

REFORMS IN THE FIELD OF SCIENCE AND INNOVATION: FACTORS AND RESULTS

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Abstract

In the 21st century, the problem of management, organization of innovative activities, selection of methods and mechanisms for innovative development of various sectors of the economy has been in the focus of attention of economists. Innovation, innovative activity, innovative process and similar concepts are firmly established in various aspects of daily life, enterprise activity and economic sectors. In developed countries, innovation is one of the important factors in increasing the competitiveness of enterprises, strengthening their position in the market and producing consumer goods. The need to move the economy of Uzbekistan to the path of innovative development is also due to the fact that the world economy is developing based on the achievements of science. In this article, we analyze the main results of the focus on science and innovation and the reforms and focus on future priorities. We express the results of practical work in numbers and present conclusions.

Keywords: *innovation, global innovation index, infrastructure, science, projects, grants, startups, international relations, prospective main directions*

Introduction. Uzbekistan pays close attention to the issues of strategy and prospects for innovative development, which is relevant in connection with the globalization of world economic connections. As the President of the Republic of Uzbekistan Sh.M. Mirziyoyev "An important condition for the dynamic development of the Republic of Uzbekistan is the accelerated introduction of modern innovative technologies in the economy, social and other spheres with the widespread use of science and technology". In Uzbekistan, the introduction of modern innovative ideas, developments and technologies is identified as one of the main sources for ensuring a quick and high-quality breakthrough for the country and joining the ranks of developed countries in the world economy.

The priority areas for the development of the social sphere of the Republic of Uzbekistan in 2017–2021, approved by Presidential Decree UP-4947 of February 7, 2017 "On the Action Strategy for the Further Development of the Republic of Uzbekistan", also included the development of education and science. At the same time, the task was set to stimulate research and innovation activities, create effective mechanisms for the introduction of scientific and innovative achievements into practice, the creation of scientific and experimental specialized laboratories, centers at higher educational institutions and research institutes high technologies, technology parks.

In pursuance of the Action Strategy, as well as in order to implement the tasks defined in the Message of the President of the Republic of Uzbekistan to the Oliy Majlis of December 22, 2017 by Decree of the President of the Republic of Uzbekistan No. UP-5308 of January 22 2018, the State Program for the implementation of the Action Strategy in five priority areas of development of the Republic of Uzbekistan in 2017-2021 was approved years (hereinafter referred to as the Action Strategy) in the "Year of Support for Active Entrepreneurship, Innovative Ideas and Technologies". This State Program provided, in particular, in the field of economic development and support for active entrepreneurship — creation of favorable legal, organizational conditions for the development of active entrepreneurship, the introduction of innovative ideas and technologies, further improvement of legal guarantees of protection and mechanisms to prevent illegal interference in the activities of business entities, tax and customs policy, banking and financial sector, development of a strategy for reforming the agricultural sector, refusal

to provide individual benefits with the provision of benefits to industries and sectors of the economy, active development of regions.

Thus, in order to accelerate the development of the country on the basis of modern achievements of world science, innovative ideas, developments and technologies, as well as the consistent implementation of the tasks defined by the Action Strategy by Decree The President of the Republic of Uzbekistan No. UP-5544 dated September 21, 2018 approved the "Strategy for Innovative Development of the Republic of Uzbekistan for 2019-2021".

The document also approved the "Roadmap" for the implementation of the strategy and targets for the innovative development of the Republic of Uzbekistan until 2030.

The main goal of the Strategy for Innovative Development of the Republic of Uzbekistan for 2019-2021 is the development of human capital as the main factor determining the level of competitiveness of the country on the world stage and its innovative progress.

