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ПЕРСПЕКТИВЫ РАЗВИТИЯ ЦИФРОВИЗАЦИИ ВЫСШЕГО ТЕХНИЧЕСКОГО ОБРАЗОВАНИЯ УЗБЕКИСТАНА

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Аннотация. В статье представлена информация о значении развития цифровых технологий в эпоху глобализации, анализ перехода отраслей экономики на цифровые технологии в Узбекистане, а также текущие проблемы в системе подготовки специалистов в высших технических учебных заведениях. В качестве решения проблем предлагается спрогнозировать перспективы цифровизации образовательной системы технических вузов и использовать технологию Forsite. Описана история возникновения технологии форсайта, ее содержание, а также методика проведения форсайт-исследований. Представлены методы Форсайта, используемые в форсайт-исследованиях, проводимых в развитых зарубежных странах, и их классификация. Для данного исследования были выбраны такие методы, как анкетирование, «ящики будущего», мозговой штурм, Дельфи, построение сценариев и обобщение результатов. Описаны результаты предварительных форсайт-исследований по выявлению положительных и отрицательных факторов широкого применения цифровых технологий в высших технических учебных заведений.

Ключевые слова: цифровизация, технологии, технические, проблемы, прогноз, форсайт-исследования, аспект, позитив, негатив.

PROSPECTS FOR THE DEVELOPMENT OF DIGITALIZATION OF HIGHER TECHNICAL EDUCATION IN UZBEKISTAN

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Abstract: The article discusses the significance of digital technology development in the era of globalization, analyzes the transition of economic sectors to digital technologies in Uzbekistan, and examines current challenges in training specialists within higher technical educational institutions. As a solution to these problems, it is proposed to predict the prospects for the digitalization of the educational system in technical universities and utilize Foresight technology. The description of the history of knowledge technology is foresight, its content is discussed, and the methodology of foresight research is established. The methods of Foresight used in foresight studies conducted in developed foreign countries and their classification are presented. For this study, methods such as surveying, "future boxes, " brainstorming, Delphi, scenario building, and result summarization were selected. The results of preliminary foresight studies identify both positive and negative factors concerning the widespread use of digital technologies in higher technical educational institutions.

Key words: digitalization, technology, technical, problems, forecast, foresight research, aspect, positive, negative.

Introduction. The economic development of Uzbekistan within the context of global economic globalization and technological advancement is difficult to envision without the rapid growth of the digital economy. However, promoting the digital economy will necessitate the removal of barriers that hinder the development of digital commerce.

In Uzbekistan, all sectors, including the education system, are moving toward digitalization, and the country must adapt to new realities. The pandemic led to an unprecedented experiment on a global scale, where all levels of education either suspended their activities for a time or attempted to maintain a continuous learning process through digital technologies, that is, remotely. The urgency of implementing distance learning first revealed the unpreparedness of university students and teachers to conduct classes in this format. In independent education, students become active participants in the learning process. A student in the distance learning system must be able to clearly define educational goals, identify problems, focus on significant details, creatively rethink the learning process, and apply the knowledge acquired [1].

Analysis of modern problems of personnel training in technical universities. Today, the system of higher technical education in the direction of training highly qualified personnel still faces a number of actual problems and shortcomings that require solutions. The main ones include the following [2-5]:

conservative didactics based on classroom and lecture-seminar methods are widely used; in principle, they cannot be used to develop a mass higher and continuous technical education ovaniya, since it requires the expenditure of excessively large material and labor resources;-The science of education is poorly developed. There are no specific scientific proposals for improving the architecture of educational structures, the architecture of training sessions, or the influence of cognitive potential on the success of the educational process;

in the field of higher technical education, it has become impossible to prepare engineers "for life" due to rapid changes in technology, the emergence of new industries, and the accelerated introduction of scientific discoveries into production;

in conditions of dissatisfaction with the quality of work in secondary schools, it creates serious problems in the formation of a student population for most technical specialties, accompanied by a significant number of expulsions of persons with insufficient training, those who are able or unable to master academic disciplines of general scientific and special training;

the problem of employment of graduates of technical universities. In the real production sector, with stable demand, planning training and employment also look difficult, especially for graduates of specialties with a small contingent;

-the mechanism for creating private higher education institutions does not meet the requirements of modern higher education. As a rule, such institutions are not provided with personnel, do not conduct scientific and didactic developments, use inadequate teaching methods, and survive only thanks to local conditions and the desire of some young people to obtain an easy and cheap diploma;

formal production practices due to the lack of necessary control on the part of the university, lack of remuneration for trainees, and reducing previous requirements from enterprises does not allow them to adapt to the rapidly changing conditions of modern productions where foreign developments and products prevail.

From the positions stated above, the solution to the problem is seen in the speedy modernization of technical universities, the transition of production to science-intensive processes, the widespread use of digital technologies while preserving the best traditions of higher education of past years [2].

