity (Table 1).

Table 1. The number of issued security documents for industrial property objects in the context of the regions of the Republic of Kazakhstan for 2020 units.

No.	Region / City	The number of issued security documents for:			Total
		inventions	utility models	industrial designs	
1	Almaty city	293	411	34	738
2	Almaty	25	53	7	85
3	Akmola	9	10	2	21
4	Aktobe	12	11	-	23
5	Atyrau	4	14	-	18
6	East-Kazakhstan	27	51	1	79
7	Zhambyl	8	23	4	35
8	West-Kazakhstan	4	28	3	35
9	Karaganda	55	104	2	161
10	Kostanay	5	24	-	29
11	Kyzylorda	1	23	-	24
12	Mangystau	6	11	-	17
13	Nur-Sultan city	75	156	2	233
14	Pavlodar	33	22	-	55
15	North-Kazakhstan	3	36	7	46
16	Turkestan	1	9	2	12
17	Shymkent	12	41	1	54
Total		573	1027	65	1665
<i>Note — Compiled by the authors according to the RSE “NIIP” RK</i>					

According to the authors, the process of registration of such objects of industrial property as utility models, industrial designs in comparison with inventions is much simpler and more profitable. This is since the short-term protection characteristic of them pays off with minimal costs than the development of inventions (Mamrayeva & Tashenova, 2017).

As stated by the International Patent Classification, the largest number of protection documents were issued under the sections “Satisfaction of human vital needs” (25 %), which includes life products: agricultural products; food, tobacco; personal and household items; health, rescue service, entertainment, and also in the section “Chemistry and metallurgy” (23 %) — products of inorganic chemistry, water treatment, cements, concrete, fertilizers, explosives, oil, gas industry, etc.

Figure 4 illustrates the number of the issued patents for inventions, utility models and industrial designs to foreign applicants by country of origin. Every year, enterprises from 25 countries of the world register their developments in Kazakhstan. The greatest inventive activity was shown by the enterprises of the USA, Russia and China. In the least degree, innovators register such countries as Switzerland, France, Germany, Korea, Japan, and others.

For example, American companies mainly patent inventions related to the categories of “Mechanical engineering; lighting; heating; engines and pumps; weapons and ammunition; blasting”, “Physics” and “Construction and Mining” (machine tools, various pipe elements, systems and methods for eliminating bottlenecks of an integrated oil and gas processing plant, systems and methods for heat management, etc.).

Russian patent holders occupy a sixth share of the total number of the issued patents for inventions. Basically, patents have been issued for inventions from the categories of “Satisfaction of human vital needs” (sugar paste for depilation; disinfectant, etc.), “Electricity” (compact 90-degree twist; ultra-high frequency installation), “Mechanical engineering; lighting; heating; engines and pumps; weapons and ammunition; explosive work” (lighting device with end illumination; method for obtaining reagent) and so on.

The leaders of the countries in the issued patents for utility models were: Russian Federation, Ukraine and Cyprus. More than a third of the total share of patents granted is for utility models developed by Russian residents: pumping plant, block-modular heating station, refrigerators (“Mechanical engineering; lighting; heating; engines and pumps; weapons and ammunition; blasting”); installation for the preparation of a coagulant solution, a method of temperature regime controlling of the electrolyze (“Chemistry; metallurgy”); profile sheet (“Construction and mining”), etc., whereas companies from the Republic of Cyprus have mainly patented utility models from the category of “Various technological processes; transportation”, for exam-

ple, a body for the transportation of long-length goods; a railway carriage; a tank for liquid cargo; a lock for the automatic coupling of a railway vehicle, etc.

The predominant number of patents for industrial designs were issued to innovators from Russia and the United States, the remaining — more than half is accounted for countries such as Belarus, Turkey, Korea, France, and others. Industrial designs of Russian patent holders are presented in the form of drawings, ceiling skirting board, closure shutter, various types of floor coverings, etc. Patents have been issued to American companies mainly for light industry products: underwear, hats, hoodies, shirts, sports trousers, bags, backpacks, and so on (Annual report of RSE “NIIP”, 2020).