The main objectives of the Strategy are: the entry of the Republic of Uzbekistan by 2030 into the 50 leading countries of the world according to the rating of the Global Innovation Index; improving the quality and coverage of education at all levels, developing a system of continuous education, ensuring the flexibility of the system of training personnel, based on the needs of the economy; strengthening the scientific potential and efficiency of scientific research and development, creating effective mechanisms for integrating education, science and entrepreneurship for the wide implementation of the results of research, development and technological work; increasing the investment of public and private funds in innovation, research, development and technological work, the introduction of modern and efficient forms of financing activities in these areas; improving the efficiency of public authorities through the introduction of modern methods and management tools; ensuring the protection of property rights, creating competitive markets and equal conditions for doing business, developing public-private partnerships; creation of a sustainable socio-economic infrastructure.

Materials and methods

In order to clarify the problems that clearly affect the promotion of innovations and ways to solve them, a methodology was applied to identify scientific problems

based on the analysis and generalization of scientific research on the research issues, as well as factor and content analysis, the task of which included the selection, interpretation and systematization of the identified factors.

Data analysis.

Innovative activity of networks is the acquisition of methods and tools for the implementation of specific processes, including the results of research and development that increase the efficiency of the development of new products and technologies in production. It should be noted that innovation includes the entire innovation process, from the emergence of an idea to the distribution of a product based on it on the market. An innovative process occurs when the results of scientific research are applied to production and the results of this process affect consumers, that is, when the processes of relations between scientific research, production and consumers are implemented. Each of its components performs a clearly defined task in the overall process: innovation is created in the field of research and development, in production – it is repeated and then passes into the sphere of production or non-production consumption, where its properties are realized. It should be noted that several practical works related to the implementation of innovative processes have been carried out in Uzbekistan in recent years.

As you know, recently in November 2022, 5 years have passed since the establishment of the Ministry of Innovative Development of the Republic of Uzbekistan. As a result of the implementation of the «Innovative Development Strategy of the Republic of Uzbekistan for 2019-2021» adopted in 2018, great progress was made in ensuring and encouraging the introduction of technological development and innovations in the fields of agriculture, energy, construction, education and healthcare. Importantly, a number of works on the development of human capital have been carried out, and the coverage of higher education and post-higher education has been significantly expanded. During 2018-2022, the number of quotas allocated for doctoral studies increased by 7.1 times and reached 3600 in 2022. Intern-research institute was introduced as a preparatory stage for post-higher education and 1200 young scientists were trained. (Fig. 2)

Compared to 2015, our republic has risen by 40 places in the Global Innovation Index (GII) ranking. Ranked 82nd in the Global Innovation Index in 2022. For information: Our country was included in the index for the first time in 2015 and ranked 122 out of 141 countries. In 2021, our republic rose to 86th place (+36) among 132 countries of the world. Ranked 4th among 10 countries in Central and South Asia. This achievement, of course, confirms the effectiveness of the reforms implemented in our country and the correctness of the directions of economic development determined by the head of our state. (Fig. 1). According to the Decree of the President of the Republic of Uzbekistan No. PF-5544 of September 21, 2018, the priority goal of the Republic of Uzbekistan is to enter the ranks of the 50 advanced countries of the world according to the Global Innovation Index rating by 2030. The main direction of the implementation of this goal is to adapt the field of science to modern economic conditions, which, in turn, will lead to fundamental changes in the structural, organizational, personnel, infrastructure and financial development of science, regulated by a strong regulatory

and legal framework.

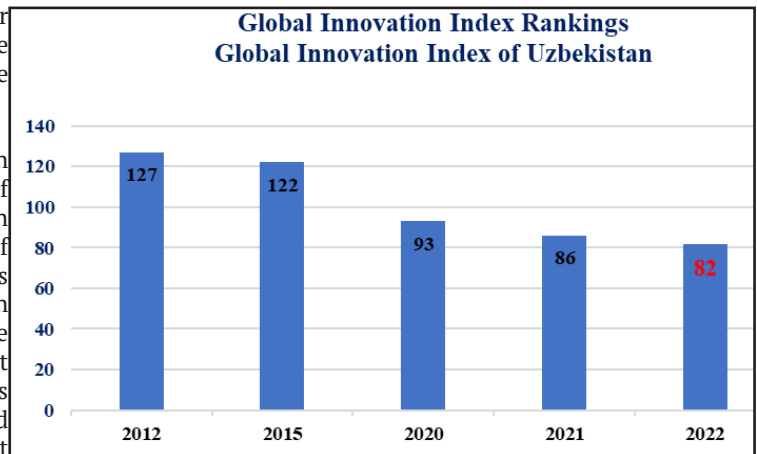


Figure 1. Results of Uzbekistan in the Global Innovation Index (GII) rating 2012-2022.