Digital technologies are the main key to the consistent development of any state, allowing us to make a qualitative leap in many aspects of society. The comprehensive digital reforms being carried out in Uzbekistan today are aimed at achieving the main goal - to become one of the leading states with a thriving economy and a strong civil society. It is digital technologies are effective tools that can ensure high-quality reform of economic sectors and spheres of public life. It should be noted that technical higher education plays a key role both in the mastery and in the dissemination of digital technologies [3].

When forecasting the development of the digitalization of education, analysts and experts consider the transition of the learning process to a digital environment as a turning point in the history of education. Modern digital technologies allow the development of distance education in technical universities. Distance education for technical universities is an opportunity to break into the future and provide higher quality education. But, like any other learning, distance education also has both positive and negative sides [4,5]. Digital resources used today in everyday human activities make it possible to overcome the barriers of traditional learning: the pace of program development, the choice of teacher, and forms and methods of teaching. In education, digitalization is aimed at ensuring the continuity of the learning process, so-called life-long learning - learning throughout life, as well as its individualization based on advanced-learning technologies - advanced learning technologies.

But, at present, there are positive and negative aspects of organizing distance education. The positive aspects of the digitalization of education have been studied more widely, and many articles devoted to this area have been published [6,7]. Having analyzed the works of many scientists, we came to the conclusion that the wider use of digital technologies in the spheres of higher technical education in Uzbekistan requires a thorough study of this process, comparing the positive and negative sides. The study of one scientist or a group of specialists in this industry does not give specific results, since in any multifactorial experiment it is difficult to take into account more than 3-5 factors. At the same time, the main problem of studies devoted to the analysis of the positive and negative aspects of the digitalization of higher education is that they, as a rule, evaluate the digitalization of one of the factors. There are practically no studies that would be devoted to the classification and systematization of general factors influencing the quality of education, the health and psychology of users, and there are also no specific conclusions aimed at the impact of digitalization and associated social risks [8,9].

We made an attempt to systematize the factors of digitalization and determine their impact on the results of personnel training.

Materials and research methods. The current development situation in the educational sphere of Uzbekistan requires not only timely decisions but also a certain degree of forecasting the future development of technical universities. Therefore, we believe that when studying this issue, it is necessary to use Foresight methods. Foresight is a relatively new technology in Uzbekistan, including in the field of education. The general definition of the term "Foresight" sounds like: active forecast, foresight, prediction of the development of a future situation in economics, science, business. In essence, this is the construction of very long-term forecasts based on reliable short-term forecasts for the next few months. The history of such a phenomenon as Foresight began in the 80s. last century. It was then that the United States began to apply this form of active forecasting in the field of defense research and security prospects. Then, Foresight programs began to be used in Japan and European countries [11-20].

Foresight methodology is based on two approaches: normative and exploratory (search). The normative approach to forecasting means focusing on the mission of the subject (organization), on the needs and goals that the subject strives to achieve. The exploratory approach starts with the present and answers the question: what will happen in the future if existing trends continue? The basis of search Foresight is an orientation towards the opportunities presented, the establishment of trends in the development of situations based on the development of an information forecast. There are more than 30 Foresight methods, however, only 10-15 of them are most intensively used in Foresight programs. For further research, we have chosen the following Foresight methods: study and analysis of foreign Foresight studies on the issue of digitalization of education, questionnaires, future box, brainstorming, development of scenarios, and summary of the results obtained [10-16].

Research results and discussion. The main objective of the study was to forecast the prospects for the development of digitalization of higher education in Uzbekistan and identify the positive and negative aspects of digitalization, assess the risks in this area. The study of the existing experience of "digitalization" and analysis of published articles on this topic shows that many articles highlight the benefits of the "digitalization" of education, but there are no specific opinions and conclusions on the problems and risks which may arise in this case.

Table 1.

Results of a survey of students, teaching staff, and university administration to study the issue of interests, opportunities, and perception of digital technologies by the main participants

№	Survey participants	Main survey results
1.	Expert survey of teaching staff	Internet speed is not enough there are no individual educational trajectories and programs for self-development, self-education, and self-esteem of students, allowing teachers to take into account individual learning styles; the existing standardized knowledge assessment system does not meet the requirements of digitalization of education, which is difficult to assess the creative and scientific thinking of students; the curriculum for the subjects is not adequate; they pay very little attention to the digitalization of classes; there are not enough computer classes to use animation and multimedia electronic resources during classes, to conduct virtual laboratories, etc. insufficient material and technical conditions for the development of electronic resources, including audio and video lectures; older students (especially part-time and evening students) often do not have the skills to work in digital and virtual environments; students' strong dependence on virtual social networks;

		there is no organization to improve the qualifications of teachers specifically in digital education technologies; - a specific distance education platform has not been developed for universities in Uzbekistan.
2.	Student survey	Internet speed is not enough insufficient electronic resources developed by teachers of this university, specifically according to the curriculum of the subject; classes are boring and monotonous, and even tiring; in classes, there is little use of gaming approaches using digital technologies; insufficient mobile applications for distance learning; interactive educational materials are variable and individual for each student; little digital measuring instruments are used in laboratory studies; - teachers over 60 years of age differ greatly in intensity use of digital technologies.

