

## PROSPECTS FOR INNOVATIVE DEVELOPMENT OF SCIENCE IN THE YEARS OF INDEPENDENCE AND TODAY

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**Annotation:** *This article analyzes the process and prospects of innovative development of science in Uzbekistan during the years of independence. Important changes in the field of science, implemented reforms, existing problems and their solutions are covered in detail. The impact of innovative technologies on science and the economy is also considered.*

**Keywords:** *science, innovation, technological progress, research, economic development, startups, investments, educational reforms, artificial intelligence.*

### Introduction

Independence has opened a new stage for the development of science in Uzbekistan. Scientific research institutes have been reformed, state programs have been developed for the introduction of new technologies. Today, the development of science and the introduction of innovations have become one of the main factors of economic development. This article analyzes the development of science during the years of independence, existing problems and promising directions.

As is known, after the adoption of the "Law on Education" and the "National Program for Personnel Training" (adopted on August 29, 1997), the education system began to be radically reformed. According to these important documents, measures were established for the rapid development of vocational colleges in our republic. This depends, firstly, on the quality of training specialists, and, secondly, on the provision of the educational institution with modern technologies. The tasks of the engineering and pedagogical staff of the vocational college are to instill in the working personnel a scientific worldview, a creative attitude to work, to cultivate in them a high work discipline and culture, and a sense of duty to the team.

Relevance of the topic: Science is a strategic resource of any state. Innovative approaches based on scientific research are necessary for the sustainable development of the economy of Uzbekistan. The development and implementation of new technologies through the development of science makes a significant contribution to economic growth. The relevance of science today is associated with the following aspects: The need to develop modern technologies; Innovative modernization of industry; Formation of a digital economy; Increasing international competitiveness.

In the era of globalization, in order to achieve fundamental changes in the socio-economic and political life of our country and ensure its future, there is a need to form a

new worldview in the new Uzbekistan, relying on our national values, in the formation of the worldview of the younger generation. Therefore, it is of great importance today to pay special attention to education and upbringing in order to awaken the spirit of love for the homeland in our youth. This is one of the main conditions for strengthening the independence of our Motherland and developing Uzbekistan. Currently, our country's production sectors are constantly based on high efficiency. For Uzbekistan, which is striving to take its place among the socio-economically developed countries, today the main focus in educational processes is to direct the socio-political worldview and thinking of young people to the interests of the Motherland. Today, conceptual foundations and practical criteria for the development of education are being developed in order to nurture modern youth who deeply feel their involvement in the processes of renewal and reforms in our country, who deeply understand their role and participation in our country's entry into the ranks of the most developed countries, who have an active civic position, creative and innovative thinking and ideas on this path. The foundation of the future is created in the fields of knowledge, in other words, what the nation will be like tomorrow depends on what kind of education and upbringing children receive today. For this, every parent, teacher and mentor must see the person in the image of each child, first of all. Based on this simple requirement, the main goal and task of the education and upbringing sector is to raise children as mature people with independent and broad thinking abilities. This requires that education and upbringing be carried out in a harmonious manner. Education cannot be separated from upbringing, and upbringing cannot be separated from education.

The main goal of the national program is to radically reform the education sector, completely free it from ideological views and stereotypes left over from the past, and create a national system for training highly qualified personnel that meets high spiritual and moral requirements at the level of developed democratic countries. Today's innovations and economic changes taking place in society require a different approach to the education system, in particular to secondary specialized vocational education. One of the main implementation tasks of the national personnel training program is to create and implement state educational standards that define the necessary requirements for the quality and specialization of training of trainees, their cultural and spiritual and spiritual levels. The main components of the national personnel training model. Vocational education methodology as a science began to take shape in the second half of the 20th century, and in Uzbekistan since 1985. The main reason for this was the introduction of the subject "Fundamentals of Informatics and Computing" into secondary general education schools. Scientific research on the methodology of teaching subjects related to informatics and information technologies was conducted by professors M. Z. Ziyohojaev, A. A. Abdukodirov, associate professor T. R. Azlarov and others, and certain achievements were achieved in this area. The discipline of methodology of vocational education of the Republic of Uzbekistan is aimed at providing in-depth training for the comprehensive preparation of teachers of secondary specialized vocational education in their future professional activities. It is based on providing theoretical knowledge on the professional orientation of future