The Global Innovation Index (GII) is an annual rating and analytical review of more than 130 countries in the field of innovative activity, on the basis of which countries are sorted by performance, and ultimately serves as a barometer of the country's socio-economic and innovative development for the world community.

The Global Innovation Index (GII) rating consists of 7 main areas:

1. Management institutions;
2. Human capital and research;
3. Infrastructure
4. Market development;
5. Business development;
6. Results in the field of knowledge and technology;
7. Creative results.

All directions are based on 21 structural sub-blocks and 80 indicators that directly cover the socio-economic development and institutional foundations of the country. The rating is compiled every year and the analysis of the achieved results allows to assess the competitiveness of the newly formed innovative economy and the effectiveness of these reforms in general. Currently, media coverage of these results remains relevant. If we are lagging behind in the main areas of the global innovation index, we consider it appropriate to introduce effective mechanisms based on these indicators, hold contests, carry out promotion work among young people and the general public, and organize educational seminars. In order to implement these tasks, the Law "On Science and Scientific Activity" and the Law "On Innovative Activity" were adopted. In 2017-2022, a total of 88 normative legal documents related to science and innovative activities were adopted – 3 Laws, 6 Presidential Decrees and 28 decisions, 40 decisions and 12 orders of the Cabinet of Ministers, as a result of which competition in the field, interests an atmosphere of responsibility and responsibility was formed. Also, two important documents were signed by our President. The first document is the "Concept of Development of Science until 2030", approved by Decree No. PF-6097 of the President of the Republic of Uzbekistan dated October 29, 2020. The second document, "Innovative development strategy of the Republic of Uzbekistan in 2022-2030". The main purpose of adopting these documents is to create a solution for all scientific and practical work that provides for the development of the process of forming the creative economy of the continuous (cyclical) "innovation-capital-

innovation” ecosystem, which includes all the main stages from the creation of new jobs to the creation of economic value.

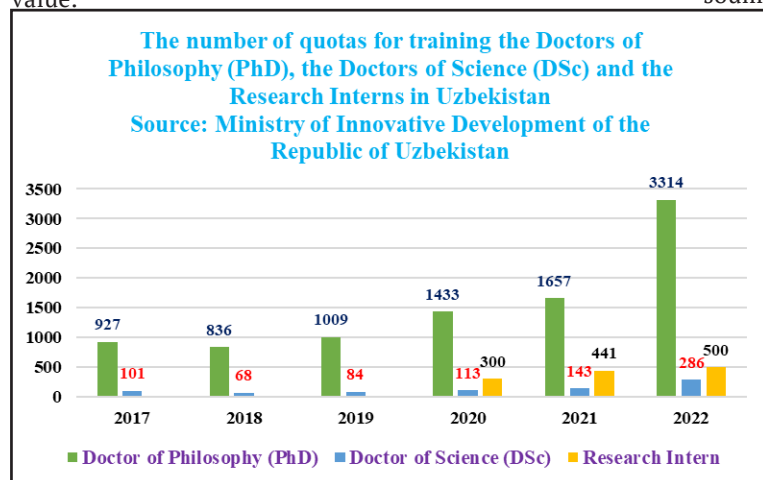


Figure 2. Post-tertiary coverage. Quotas allocated for doctoral studies from the state budget 2017-2022