For example, a number of researchers have the opinion that the "digitalization" of education implies independent study of the material by students, when the teacher acting only as an assistant, curator, to whom they will have to communicate only when necessary. In addition, in their opinion, professional teachers will be replaced by robots and virtual systems in the future [7-14].

The study is expected to answer two research questions (see Table 1):

What are the interests, capabilities, and perceptions of digital technologies by the main participants in education?

Consequences and social risks of digitalization of higher education.

To obtain reliable information on the first question, we conducted questionnaire surveys of the following categories of participants in the digitalization of education:

expert survey of university teaching staff. For this purpose, the best teachers with extensive experience in the use of information and communication technologies in the educational process were chosen as experts;

a survey of students on their attitude to the digitalization of education; a survey was conducted of more than 200 students from various courses of study.

At the next stage of the study, the methods of literary analysis and SWOT analysis were used. This method is usually used to determine the strengths and weaknesses of the study area, as well as to identify "windows of opportunity" and threats. The advantage of this method is the possibility of it being carried out by a small number of experts (see Table 2):

Table 2.

Negative aspects of digitalization of higher technical education in Uzbekistan

№	Negative aspects	Main reasons
	Impact on students' competencies	
1.	Loss of writing skills	The eye sensor develops poorly,
2.	They will become less able to recognize written text	The difference between reading from a screen and from paper.
3.	Loss of ability to perceive large texts	A person constantly connected to the network does not read the text but scans it like a robot - snatching scattered pieces of data from everywhere. During the research, it turned out that pages on the Internet, as already mentioned, are not read, but are skimmed according to a template.
4.	Reduced need to learn spelling, punctuation, and grammar	Due to the use of the auto-correction function in gadgets and browsers

5.	Refusal of paper textbooks	Replacing paper textbooks with electronic resources (textbooks).
6.	Loss of creativity.	When writing by hand, the areas of the brain responsible for the interpretation of sensory sensations and the formation of speech are involved. For those who do not write with their hands, these areas are turned on much less often.
7.	Screen addiction.	Using computer games or using social networks
	Impact on health and psyche	
1.	Digital dementia. Loss of mental abilities	Digital technologies save us from mental work. It is not worth reminding that an organ that is not used dies. Unused connections between neurons in the brain weaken.
2.	Possibility of developing cancer	Risk of developing cancer, radiofrequency radiation may also affect the blood-brain barrier, opening the way to the brain for toxic molecules, damaging neurons in the hippocampus (memory center brain).
3.	Decrease in social skills. Inability to interact with society, inability to understand others and to make yourself understood.	A study conducted by American scientists has proven that a child who spends at least five days without mobile phones, computers and television improves social skills.
4.	Electromagnetic radiation.	A computer is a source of electrostatic and electromagnetic fields.

5.	Problems with speech development in children.	If the teacher's "mirror" neurons were not involved when presenting educational material, then the students' brains would not turn on.
6.	Vision problems.	High load on the organs of vision, causing its deterioration and the appearance of "red eye" and "dry eye" syndromes.
7.	Joint disease	Incorrect posture when working with a computer for a long time
8.	High load on the psyche and nervous system	Long concentration of attention with a large flow of information for a long time.
9.	Possibility of electric shock to a person	Using electric current without using grounding
10.	Headache, irritability, nervous tension, and stress.	Due to increased concentration when working with computers for long periods of time.

The conducted research shows that at present, digitalization of higher technical education is being widely implemented without taking into account the degree of harmful impact on human health and development, especially young people. But it must be said that there are no serious and completed studies on the "digitalization" of technical education [7,16]. In this regard, it becomes necessary to conduct comprehensive research to describe the process of transformation of the institution of higher technical education under the influence of digitalization and evaluate it from the perspective of social challenges, which both the system of higher technical education and society as a whole are facing or will face in the future [21].

Conclusion. Digitalization of higher technical education in Uzbekistan is only beginning to gain momentum. The main thing on this path is not to stop and not to turn off. Indeed, in the near future, when artificial intelligence, digital and robotic systems free humanity from routine, algorithmic and reproductive activities, personnel capable of thinking creatively and scientifically, making responsible decisions in in situations of increased uncertainty and risk.

This is precisely what is considered the strategic prospect for the development of higher education in the republic. The perspective should set up the scientific, pedagogical, and managerial communities for the steady development and consistent implementation of a productive educational strategy today.

