DIGITAL TRANSFORMATION OF HIGHER EDUCATION: KEY DIRECTIONS, OBJECTIVES, TOOLS, AND BENEFITS FOR ACHIEVING SUSTAINABLE DEVELOPMENT OF THE STATE

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Objective: In an era characterized by rapid technological advancements, the digital transformation of higher education has emerged as a pivotal strategy for achieving sustainable societal development. This study aims to discern the key directions, objectives, and mechanisms associated with the digital transformation of higher education institutions.

Methods: To accomplish the research goal, the study utilizes the methods of theoretical generalization, structural and logical analysis and synthesis, as well as the method of expert survey.

Results: The study shows the key directions, objectives, and mechanisms of the digital transformation of higher education, along with its leading advantages for students and educational institutions.

Conclusion: The conclusion is drawn that the digital transformation of higher education is a major challenge and simultaneously a tremendous opportunity for Russian universities to enhance their competitiveness, attract additional resources, renew their IT infrastructure, and raise the quality of education. Digital transformation will enable universities to make higher education more accessible and capable of providing professional growth and career advancement through a focus on individualization and flexibility of the educational process.

Keywords: higher education, digital transformation, digital technology, digitalization, sustainable development.

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INTRODUCTION

In the framework of sustainable development, a priority sphere for public administration is creating a quality system of educational services. Today, higher education is the foundation of the intellectual and material prosperity of the Russian federation. Its aim is to ensure fundamental scientific and applied training of professionals who determine the pace and level of scientific and technological progress and socio-economic and cultural development, as well as to safeguard the country's interests and strengthen its competitiveness in the international arena. A higher education degree increasingly becomes a mandatory condition for specialists' employment in accordance with the requirements of the labor market.

Presently, higher education is developing as an open public system. The influence of market relations is rising, which manifests in more severe competition for gifted youth, educators, and scholars, as well as for financial resources. Digitalization permeating all spheres of life poses new challenges. The traditional university model cannot compete in the face of the challenges to higher education, which include lifelong learning, mobility and the development of internationalization, flexibility of curricula, incorporation of the IT component into educational programs and research studios, creative learning, 21st-century competencies, digital science, etc.

Digital transformation is the transformation of all spheres of social life influenced by innovative ICT. The education system, which is the foundation of the innovation economy and forms its human potential, is also influenced by ICT. Digital technologies are now part of the daily lives of students and educators alike. They are familiar with the use of digital devices not only in areas related to teaching and learning activities, but also outside the educational process, in the spheres of entertainment, information acquisition, and communication.

The need for the digital transformation of education is evidenced by international surveys. An OECD study suggests that the primary way of catching up with the IT-based world and changing the digital society is by funding government programs that support personal development through the education system and lifelong learning (OECD, 2019). Thus, the goal of decisions in educational policy is to make digital literacy an integral part of the education and training of future professionals.

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The digital transformation of higher education has several benefits, which contribute to the achievement of Sustainable Development Goals (SDGs):

- Reducing social inequality and promoting social inclusion. This is primarily achieved by providing students free access, without geographical restrictions, to open educational systems and resources and the full range of information in the digital educational environment (Akhmetshin, 2020);

- Positive impact on the country's GDP and facilitation of its overall economic growth by means of increasing the level of education of the population (Rodina et al., 2020).

As pointed out by A.V. Bykova (2020), digital transformation is an inevitable event rather than a choice. The task of achieving SDGs and raising the country's competitiveness necessitates a new approach, with digital technology occupying a prominent place in education, the workplace, and everyday life. For this reason, it is necessary to provide a digital environment in which teachers can apply the methods and techniques of digital technology. This requires appropriate legislative provisions to be created.

A precursor of the digital transformation of higher education was the Unified Digital Platform of Science and Higher Education (UDP) designed and created in accordance with the Concept for the Creation of the UDP and the Decision of the Government of the Russian Federation No. 1836 of November 16, 2020 (Ministry of Science and Higher Education of the Russian Federation, 2019). The next step in the digital transformation of higher education was the Strategy for Digital Transformation of the Science and Higher Education Sector (Ministry of Science and Higher Education of the Russian Federation, 2021) developed for the Ministry of Education and Science to achieve a level of digital maturity in the exercise of its powers to develop the science and education sector.