At the same time, the level of commercialization of scientific and innovative developments in the real sector of the economy, cooperation between science, education and industry in the real sector remains relatively low. The amount of annual funds allocated from the state budget to the fields of innovation and science was increased by 3 times and the amount of project financing was increased by 3.5 times, in particular, 40 percent of the funds were directed to the purchase of necessary equipment, reagents and materials; The management system in the field of science has been improved, in particular, a national rating system aimed at evaluating the effectiveness of scientific and innovative activities of scientific organizations has been introduced; The number of young scientists was increased by 1.5 times, in particular, from 6.5 thousand people (indicator in 2018) to 10.8 thousand people (indicator in 2022); In higher education and scientific-research institutions, the basic salaries of employees with scientific degrees were increased by 3.2 times, and the procedure for paying employees additional fees based on target indicators was introduced; The material and technical base of scientific research institutes has been fundamentally renewed, and a total of 160.16 billion was provided to them over the course of 5 years. 272 types of laboratory equipment worth soums were supplied; The system of financing science and scientific activities has been diversified, the funds allocated to science and innovation from industrial enterprises and the private sector have increased threefold in 2018-2022, in 2022 (954 billion soums were spent) from state funding (allocated 591 billion soums) 1 increased by 6 times; Deputy heads of all ministries and agencies, business associations, large organizations with a state share of 50 percent or more in the charter fund were assigned the task of introducing innovations (Chief Innovation Officer), and also established departments responsible for innovative activities; Modern infrastructures for the development of innovative activities were created, in particular, 19 new innovative infrastructures were established in the republic's territories (9 technological parks, 4 innovation centers, 3 business accelerators, 3 co-working centers, 1 landfill);455.1 bln. scientific developments in the amount

of soums were commercialized, of which 366.8 billion soums worth of products were produced (324.8 billion soums worth of products were sold and 88.3 billion soums worth of services were provided); At the same time, there are still problems, for example, we believe that it is appropriate to completely abandon the current theoretical methodological course at the stage of the basic doctoral studies, and instead of it, in the field of specializations, the subjects and courses that the doctoral students need to master must be mastered in the credit-module system or other systems.

For the innovative development of the regions, from 2021, regional departments of the ministry were established, and 28 innovative districts were designated throughout the Republic, and 214 scientific, 102 startup and 128 commercialization projects are being implemented in the regions. 205 innovative projects worth 199.4 billion soums have been implemented and 122 new enterprises have been established for the innovative development of

regions. (Table 1).

Based on the principles of deep science and digitalization, priority projects are being implemented in the fields of robotics and mechatronics, artificial intelligence, biotechnology, soil science, geology, viticulture and winemaking, hydrogen energy, development of the copper industry, telemedicine, development of foreign languages. In order to develop scientific and innovative activities in the regions, innovative development departments of the Republic of Karakalpakstan and regions were established in the ministerial system.

Table 1. Results on the innovative development of regions as of 2022

199,4 billion soums	205 innovative projects	122 new enterprises	322 new product services	
			1806 new vacancies	
Applied Fields				
40 % Agriculture	29% Education	10,5 % Science		
10,3 % Other fields	8% Animal husbandry	2,2 % Industry		
Scientific and Technical Information System	Information Resource database	Scientific Expert database	Express Analysis Service	English For Science

Karakalpakstan in order to improve the living standards of the residents of this region, create new high-tech jobs, improve social infrastructure, and implement projects with price and quality advantages and innovation elements in the areas of comprehensive innovative development of the region based on the introduction of highly effective innovations in selected districts. 28 districts that are being transformed into innovative regions in the republic and regions have been approved. Deputies on innovation issues of 28 innovative districts were appointed to be responsible for the direct implementation of these issues. As of 2017, there were no unified areas for the implementation of the results of scientific developments in the regions of the republic, for the effective use of the existing scientific, technical and innovative potential. In order to create a favorable environment for the development of high technologies, the sustainable development of scientific-technological and innovation entrepreneurship, the establishment of small innovation enterprises, the production and supply of competitive, scientific-volume

products in national and foreign markets, 19 innovative enterprises have been established in our republic over the past 5 years. Infrastructures (technological park, business incubator, business accelerator, co-working center, etc.) were established (Fig. 3).