teachers involved in the training of specialists in the field of informatics as a subject. In modern education, this is primarily about teaching students to behave consciously, intelligently and culturally in social life. Since the discipline of "Qualifications in Education Methodology" is related to several specialized disciplines, it is based on the methodologies of these disciplines and relies on the general principles of education and upbringing. As is known, these principles are developed by pedagogy and didactics. In addition, qualification education methodology directly uses the laws established by physiology and psychology. As is known, methodology is a set of methods and techniques, the implementation of some action. There are such phrases: teaching methodology, teaching methodology. These two concepts are practically equal, and teaching is the activity of the teacher. Teaching methodology, as a subject of study, sets the following tasks for the future engineer-pedagogue. "How and what should be taught?", "Why should it be taught in this way?". Based on the general goals of education and upbringing, its role and tasks in the system of modern sciences, and its importance in the life of society, the main goals of science can be defined as follows: To ensure that students have a solid and conscious mastery of the basics of knowledge about the processes of processing, transmitting and using information; to reveal to students the importance of information processes in the formation of a modern scientific picture of the world, the role of information and communication technologies in the development of society; None of the above issues should be solved separately, in isolation from the others. They should be implemented as a whole, closely interconnected, because as a result of students' solid mastery of the basics of the subject, it is possible to educate their thinking, create the foundations of a scientific and professional worldview. Teaching students to draw correct and deep conclusions, make logical observations, bring them to a critical and creative approach to solving each problem, allowing them to work productively in various conditions. National Personnel Training Program, National Personnel Training Program of the Republic of Uzbekistan - adopted on August 29, 1997 at the 9th session of the Oliy Majlis of the Republic of Uzbekistan on the initiative of President I. A. Karimov. The goal of the program is to radically reform the education sector, completely free it from ideological patterns left over from the past, and create a national system of training highly qualified personnel at the level of developed democratic countries, meeting the high spiritual and moral requirements. K.t.m.d. Prepared in accordance with the provisions of the Law of the Republic of Uzbekistan "On Education" (August 1997), based on the analysis of national experience and achievements in the world education system, and is aimed at forming a new generation of personnel with high general and professional culture, creative and social activity, the ability to independently set goals in socio-political life, capable of putting forward and solving future tasks. The program is aimed at implementing the national model of personnel training, comprehensively developed, adapted to life in society, and providing socio-political, legal, psychological-pedagogical, etc. for the conscious selection and subsequent thorough mastery of educational and professional programs . It involves creating conditions for this, educating citizens who feel responsible for society, the state and the family. The national model of personnel training,

developed on the initiative and under the direct leadership of the President of the Republic of Uzbekistan I.A. Karimov, has a number of unique, inimitable features. It aims to train courageous, independent-minded, qualified, knowledgeable specialists who can ensure the modern development of Uzbekistan in line with international standards, and at the same time possess noble human qualities. It is a completely new concept introduced into the social consciousness by I. Karimov, a doctor of political science. It serves the development of the state and society.

The main goal and driving force of the reforms being implemented in the republic is the creation of conditions and effective mechanisms for the harmonious development and well-being of a person, the realization of his individual interests, the change of outdated thinking and patterns of social behavior. The formation of an excellent system of personnel training based on the rich intellectual heritage of the people and universal values, on the basis of the achievements of modern culture, economy, science, technique and technology is an important condition for the development of Uzbekistan. The national personnel training program was developed in accordance with the provisions of the Law of the Republic of Uzbekistan "On Education", was prepared on the basis of an analysis of national experience and world achievements in the education system and is aimed at forming a new generation of personnel with high general and professional culture, creative and social activity, the ability to independently set goals in socio-political life, capable of putting forward and solving future tasks. The program envisages the implementation of a national model of personnel training, the creation of socio-political, legal, psychological-pedagogical and other conditions for the conscious choice and subsequent thorough mastery of educational and professional programs, the upbringing of citizens who feel their responsibility to society, the state and the family. is not formed, only 10 percent of secondary school graduates enter higher education institutions. In addition, the eleven-year general secondary education based on compulsory nine-year education is not scientifically justified, it does not provide students with a sufficient level of vocational guidance and practical orientation of education, as well as the formation of independent thinking and labor skills. Every year, about 100,000 graduates of basic schools are left unsatisfied in the production sector and for continuing vocational education. Due to the lack of continuity and continuity between the existing general education and vocational programs in the education system, graduates of basic and secondary schools are not developing career orientation and work skills. As a result, young people and girls experience serious difficulties in determining a life path that is consistent with their abilities, desires, creative and labor inclinations. The educational process is aimed at students with an average level of knowledge, such mechanisms of education as working with gifted young people on individual educational programs are not being used well, the educational programs are far from being completely free from ideological influences, and they do not give enough space to subjects that teach the basics of spirituality and morality, and provide economic, legal, and aesthetic knowledge.

