



Introduction of digital technologies and digitalisation in higher education institutions of Ukraine: Current state and prospects

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Abstract. The purpose of the article is to highlight the issues of introduction of digital technologies into the educational process of Ukrainian higher education and digitalisation of higher education institutions, to characterise the current state, and outline the prospects for their development. The research methodology employs systemic and cultural-historical approaches, as well as techniques of analysis, synthesis, generalisation, description, and comparison. This comprehensive application of methods allows for obtaining substantiated research results. The scientific novelty of this research lies in the analysis of scholarly works on the implementation of digital technologies in higher education institutions, which has enabled a detailed examination of the current state of digitalisation in education, highlighted the key tasks in this area, and identified promising directions for the development of educational technologies. Conclusions. The digitalisation of national education is critical for enhancing its quality, aligning it with modern requirements, and improving its position in global educational rankings. At the same time, there are significant gaps in leveraging the opportunities provided by modern digital technologies, including a shortage of digital tools and educational resources, as well as a low level of digital competence among teachers and students. The main challenges for higher education institutions in Ukraine include the digitalisation of internal processes and the development of digital marketing to ensure effective interaction among all participants in the educational process. The effectiveness of educational digitalisation directly depends on the level of digital literacy and competencies of the educational participants, making it a key direction in the development of digital education. Prospective development directions include systematic support for the digitalisation process, enriching educational institutions with modern technologies and resources, and focusing on the systematic development of digital skills among teachers, researchers, and students

Keywords: higher education institutions; digital technologies; digitalisation in education; quality of education; educational process; digital competences

Problem statement

The current situation in society requires education to quickly adapt to the rapidly changing conditions of technological progress. The widespread introduction and effective use of digital technologies has led to the actualisation of the issue of digitalisation in education. The use of modern digital technologies and tools for transferring knowledge to students, such as computers, gadgets, interactive whiteboards, smart boards, LCD projectors and other visualisation tools, is a necessary

step in the development of education and allows for more efficient and interactive learning. Their use not only helps to improve the quality of education, but also provides access to new knowledge and modern educational technologies.

These tasks are especially important now, under martial law, and will be relevant in the near future, during the period of post-war reconstruction of Ukraine, as the processes of introducing digital technologies in

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higher education institutions (HEIs) significantly affect the effectiveness of the educational process, provide access to quality education for all students, and make it possible to organise educational activities taking into account the needs, interests, and abilities of students.

Analysis of research and publications

The importance of introducing digital technologies into the educational process and the significance of digitalisation for higher education institutions are reflected in the works of contemporary researchers, teachers, and scholars. S. Karpliuk (2019), O. Buinytska *et al.* (2020), A. Krutova & S. Stavarska (2021), S. Tolochko (2021), Bykov (2022), L. Franko (2022), V. Kremen (2022), I. Yansenkova (2022), E. Hrom (2022), E. Chernovol (2023), L. Filippova *et al.* (2023), O. Bochko, O. Burov, A. Verbytskyi, B. Hrytseliuk, A. Hurzhia, L. Kartashov, T. Koval, O. Kolhatyn, A. Kolomiets, S. Kuzmenko, N. Morse, K. Osadcha, O. Spivakovskiy, T. Sorochan, O. Spirin, and others. All of them, to varying degrees, study and describe the importance and effectiveness of the use of digital technologies in education, the importance of the digitalisation of higher education institutions, develop methods of using digital tools to improve the efficiency of the educational process and study their impact on the quality of education and the development of students.

The purpose of the study is to highlight the issues of introducing digital technologies into the educational process of Ukrainian higher education and digitalisation of higher education institutions, to characterise the current state and outline the prospects for their development.

Outline of the main material

Nowadays, digital technologies are developing rapidly and are becoming increasingly important in science, technology, economics, education, politics, society and the environment. General modern trends in the digitalisation of society are clearly manifested in education. In the context of the digitalisation of education, higher education institutions face special challenges that reflect the need to introduce digital technologies to ensure educational activities at all levels of education.

The term “digital educational technologies” refers to the use of various electronic tools and software aimed at improving the quality of education and ensuring access to knowledge for students and teachers. The digitalisation of education involves enriching the educational process with electronic and digital devices, tools, and systems, as well as establishing electronic communication for information exchange among participants in the educational process, thereby creating an integrated environment that merges virtual and physical spaces into a single cyber-physical space.

Kyiv-based researchers O. Buinytska *et al.* (2020) believe that “one of the main tasks of today is to ensure the digitalisation of higher education institutions that

will meet the demands and opportunities of the market, integrate into the global information open educational space, which provides free access for all participants to global digital resources, satisfy students’ educational needs in digital products, as well as ensure effective electronic communication and collaboration among all participants in the educational process”.