Thus, the digitalization of higher technical education in Uzbekistan involves the use of mobile and Internet technologies by students, the use of digital technologies, the inclusion of students in independent search, selection of information in project activities that form their modern competencies. But digital learning technology is an untested technology. Therefore, there is a need to conduct a comprehensive study of the widespread use of digital technologies in educational processes, taking into account the negative impacts on students.

Literature

Aleshin D.N., Aleshina E.A., Muzychenko L.N. Prospects for the development of higher technical education and the implementation of ideas in the scientific and technical professional educational environment of the university. //Bulletin of the North Caucasus Federal University. 2021. No. 5 (86). P.149-159. DOI 10.37493/2307-907X.2021.5.17

Mavlyutova G. A. Digitalization in the Modern Higher Education Institution // Economic Security and Quality. – 2018. – No. 3 (32). – Pp. 5–7.

M.P. Karpenko, The future of higher education. //Innovations in education. 2013. No. 8. – p.5-12

Voitov I.V. Features of modern higher education technical education in the context of the formation of an innovative economy. //Higher technical education Vol. 1 No. 1 2017. P. 7-12

Asanov A. About the current state and prospects for the development of the sphere of higher technical education and science in the Kyrgyz Republic. URL:https://mnenie.akipress.org/unews/un_post:24113

Rakhimov, O., Rakhimova, D., Ashurova, L., Khujakulov, A. Methodology for using forsight technology in training future ecologists in Uzbekistan. E3S Web of Conferences, 2023, 462, 03048. DOI 10.1051/e3sconf/202346203048.

Rakhimov, O., Ehsev, S., Latipov, S., Rakhimov, J. Positive and Negative Aspects of Digitalization of Higher Education in Uzbekistan. AIP Conference Proceedings. 2022, 2432, 030067. Analysis of developmental education models in the ecological education system in Uzbekistan. E3S Web of Conferences, 2023, 458, 06020. DOI 10.1051/e3sconf/202345806020

K. Amundsen, M. Wilson, Review of Educational Research **82(1):** 90–126 (2012)

S. Shay. Harvard Education Review **74(3)** 307–329 (2004)

P. Felten, A. Kalish, A. Pingree, & K. Plank. Towards a scholarship of teaching and learning in educational development. In D. Robertson & L. Nielson (Eds.), Improving the Academy: Resources for Faculty, Academic, and Organizational Development, **25** (pp. 93–108) (2007)

B.R. Martin. Research foresight and the exploitation of science base. (HSMO, London; 1993)

12.Kononiuk A., Gudanowska A., Magruk A., Sacio-Szymanska A., Fantoni G., Trivelli L., Ollenburg S., Begoming Future-Orented Entepreneurs in Universities and Companies (WPI report). Brussels: Evropean Comission (2017).

Rakhimov O. D., Manzarov Yu. Kh., Ashurova L. Preliminary Foresight Research in the Higher Education System of Uzbekistan // Modern Education (Uzbekistan). – 2021. – No. 4 (101). – Pp. 16–22.

Rakhimov O. D., Sh F. S., Ashurova L. Foresight as a technology for forecasting the development of the use of digital technologies in the higher education sector of Uzbekistan //The phenomenon of market economy: from the origins to the present day. Development institutions and information technologies in innovative solutions. – 2022. – C. 167-175.

Rashidov Zh., Kholmirov B. Foresight Technologies in the Higher Education System [Text] : Methodical Manual /. – Tashkent: "Sano-Standart", 2023. – 28 p.

Rakhimov O., Ehsev S., Latipov S., Rakhimov J. Positive and negative aspects of digitalization of higher education in Uzbekistan. InAIP Conference Proceedings 2022 Jun 16 (Vol. 2432, No. 1, p. 030067). AIP Publishing LLC.

Ejdys J., Gudanowska A., Halicka K., Kononiuk A., Magruk A., Nazarko J., Nazarko Ł., Szpilko D., Widelska U., Foresight in higher education institutions: evidence from Poland. Foresight. 2019;13(1 (eng)):77-89.

Stolze A., Sailer K. An international foresight reflection on entrepreneurial pathways for higher education institutions. Industry and Higher Education. 2021 Dec;35(6):700-12.

Satunina A. E. E-Learning: Pros and Cons. Electronic resource. Access mode: http://www.science-education.ru

Digital Education [Electronic resource]. Access mode: https://emeritus.org/blog/learning-the-emeritus-way/

Semenov E. V., Sokolov D. V. Digitalization of Higher Education: Opportunities and

Risks // Ideas and Ideals. – 2022. – Vol. 14, No. 4, Part 1. – Pp. 137–153. – DOI: 10.17212/2075-0862-2022-14.4.1-137-153.