The state of science and technology development in Uzbekistan. Measures to support its development, existing problems and considerations for solving them.

Science is the main force leading any state to development. It is no exaggeration to say that it is very appropriate to assess the development of a state through the development of science. Therefore, for Uzbekistan, the development of science is one of the important steps on the path to prosperity and stability. It is not for nothing that our Constitution stipulates that the state should take care of the scientific and technical development of society. Throughout history, respect and reverence for science have been preserved as a tradition in Uzbek society. As our great ancestor Imam Bukhari said, "there is and will be no salvation in the world except through science."

The current state of science. Today, more than 30 thousand people are engaged in scientific research in Uzbekistan, more than 27 thousand of whom have higher education.

Every year, a significant part of the State Budget of the Republic of Uzbekistan is spent on social expenditures, including education and science. In 2021, more than 239 billion soums were allocated from the country's budget only to support innovative development and innovative ideas, design, construction (reconstruction) and equipment of facilities. In 2022, this figure will be more than 671 billion soums, or 0.39% of state budget expenditures.

Over the past four years, 28 scientific organizations and 4 innovative technoparks have been established. Scientists' salaries have increased threefold. Significant funds have been spent on updating the material and technical base of industry organizations. As an important participant in state research policy, the activities of the Academy of Sciences of Uzbekistan, which includes 28 scientific research institutions and 4 state museums, have been improved.

The establishment of the Ministry of Innovative Development of the Republic of Uzbekistan in 2017 was an important step in organizing the development and implementation of innovative ideas and technologies, which served to implement significant work in this area. In particular, with the direct support of the ministry, 342 scientific developments were commercialized in 2018-2021. As a result, products worth 151.2 billion soums were produced, and products worth 128.7 billion soums were sold.

In general, in recent years, the legal framework for improving the system of state support for science and innovation has been created. In particular, in 2018-2021, 2 laws, 5 Presidential Decrees and 26 resolutions, 35 resolutions and 7 orders of the Cabinet of Ministers were adopted in the field of scientific and innovative activities.

Despite the progress made in the development and support of scientific and innovative activities, there are still a number of problems that need to be solved. Especially in today's era of globalization and digitalization, it is precisely the innovative approach that lays the foundation for the country's success. Such an approach can only be implemented thanks to scientific achievements, therefore, the development of science is an important component of the innovative development of the state.

Science problems directly affect economic growth, improving the living standards of the population, and solving urgent problems in the social sphere. The Concept for the Development of Science until 2030, approved by the Decree of the President of the Republic of Uzbekistan No. PF-6097 dated October 29, 2020, specifically identified 19

problems for the development of science. These include the low level of attention paid to science by enterprises in the real sector of the economy, the high average age of research teams, and the insufficient allocation of financial resources to science and scientific activities. Solving these problems is important and requires comprehensive and thoughtful measures.

The main problems in the field of science. First of all, the problems of dissertation defense and the implementation of scientific and pedagogical activities. A modern scientific and pedagogical staff is a researcher who analyzes a pressing problem with his work and puts forward effective solutions to this problem. Such a definition requires honesty and diligence from the scientist himself. In the conditions of modern development of science, there is no doubt about the relevance of this definition.