LITERATURE REVIEW

The key approaches to the interpretation of the concept of digital transformation of higher education are summarized in Table 1.

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Table 1. Approaches to the interpretation of the concept of digital transformation of higher education

Source	Definition
T.I. Aliunova and D.Iu. Aliunov (2020)	the use of IT to support teaching and learning (e.g., time-shifted learning through digital materials and summaries or real-time classroom interaction)
S.I. Aksenov, R. U. Arifulina, and O.A. Katushenko (2021)	the digital educational space; the interaction between teachers and students takes place on online platforms, which are one of the tools for managing the educational process and content
N.S. Shepelova and N.N. Shepelov (2020)	modernization, reform, and transformation, as well as the resolution of problems and decision-making in higher education by means of digital technologies
L.D. Bychkov (2021)	transformation of educational and management processes and social practices in the higher education system resulting from the introduction of digital technologies

The definitions reflect the wide range of approaches, from a simplified utilitarian understanding exclusively as the use of digital technology in the educational process to a more conceptual view as the process of digital transformation of all aspects in the work of higher education institutions. Hence, there is a need for an in-depth exploration of the essence of this concept.

Proceeding from the conducted review of publications, we can distinguish three primary directions in the study of the digital transformation of higher education:

- the first line of research shows the relationship between the digital transformation of higher education and educational programs, digital competencies, etc. (Krainov, 2021; Safuanov et al., 2019);

- the second direction of research is related to sustainable development, digital economy, personalized learning, digital learning, information management, etc. in the digital transformation of higher education (Akimova & Ivolgina, 2020; Liga & Shchetkina, 2021);

- the third area of focus groups publications on distance learning, teaching, digital learning, knowledge transformation, and learning systems (Andriukhina, 2020; Larionova & Karasik, 2019);

- the fourth line refers to such categories as software equipment, technologies, and entrepreneurship, meaning that it concerns support for the process of digital transformation of higher education (Babin, 2018; Larionov et al., 2021).

Researchers further assert that the digital transformation of higher education has to involve:

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1. Digital transformation of internal university processes and services:

- creation of basic information services used in the learning process (multimedia screens for classes, cloud technology for data storage and exchange, etc.) (Zhukova et al., 2020);

- creation of a digital library (giving students and teachers access to scientific literature from any device regardless of physical location and time of day) with the tools of scientometric evaluation of the indicators of scientific work and publication activity of university faculty and staff members (Antonova et al., 2018);

- digital transformation of management processes, including research projects, procurement, interaction with applicants and students, etc. (Terelianskii et al., 2021);

- creation of digital campuses (Minina, 2020).

2. Creation of a digital marketing system that provides: organization of a university's interaction with applicants and their parents, graduates, and employers; constant monitoring of a university's reputation and building its positive image; stimulating the creation of new digital communities and innovations at all stages of the educational cycle, etc. (Shishalova, 2021).

3. Creation of a system of digital interaction with applicants and students, including the use of digital technologies to inform applicants on various issues of the educational process, which is important for both domestic applicants and potential foreign applicants; the use of analytics to identify learning outcomes; creation of a feedback system with students, studying their opinions and suggestions and evaluating teachers, the quality of the curriculum, and the need for certain educational and professional programs (Gorodetskaia & Drondin, 2021).

To increase the effectiveness of digital transformation of the education industry, L.A. Burganova et al. (2020) suggest the implementation of the following interrelated components: improving approaches to governance, funding, quality, and transparency in higher education; building partnerships between higher education institutions to improve efficiency and quality; developing the capacity and improving the educational environment. The latter includes funding the purchase of computer and multimedia equipment and software for distance learning and teaching, as well as modern telecommunication facilities, the development of modern digital infrastructure in higher education institutions, the development and launch of electronic learning management

systems, and the purchase of laboratory equipment for modern educational and research laboratories.

Thus, the aim of the study is to identify the directions, objectives, and mechanisms of the digital transformation of higher education to achieve sustainable societal development.