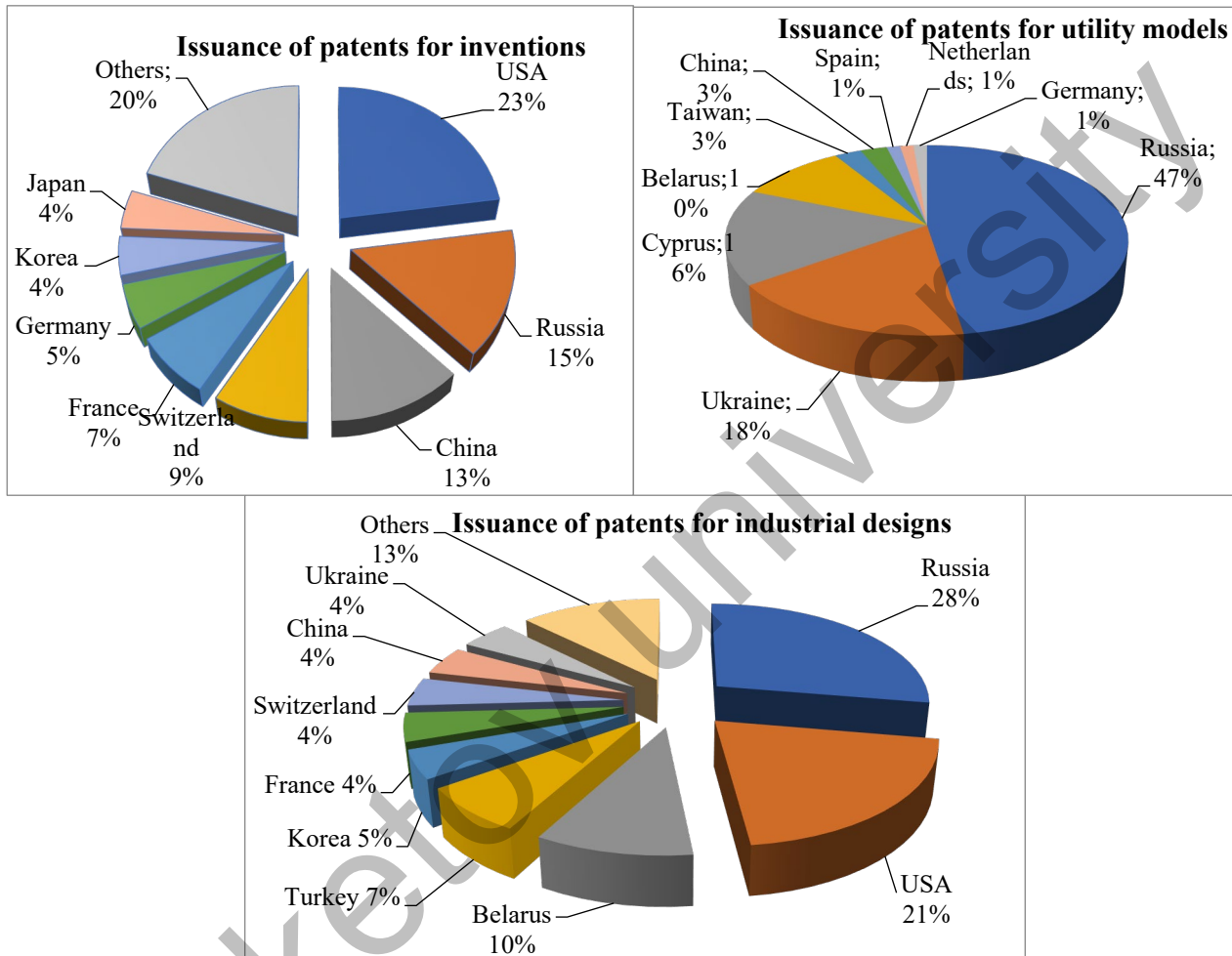


Figure 4. The volume of the issued patents for inventions, utility models and industrial designs to foreign applicants in 2020, in %

Note — Compiled by the authors according to the RSE “NIIP” RK

Thus, there is a growing trend in the investment attractiveness of the country on the background of increased interest to patenting on the territory of the republic from foreign applicants.

### Discussion

The issues of the development of enterprises' innovative activity in the Republic of Kazakhstan are of a debatable nature, which is associated with increasing competitiveness of the national economy. This requires a gradual changing of the economy orientation from the export of raw materials to highly innovative technological structures, the introduction of modern technologies underlying of development innovative models and economy knowledge.

The key strategic task of the economy should be using the innovative technologies as the only possible way, which will lead to a successful competitive activity of subjects in the domestic and foreign markets.

The implementation of the proposed ways of activating innovation activity will help to increase the level of the innovation activity of industrial enterprises and accelerate production modernization.