Today, a future researcher faces a number of problems in carrying out scientific and pedagogical activities. The first of them is the choice of a relevant research topic. Unfortunately, not everyone pays attention to this. Sometimes the right choice of a research topic is the key to success. An analysis of the selected research topics shows that there are still many outdated or irrelevant research topics. Some topics are more like the topics of abstracts. Sometimes researchers are forced to make corrections to the name of the topic. For example, in the bulletins of the Higher Attestation Commission under the Cabinet of Ministers, where research topics are supposed to be published, separate pages are allocated for publishing changes in the name of the research topic. The names of some topics change three or four times. In this case, a natural question arises - what is the reason for such changes? Why is there a need to change the topic during the research phase? The answers to these questions may vary.

The second problem is the presence of excessive formalities in the processes associated with scientific activity. As mentioned above, research topics must be published in a special bulletin. Otherwise, the topic is considered not officially assigned to the researcher. Any changes, even editorial changes, must be reflected in this bulletin. Similarly, the announcement of the planned defense of the dissertation must be published on the website of the Higher Attestation Commission under the Cabinet of Ministers. Some researchers face problems with the publication of the announcement of the defense of the dissertation (the text of the dissertation and the abstract must be properly formalized in accordance with the established requirements). The process of formalities is also observed in some cases in the relations between Academic Councils and applicants. As a rule, the submission of the applicant's documents to the Council is carried out in the traditional way. The activities of the Scientific Councils, which are the arena of scientific debate, in particular, the issues related to keeping minutes and compliance with various formalities, can also be simplified through digitalization.

The third problem is the relatively weak role of the scientific councils. Although the main part of the work is checked at the university or scientific organization where these councils operate, the final decision on the defense of the dissertation is approved by the Higher Attestation Commission under the Cabinet of Ministers. In this regard, it is

necessary to consider the issue of increasing the independence of universities or scientific organizations, strengthening their responsibility for the quality of research. Of course, in this case, mechanisms for monitoring the activities of the Scientific Councils should be created, openness and transparency should be ensured.

Preventing conflicts of interest in the activities of the Scientific Council is also an important task. It is advisable to prevent conflicts of interest by introducing information technologies, especially in the areas of determining reviewers or official opponents, discussing scientific research work and recommending it for the next stages of defense.

The implementation of research results in practice for the defense of a dissertation is considered one of the urgent problems. According to the current regulations, the implementation of scientific research results in practice is required for the defense of a dissertation. It is impossible to become a Doctor of Philosophy and Doctor of Science without a document on the implementation of scientific results. Sometimes the results of the research may be aimed at implementation in the future (for a long time), which leads to the fact that the completed dissertation work is not protected due to the lack of a document on the implementation of its results in practice. This encourages some researchers to find ways to quickly implement their results in practice, which is not always possible to achieve.

In our opinion, the biggest problem is the problem of scientific publications. Access to international and national rankings sets before the modern researcher the task of publishing research results in journals indexed by international databases (Scopus, Web of Science, etc.). Researchers who do not have experience in publishing articles in such journals face problems with their publications - the journal editorial board refuses to publish their articles, or the articles are returned for editing and elimination of shortcomings (prestigious scientific journals), or a fee is required for publication. Completing and correcting an article is a difficult task that not everyone can solve. Therefore, paying for publication is considered an acceptable way for many. Choosing such a method, the author does not really pay attention to the quality and reputation of the journal. Some are not surprised that in such journals with a dubious reputation their articles are accepted immediately, without any objections or reviews, only on condition of paying for publication. That’s why many fall prey to so-called “predatory” journals. The demand for fast publication of articles is forcing more and more researchers to turn to such “predatory” journals. A 2020 study by Publons found that at least 6,000 “fake” reviews were submitted for more than 1,000 “predatory” journals on the Internet. The analysis showed that the widely used scientific database Scopus stores articles from more than 300 “predatory” journals with questionable publishing practices. Together, these journals published more than 160,000 articles in three years – almost 3 percent of the research indexed in Scopus during this period.

Uzbekistan is becoming a “leading” country in the world in publishing low-quality scientific articles, due to the high share of articles excluded from the Scopus system for 2019 and 2020 (32.5 percent and 59.7 percent, respectively) belonging to Uzbek authors. In order to prevent the publication of articles in “predatory” journals, the lack of clear and transparent mechanisms for monitoring and assessing the quality of journals included in

Scopus, Science and other authoritative databases, the procedure for determining the quality of articles and methodological recommendations for authors on preparing and designing scientific articles for publication, leads to an increasingly acute form of this problem.