METHODS

Due to the novelty of the studied phenomenon and the exploratory nature of the research goal, the study adopted a qualitative approach.

The first stage of the study consisted of selecting relevant normative legal acts from the ConsultantPlus information and legal database, as well as scientific sources using the keywords "digital transformation of education", "digitalization of education", and "higher education" with a restriction on the date of publication no older than 10 years.

The tentative complex of theoretical research methods adopted to achieve the research goal included theoretical summarization to determine the content of the concept of digital transformation of higher education and structural and logical analysis for establishing the leading directions of research on the digital transformation of higher education.

In the second stage, an expert survey was conducted, in which we sought to answer the following research questions:

(1) What are the main directions, objectives, and mechanisms of the digital transformation of higher education?

(2) What are the main advantages of the digital transformation of higher education for students and educational institutions?

Emails with an invitation to take part in the study were sent to 55 experts. The selection criterion for the sampling of experts was the presence of at least three publications in peer-reviewed journals on the study problem. Consent to participate in the survey was expressed by 48 experts, after which they were sent emails with the research questions. The letters also asked them to substantiate their answers in free form and additionally express their own opinions on the digital transformation of higher

education. All participants in the survey were informed of its purpose and the organizers' intent to publish the results in a summarized form.

After the responses were received, the experts were sent a follow-up letter asking them to rate the identified advantages of the digital transformation of higher education for students and educational institutions in order of importance by putting them on a scale of order by assigning points. Based on these scores, the obtained options were ranked, and their weights were determined, which indicated the significance of each benefit from an expert point of view. To ensure an objective analysis of the data obtained in the expert survey, the consistency of expert opinions was assessed by mathematical processing using Kendall's Coefficient of Concordance (W).

RESULTS

The results of the expert survey outline the main directions, objectives, and means of the digital transformation of higher education (Table 2).

Table 2. Leading directions, objectives, and instruments of the digital transformation of higher education

Objective	Methods of achievement
Direction 1 "Effective use of digital technologies in the educational process"	
Digital learning environments are accessible and updated	availability of computer and multimedia equipment and software, modern means of communication, a STEM laboratory, access to broadband Internet
Educators have digital competencies	the existing limits of digital competencies; advanced training; renewal of educational standards
Educational content meets modern requirements	the available renewed educational programs in ICT at all levels of education; provision of digital content to obtain education
Direction 2 "Optimization of control, regulation, and monitoring processes"	
Services and processes in education and science are transparent, convenient, and efficient	electronic records management; improvement of the student registration process; electronic enrollment office; distance enrollment for applicants with special needs; an electronic system for granting academic degrees and titles
Management and regulatory processes in education and science are optimized and automated	automation of licensing and accreditation of educational programs; attestation of scientific institutions and universities; competitive selection of textbooks and manuals, including electronic ones; ordering and issuance of educational documents and their supplementary materials; electronic learning management systems in higher education institutions; competition-based funding for scientific research; creation of digital tools for assessing learning outcomes (development of digital solutions for academic performance evaluation)

Education and science data are available to stakeholders as needed and are used for managerial decision-making at all levels	access to educational analytics and data; efficient interaction between state registers; access to educational records in a single office; monitoring of graduate employment; a register of research infrastructures; an automated system for paperless submission in the field of science

The key benefits of the digital transformation of higher education for learners identified through the expert survey are presented in Table 3.

Table 3. Key advantages of the digital transformation of higher education for students

Leading advantages	Rank	Weight
development of technological and digital skills	1	0.23
individualization and differentiation of learning	2	0.17
interactive learning	3	0.14
increasing attention and engagement through interaction with other people	4	0.12
a more affordable way of accessing education	5-6	0.10

Note: compiled based on the expert survey; the value of the concordance coefficient W = 0.71 (p < 0.01) indicates a strong consistency of expert opinions.

Finally, the expert survey results give insight into the leading advantages of the digital transformation of higher education for educational institutions (Table 4).