### **Conclusions**

The obtained results made it possible to estimate the level and current state of the enterprises' innovation activity in the Republic of Kazakhstan, namely, the positive dynamics of registration of license agreements has been determined; a steady increase in the filing of applications for registration of the utility models was identified, while applications for inventions registration and industrial designs had a downward trend. At the same time, most of the submitted applications for registration of industrial property objects find its practical application. The predominant number of patents for industrial property objects belongs to the domestic innovators.

During the analyzed period, the industrial property market has undergone significant changes, while there is a positive dynamic of its development. Even though the commercialization of intellectual property in the Republic of Kazakhstan is not yet widespread, its importance in the country is growing every year, and enterprises are paying more and more attention to their developments and protection.

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### Қазақстан кәсіпорындарының инновациялық қызметін дамыту: патенттік белсенділікті талдау

#### **Аңдатпа**

**Мақсаты:** Қазақстан Республикасы кәсіпорындарының инновациялық белсенділігінің жағдайын зерттеу.

**Әдісі:** Мақалада жалпы ғылыми әдістер, сонымен қатар талдау, салыстыру және жүйелеу әдістері қолданылған.

**Қорытынды:** Қазақстан Республикасы кәсіпорындарының инновациялық қызметін дамытудың қазіргі заманғы үрдістері қарастырылған, атап айтқанда 2009–2020 жылдардағы Қазақстандағы инновациялық өнімдер нарығының сандық мәндері талданған. Инновациялық белсенділіктің негізгі көрсеткіштері және зерттеуге арналған ішкі шығындардың динамикасы бойынша статистикалық деректер келтірілген және зерттелген. Еліміздің өңірлері бойынша инновациялық белсенділіктің ерекшеліктері мен айырмашылықтары анықталды. Түскен өтінімдерге және өнертабыстарға, өнеркәсіптік үлгілерге, пайдалы модельдерге берілген патенттердің санына талдау жүргізілді. Ұлттық және шетелдік өтінім берушілердің патенттік белсенділігінің серпіні көрсетілген.

**Тұжырымдама:** ҚР өнеркәсіптік меншік нарығы талданып отырған кезеңде айтарлықтай өзгерістерге ұшырады, сонымен қатар оның дамуының оң серпіні байқалады. Елде зияткерлік меншікті коммерцияландыру процесі әлі жеткілікті дамымағанына қарамастан, Қазақстанның көптеген өңірлеріне тұрақты инновациялық белсенділік тән. Өнеркәсіптік меншік объектілерінің лицензиялық саудасын дамытудың оң серпіні анықталды, бұл ретте өнертабыстарға, өнеркәсіптік үлгілерге және пайдалы модельдерге патенттердің басым саны отандық жанашылдыққа тиесілі.

**Кілт сөздер:** инновациялар, кәсіпорындардың инновациялық қызметі, инновациялық өнім, пайдалы модельдер, өнеркәсіптік үлгілер, өнертабыстар, патент, ФЗТКЖ, өнеркәсіптік меншік.

Д.Г. Мамраева, А.Б. Токсамбаева, Л.В. Ташенова

### Развитие инновационной деятельности предприятий Казахстана: анализ патентной активности

#### **Аннотация**

**Цель:** Исследование состояния инновационной активности предприятий Республики Казахстан.

**Методы:** В статье использованы общенаучные методы, а также методы анализа, сравнения и систематизации.

**Результаты:** Рассмотрены современные тенденции развития инновационной деятельности предприятий Республики Казахстан, в частности, проанализированы количественные значения рынка инновационных про-

дуктов в Казахстане за 2009–2020 гг. Приведены и изучены статистические данные по основным показателям инновационной активности и динамика внутренних затрат на исследования. Выявлены особенности и различия инновационной активности по регионам страны. Проведен анализ количества поданных заявок и выданных патентов на изобретения, промышленные образцы, полезные модели. Показана динамика патентной активности национальных и иностранных заявителей.

**Выводы:** Рынок промышленной собственности РК за анализируемый период подвергся значительным изменениям. Наряду с этим, наблюдается и положительная динамика его развития. Несмотря на то, что процесс коммерциализации интеллектуальной собственности в стране еще недостаточно развит, для большинства регионов Казахстана характерна стабильная инновационная активность. Выявлена положительная динамика развития лицензионной торговли объектами промышленной собственности, при этом преобладающее количество патентов на изобретения, промышленные образцы и полезные модели принадлежит отечественным новаторам.

**Ключевые слова:** инновации, инновационная деятельность предприятий, инновационный продукт, полезные модели, промышленные образцы, изобретения, патент, НИОКР, промышленная собственность.

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