To prevent such situations, it is necessary to officially approve and regularly update the list of journals included in international databases and recommended journals, and to publish a list of “predatory” journals. In turn, it is advisable to form the image of an honest and fair scientist, and provide practical and methodological assistance to young scientists. Attention should be paid not to quantity, but to quality.

Secondly, there are problems associated with the application of a single integrated approach to the development of science and innovation. The established system of science and innovation management in the Republic of Uzbekistan indicates the presence of a multi-vector approach. State management in this area is carried out by the Ministry of Innovative Development, the Ministry of Higher and Secondary Specialized Education, and the Higher Attestation Commission under the Cabinet of Ministers.

In particular, the Ministry of Innovative Development carries out a single state policy in the field of innovative and scientific and technical development of the Republic of Uzbekistan. The Ministry of Higher and Secondary Specialized Education carries out educational, pedagogical and scientific and methodological guidance to higher educational institutions, organizes scientific and research work in them and the training of scientific and pedagogical personnel in accordance with the established procedure. The authorized state body for the certification of highly qualified scientific and pedagogical personnel is the Higher Attestation Commission under the Cabinet of Ministers.

This system was aimed at the development of science and innovation as a sector. However, this mechanism does not allow for the full integration of education, science and production. The problem of this approach is clearly manifested in the issues of training scientific personnel. For example, the Ministry of Innovative Development coordinates the system of training personnel with scientific degrees, including allocating quotas for admission to doctoral studies. Training of scientific personnel, as a rule, is carried out in higher educational institutions themselves, where scientific and methodological guidance is provided by the Ministry of Higher and Secondary Specialized Education. Coordination of the activities of scientific councils, in particular, the awarding of the diploma of Doctor of Science or Doctor of Philosophy, is carried out by the Higher Attestation Commission under the Cabinet of Ministers. Such an approach to public administration in this system, which is essentially holistic, can hardly be called effective and comprehensive.

In this regard, the role and importance of the Academy of Sciences as a leading organization of the scientific community should also be increased. The Academy of Sciences should take the initiative in creating methodological foundations for the development of science and technology, the introduction of innovations. The Academy of Sciences, as a leading state scientific institution, should develop a unified approach to the development of national science and innovations.

Thirdly, the country's innovative development is relatively low. Another problem is the effectiveness of measures for the country's innovative development. Uzbekistan's position in international rankings is a vivid example of this. According to the results of the 2021 Global Innovation Index, which determines the trends in the innovative development of countries around the world, Uzbekistan ranked 86th among 132 countries. Uzbekistan's position in the ranking increased by 7 places compared to last year and by 36 places compared to 2015. This is truly a significant achievement. However, Uzbekistan is still in the group of lower-middle-income countries (the ranking divides countries into 4 groups - high-income, upper-middle-income, lower-middle-income, low-income), lagging behind countries such as Kazakhstan, Azerbaijan, Jamaica, Mongolia, and the Philippines. According to key indicators, Uzbekistan has problems with the quality of regulation, intellectual property policy, and the creation of products based on modern technologies. In this regard, Uzbekistan needs to implement reforms in areas where it has weak positions and can achieve significant results. It is necessary to strengthen scientific cooperation with leading foreign research organizations and conduct joint scientific research on topical issues. Intellectual property policy is of no small importance. According to experts, the market for intellectual property rights and royalty management grew from 4.28 billion US dollars in 2016 to 12.68 billion by 2021, an average of 24.2% from 2016 to 2021. Now it is intellectual property that is one of the promising areas of scientific development. Therefore, it is necessary to pay attention to supporting scientific and technical creativity and inventive activity in the country.

The lack of healthy competition also negatively affects the effectiveness of the measures being taken. In some cases, some scientific organizations operate as a single organization that is not seen as a competitor in the relevant fields of science.