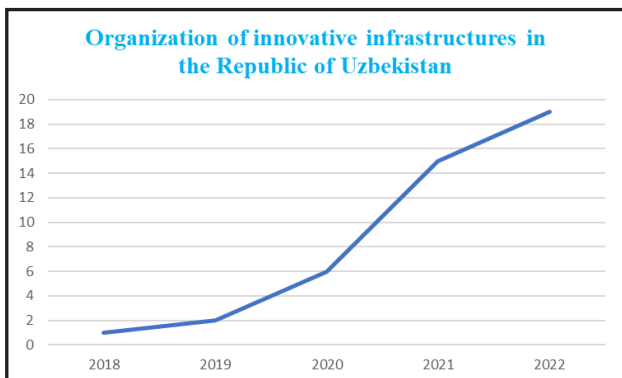


Figure 3. Organization of innovative infrastructures in the Republic of Uzbekistan.

Analyzing the above data, there are many problems here. In particular, the number of fundamental and practical projects remains small. Of course, the fact that there are many practical projects is a good indicator. However, in developed countries, the place of innovative projects is in the first place. In order to solve these problems, we believe that it is necessary to fundamentally improve the conditions for the announcement, holding, commission consideration and discussion of state grants and other scientific competitions. A number of works are being done on the basis of foreign experiences. In particular, 12 foreign companies («Yemmak» (Turkey), «Fasso» (Italy), «Lumeks» (Russia), «Hastovuk» (Turkey), «VDL agrotres» (Netherlands), «Pas reform» (Netherlands), «Main» (Netherlands), «Biotrof» (Russia), «Agrofeed» (Hungary), «Sobb» (USA), «JamesWay» (Canada), «Pitersime» (Belgium) experiences were studied. Based on experiences, the role of innovations in the agricultural sector is expanding. (Table. 2).

Table 2. Expenditures directed to scientific and innovative from the state budget in 2019-2021 (in billion soums). Source: Ministry of Innovative Development of the Republic of Uzbekistan

Commercialization of Scientific Developments	22.7 billion soums	79 projects	
Week of Innovative Technologies in agricultural sector	1.67 billion soums	16 contracts	25 agreements
Innovative Technologies in	12 foreign companies	16	25

An innovative energy-saving greenhouse based on modern technologies of South Korea worth 109,000 US dollars was established in the Andijan experimental exhibition area for the purpose of growing seedlings of medicinal plants. Cultivation of amaranth, stevia, rastaropsha, helba medicinal plants was started on the 8.0 hectares of cultivated area belonging to Andijan experimental exhibition area. In the first year, more than 4.3 tons of amaranth grain, 600 kg of rastaropsha grain, more than 300 kg of helba grain, 500 kg of stevia leaves were obtained and 10,000 stevia seedlings were grown.

In terms of assisting in the commercialization and introduction of new developments into production and the implementation of start-up projects, the formation of