Table 4. Key advantages of the digital transformation of higher education for educational institutions

Leading advantages	Rank	Weight
support for the professional development and digital literacy of teachers	1	0.22
improved efficiency of management and organizational processes	2	0.20
saving resources for the creation of a learning and research environment	3	0.16
formation of mobile educational process management structures	4	0.13

Note: compiled based on the expert survey; the value of the concordance coefficient W = 0.72 (p < 0.01) indicates a strong consistency of expert opinions.

DISCUSSION

Our results indicate that the key directions for the digital transformation of higher education as proposed by the experts are effective use of digital technologies in the educational process and optimization of management, regulation, and monitoring processes. To some extent, this aligns with previous studies, which distinguish three leading directions of digital transformation:

- transformation of the existing methodology and approach to learning, changing the paradigm of higher education, encouraging institutions to introduce student-

centered learning, and using the full potential of ICT in the educational process (Aksenov et al., 2021);

- creation of a digital learning space to support both students and teachers and form a digital learning community (Bychkov, 2021);

- development and maintenance of digital infrastructure that is effective in changing the educational paradigm (Larionov et al., 2021).

Our study also suggests that to students, the digital transformation of higher education provides:

- the development of technological and digital skills, which, as noted by S.V. Gorodetskaia and A.L. Drondin (2021), are essential for competitiveness in the labor market amid the transition to the sixth technological order and the associated implementation of Industry 4.0 technologies;

- individualization and differentiation of learning, as students can progress according to their capabilities and preferences and optimize variations in the construction of individual learning trajectories, particularly using informal education tools (Minina, 2020);

- interactive learning, because digital learning tools and technologies facilitate communication between all participants in the educational process, help to organize collaborative learning, provide constructive feedback for making changes in the learning process, and allow combining visual, auditory, kinesthetic, and textual instruments (Andriukhina, 2020);

- improved attention and engagement owing to interaction with other people, as simulation of the environment via digital technologies facilitates learning and accelerates the acquisition of new knowledge and the formation of skills close to real conditions of their application in real professional settings (Safuanov et al., 2019);

- a more inexpensive way to access education, given that the digital transformation lowers students' costs for transportation, accommodation, and attending a higher education institution in general (Aliunova & Aliunov, 2020).

For higher education institutions, digital transformation will provide the opportunity to:

- support the professional level and digital literacy of educators by allowing them to share the best pedagogical experience and pedagogical innovations in developing a modern digital educational environment (Larionova & Karasik, 2019);

- improve the efficiency of management processes, organization, and the transparency of operations (Rodina et al., 2020);

- save resources for the creation of an educational and research environment due to the remote work of teachers and part of the staff, including the opportunity to quickly and cheaply create virtual prototypes, while simultaneously creating opportunities for remote collaboration, to repeat each experiment as many times as necessary without limitations in terms of time, space, financial, physical, and other types of resources (Bykova, 2020);

- form mobile educational process management structures (Shepelova & Shepelov, 2020).

The experts emphasize that readiness for digital technology relates primarily to digital infrastructure and the availability of technologies at the institutional level, which is an essential precondition for the digital transformation of higher education. Nevertheless, the increasing accessibility of digital technologies creates only a foundation, which does not presuppose the implementation of digital technologies. The practical application of digital technologies has to encompass the work of educators, the organization of students' communication, and the development of educational programs and the methodology of knowledge transmission (Krainov, 2021).

The utilization of digital technology may vary depending on the nature of a particular institution and such factors as the type and level of education provided, the composition of full-time, part-time, and distance learning students, students' age distribution, the total number of teachers and students, and the level of readiness of the educational institution.

CONCLUSIONS

Digital technologies have changed the way people interact, work, and learn. The transition to digital higher education has shown the ability of higher education to provide continuity but has also demonstrated that there is still much work to be done to ensure the effectiveness and quality of the use of digital technologies.

The digital transformation of higher education poses a major challenge and a tremendous opportunity for Russian universities to strengthen their competitiveness, attract additional resources, upgrade their IT infrastructure, and raise the quality of

education. It enables universities to make education accessible and capable of ensuring professional growth and successful career advancement due to a focus on individualization and flexibility of the educational process.

A promising direction for further research is the analysis of the implementation of the provisions of the state digital transformation policy in higher education today.

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