Topic solution: To accelerate the processes of scientific and innovative development, the following measures should be taken: Strengthening cooperation between the public and private sectors - improving mechanisms for implementing scientific developments in practice; Increasing investments in scientific research - increasing and effectively distributing funds allocated for science; Developing a support system for innovative projects - financing and encouraging startups; Introducing modern scientific approaches - developing artificial intelligence, big data (Big Data), technological clusters; Integrating education and science - strengthening cooperation between higher education institutions and scientific research centers.

It is necessary to strengthen the activities of venture funds in improving the country's innovative development. Venture investments have contributed to the development of many companies and products. For example, if the investment made by the two founders when Google was founded was 200 thousand US dollars, the current capitalization of the company exceeds one trillion US dollars.

Taking into account the above, the following should be done for the development of science:

– to create an atmosphere of academic honesty and healthy competition in the scientific research environment by adopting a Code of Scientific Ethics for researchers in Uzbekistan;

– to fundamentally revise the current system of dissertation defense, eliminating excessive bureaucratic obstacles and requirements, and to consider the possibility of gradually transferring the authority to approve the degrees of Doctor of Philosophy and Doctor of Science directly to the Scientific Councils;

– preventing conflicts of interest, various formalities by introducing digitalization into the activities of scientific councils, ensuring openness and transparency, increasing the responsibility of scientific councils;

– gradual transition to a single integrated system of state management in the field of science and innovation through a critical review of the activities of relevant state agencies;

– creating an effective and efficient system for conducting scientific research, preventing pseudo-scientific activity (poor-quality scientific articles, publication in "predatory" scientific journals);

– developing Methodological Recommendations for authors on the preparation and registration of scientific articles in journals indexed in international scientific and technical databases;

– ensuring the systematic and targeted adoption of measures for the innovative development of the country (activation of venture investments, international scientific cooperation, intellectual property policy).

Conclusions and proposals. During the years of independence, Uzbekistan has taken important steps in the development of science. The implementation of innovations in practice and increasing the role of science in economic growth are considered one of the promising directions. The development of science and innovation is one of the main factors of sustainable development, and its support should be an important direction of state policy.

The program envisages the implementation of a national model of personnel training, the creation of socio-political, legal, psychological and pedagogical and other conditions for the conscious choice and subsequent thorough mastery of educational and professional programs, the upbringing of citizens who feel their responsibility to society, the state and the family. is not formed, only 10 percent of high school graduates enter higher education institutions. In addition, the eleven-year general secondary education based on the nine-year compulsory education is not scientifically justified, it does not provide students with sufficient vocational guidance and practical orientation of education, as well as the formation of independent thinking and labor skills. Every year, about 100 thousand graduates of basic schools are left unsatisfied in the production sector and for continuing vocational education. Due to the lack of continuity and continuity between the existing general education and vocational programs in the education system, graduates of basic and secondary schools do not develop vocational guidance and labor skills. As a result, young men and women experience serious difficulties in determining a life path that corresponds to their abilities, desires, creative and labor inclinations. The educational process is aimed at

students with an average level of knowledge, such mechanisms of education as working with talented young people on individual educational programs are not being used well, the educational programs are not completely free from ideological influences, they do not give enough space to subjects that teach the basics of spirituality and morality, and provide economic, legal, and aesthetic knowledge. A new type of education from vocational and technical schools is being established

Uzbekistan has achieved significant results in the development of science during the years of independence. Today, the combination of innovations with science, the introduction of scientific developments into the real economy, and the expansion of international cooperation are among the important tasks.

The following proposals can be put forward for the further development of science in the future:

Increasing state and private sector investments in scientific research will expand the possibilities of implementing innovative developments in the economy.

Improving the system of commercialization of scientific developments - it is necessary to link science with economic activity through the development of startups and technoparks.

Strengthening cooperation between higher education institutions and the industrial sector - is an important factor in ensuring the practical application of scientific results.

Increasing the potential of scientific personnel - it is necessary to expand international grants for young scientists, scientific exchange programs, and provide them with modern laboratories.

Accelerating digital transformation - scientific research requires widespread use of modern technologies and artificial intelligence.

Thus, the innovative development of science plays an important role in the economic and social development of Uzbekistan. State support, expanding cooperation with the private sector, and developing scientific research based on advanced technologies will ensure the further advancement of the field of science in the future.

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