a state order for scientific research projects was launched based on the needs of the industrial sectors for scientific development and innovation and existing technological problems. As a result of the formation of the system created by the Ministry, the amount of funds allocated by the economic sectors for research and experimental work is 57.8 billion in 2019. 96.6 billion soums in 2021. To soums, the growth rate was 160 percent. 170 bln. 197 million soums. Was delivered to soum. In 31 ministries, offices and chartered funds operating in the economic spheres, one of the deputy leaders of business associations with a state share of 50% and above was assigned the task of introducing innovations – Chief Innovation Officer, and specialized departments for carrying out innovative activities were opened in each of these organizations. The Regulation on short-term contract employment of scientific staff in interested organizations in the real sector of the economy, including the procedure for providing employment while retaining the main job at a scientific-research institute – «internship» internships, was developed and approved. In addition, the «Innovative products» section, which is not linked to the TIF code, has been established on the Cooperation.uz electronic cooperation portal, and contracts with state bodies and large state organizations on the development, implementation and technical support of local scientific organizations and enterprises with innovative goods and software products have been established through the portal. Authorized to sign directly. From August 1, 2022, the Regulation on the organization of scientific research based on the chain of «network-territory-scientific/higher education organization» in the organization of the production of innovative products was approved. As a result, on the basis of the «1+1» principle, scientific projects are financed together with network organizations on a competitive basis. Industrial clusters and large innovative enterprises are regularly carrying out certain activities in order to form the skills to invest in «radically innovative» innovations aimed at solving their needs and problems. In the last five years, a number of practical and effective new mechanisms have been introduced in the rapid development of the economy, the integration of science and production, the introduction and commercialization of scientific and technical developments in all spheres of state and public life. As a result, in 2018-2022 scientific and research institutions will spend 455.1 billion. Scientific developments in the amount of soums were commercialized, of which 366.8 bln. Produced products worth 324.8 billion soums and provided services worth 88.3 billion soums. In order to develop the «Scientific-scientific organization-region» and «Scientific-scientific organization-network» systems, the spring and autumn stages of the new effective «Commercialization Forum» have been launched regularly. In the spring stages of the commercialization forum, within the framework of the «Scientific-scientific organization-territory» system, the Republic of Karakalpakstan and regional governments will allocate 6.48 billion to 37 developments in 2021. 8.93 billion soums for 44 developments in 2022. Soum funds were directed. 17.1 billion within the autumn stage of the 2022 commercialization forum. Soum contracts, as well as 2.78 bln. Practical work has been started within the framework of export contracts in the amount of US dollars. For information: the farm «IPAK KOCHAT KLASTAR» has a 5-year contract with the private enterprise «ASVS Oyl» of the Republic of Kazakhstan for the supply of seedlings of the new «Uzbekistan» and «Marhamat-2017» varieties

of mulberry, the total cost of which is 2.5 million. The US dollar export contract was signed. Within the framework of 66 projects presented under the "Scientific-Scientific Organization-Network" system, new types of innovative and import-substituting products were created, including:

- The production of dental implants with bioactive coating based on high technologies has been launched;
- the production of environmentally friendly, resource-saving and economically effective new generation "TERIA" series bacterial biofertilizer was launched;
- the production of 4 types of superplasticizers that increase the strength of concrete products has been launched;
- the production of reverse osmosis water filters, which purify water at the molecular level, has been launched.

Starting from 2022, 17 new innovative (spin-off) enterprises specializing in the production of scientific and innovative products (goods and services) operating in the fields of agriculture, food industry, construction, health care, automotive industry will be launched. An additional one-time reward system was introduced to the authors of patented intellectual property objects in the amount of ten times the base calculation amount. As a result, in 2018-2022, one-time awards of 1115.63 million soums were paid to the authors of scientific development and scientific teams. Spending on science and innovation has increased significantly since 2017. A total of 1488.3 billion from the state budget for the implementation of programs and projects on scientific and innovative activities. Soums (in 2018 – 198 billion soums, in 2019 – 347.7 billion soums, in 2020 – 428.6 billion soums, in 2021 – 514 billion soums). Interest in science among the young generation has increased, and since 2017, a lot of work has been done to create favorable conditions for the development of scientific and innovative activities in our country. (Figure 7).

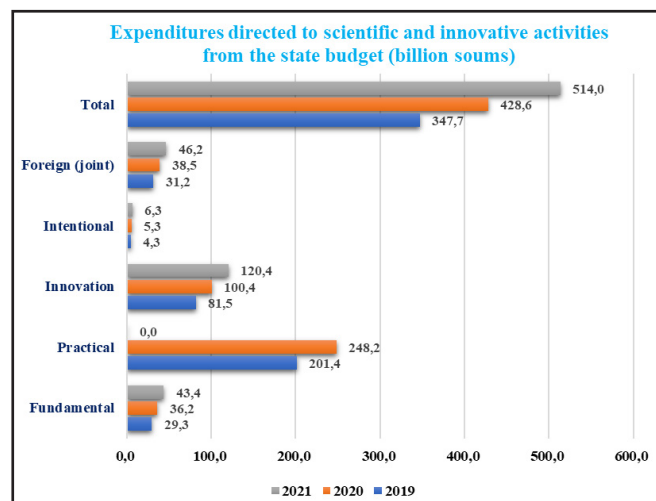


Figure 4. Expenditures directed to scientific and innovative activities from the state budget.

In this regard, a strong legal framework has been created, reforms have been implemented that allow for a significant increase in state spending on science and innovation, work is being actively conducted to improve the potential of personnel and launch new infrastructure facilities. But at the same time, some small problems are causing the big problems mentioned above. In particular, we believe that it is in accordance with the goal to implement the procedure for the implementation of the procedure for state financing of 25 to 50 percent of the

expenses of leading scientists of foreign scientific centers and institutes and universities, which are involved in the educational and experimental and scientific activities of scientific research institutions and higher educational institutions. In this, the main task is to ensure access to the world market through the full use of local scientific potential and the transfer and commercialization of modern technologies, including scientific and innovative developments, and the basis for such high goals is created.

Conclusion and recommendations.

The results of the study proved that in the conditions of economic integration, the system of innovation processes should be institutionalized as a social institution for the interaction of science, economics and education to solve the problems of modernization and development of a new formation of human resources capable of working in modern conditions. The formation of a social institution of innovation in universities is hampered by the combination of factors of an objective and subjective nature that we have identified. The research hypothesis was confirmed that the identification, systematization and formulation of factors and trends in the development of innovative processes in universities is an urgent scientific problem that requires research and formulation of priority trends. The purpose of the study was achieved: the systematization of factors made it possible to formulate a number of major problems and trends in the development of innovations at universities that need to be addressed: 1) accelerating the diffusion of knowledge from universities, i.e. from the field of development to the real economy - involves the efforts and increase in the efficiency of commercialization departments, which should be in close connection with production; scientific developments of the departments often remain without implementation and this reduces the motivation of scientists for research; 2) the development of the paradigm of entrepreneurial education, combining academic and entrepreneurial culture - involves the convergence of the paradigms of the functioning of universities (priority of intellectual capital) and economic spheres (priority of innovative growth of the economy); the development of this trend implies not only the strengthening of the applied nature of research by scientists, but also an increase in the volume of investments in the education system by the economic sector; 3) the need for a more effective and intensive development of the strategy of the higher education system, which involves updating the content, changing the forms of education from classroom to dual practical forms of education, and intensifying the development of innovative project interdisciplinary technologies. In this direction, scientific research should be both fundamental and applied. The goal of all transformations in the system should be the position that new knowledge and research results should be converted into a real productive force for production. Our study has a perspective in studying the content and tools for implementing the scientific trends formulated in this article.

In conclusion, our main and ongoing goals are to create conditions for the effective and stable operation of scientific and technological products market based on supply and demand. It is also necessary to improve the protection of intellectual property, to ensure the rights of producers of goods to produce products and receive income. In addition, the other main and ongoing goals are the introduction of the principles of integration and cooperation in the development of innovative processes, the attraction of investments in the development of infrastructure, the

expansion of opportunities for the motivation of quality labor and the promotion of production, the "new" of the economy of commodity producers (organic products, environmental restrictions, the quality and certification system and other systems) and "intelligent, smart" (introduction of Internet technologies, electronic tools, etc.) to increase the demand for innovative services (new technology and high-performance equipment, selective varieties, development of innovative infrastructure, etc.). Currently, biotechnology, renewable energy, increasing soil fertility, mining and metallurgical industry, development of animal husbandry, and artificial intelligence are identified as priority directions in the field of science and innovation in the Republic of Uzbekistan. At the same time, it is necessary to develop specific mechanisms regarding the insufficient implementation of resource-saving technologies, taking into account its competitiveness in the foreign market, in the development of export-oriented priority sectors, relatively limited measures of state support for price parity, and the level of labor incentives.

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