To support stable and effective adaptation to digital education systems, on September 30, 2020, the European Union adopted the Digital Education Action Plan for the period 2021-2027. The main focus of this plan is on developing a productive digital education ecosystem, improving digital skills, implementing digital transformation, and shaping a common vision for high-quality, inclusive, and accessible digital education in Europe (European Commission..., 2020).

The Digital Education Action Plan for 2021-2027 calls for strengthened cooperation at the European Union level in the field of digital education. This is necessary to address challenges arising from the COVID-19 pandemic and to capitalise on emerging opportunities. The plan aims to create opportunities for the educational and professional community, including teachers, students, policymakers, scholars, and researchers at national, European, and international levels (Krutova & Stavarska, 2021).

The digitalisation of higher education has been in the focus of the European University Association (EUA) since 2012, with the introduction of Massive Online Open Courses (MOOCs). Currently, the European University Association coordinates projects aimed at developing approaches to institutional development strategies and promoting digitalisation by disseminating best practices, sharing experiences among university leaders, and supporting community development.

Already in 2019, digitalisation was identified as one of the priorities of state policy in Ukraine, which led to the creation of the Committee on Digital Transformation of the Verkhovna Rada and the Ministry of Digital Transformation of Ukraine. According to the Strategy for the Development of Higher Education for the period 2022-2032, approved by the Cabinet of Ministers of Ukraine, higher education institutions must actively implement digital tools and fully transition to modern digital models of education by 2032 to ensure the competitiveness of their educational and scientific activities (Order of the Cabinet of Ministers of Ukraine № 286-p, 2022).

The Higher Education Development Strategy for 2022-2032 sets key objectives for higher education institutions in Ukraine, which include: digitalisation of internal processes; development of digital marketing to facilitate interaction among various educational process participants (teachers, students, administration, applicants); and enhancing the digital competence of both students and teachers (Order of the Cabinet of Ministers of Ukraine № 286-p, 2022).

Digitalisation of education is generally the development of a publicly accessible database containing teaching and learning materials in digital form, the organisation of the educational process in the global information network, the use of modern mobile, cloud and intelligent technologies, and the widespread use of massive open educational courses and resources. There is also an understanding of the digitalisation of education as the process of using digital content in teaching and learning to optimise educational activities or as the modernisation of the content and objectives of education to develop digital competences (Safonov *et al.*, 2022). Undoubtedly, the digitalisation of education radically transforms the educational process and the roles of all its participants. In the context of higher education institutions, it is directly related to the formation of the components of digital competence of lecturers and students.

According to scholars V. Bykov and V. Kremen, digitalisation of education performs two key functions: firstly, the creation of a digital educational environment that includes digital teaching tools, online courses, electronic educational content, and various digital resources and services; secondly, an extensive modernisation of the educational process aimed at preparing individuals for life in a digital society and for professional activities within the digital economy (Kremen *et al.*, 2022).

Thus, digitalisation in education allows for a wider range of services, better communication between students, and the dissemination and use of technology for teaching and learning. When introducing digitalisation into the educational process, it is important for an educational institution to critically reflect on which digital platforms and tools should be used through the prism of the task of "improving teaching". After all, it is extremely important to support universities in general, and lecturers in particular, in building institutional capacity (policies, procedures, staff, infrastructure, resources) to improve teaching and professional development.

In recent years, the COVID-19 pandemic and martial law in Ukraine have led to significant changes in higher education. The problem of organising distance and blended learning, which involves digital communication between participants in the educational process and the use of digital technologies to visualise educational content, has become relevant. In addition to the recognised learning management system Moodle, which is widely used in the higher education system, cloud-based services, including the following tools, have become necessary: a) video conferencing Zoom, Skype, WebEx; b) distance learning: Google Classroom, Microsoft Teams; c) content visualisation: Canva, Prezi, Google Presentations; d) online whiteboards: Padlet, Google Keep, MIRO; e) testing, surveys: Kahoot!, Quizizz, Google Forms; f) Microsoft Forms; g) interactive tasks: LearningApps, Classtime, Wordwall. Considerable attention is paid to the selection of distance learning courses on the educational portals Prometheus, Coursera, EdEra, Diia.Osvita, etc.

Universities are actively working to create their own digital content that takes into account the specifics and areas of bachelor's and master's degree programmes, including e-textbooks, e-courses, and the introduction of SMART, AR, and VR technologies, etc. There are numerous computer classrooms, large-format LED screens and projection equipment for presentations in classrooms, modern technical facilities for distance learning, free Wi-Fi, cybersecurity centres, robotics laboratories, virtual laboratory complexes (VisSim, Modelica, LabView, etc.), professional computer databases by type of activity, and other innovations and trends.

Digital platforms and applications (Adult Learning, Google Classroom, Microsoft Teams, Moodle) are deployed to support the educational process in distance and blended learning, Microsoft 365 cloud services, Google Workspace for Education, as well as digital means of communication with students (BigBlueButton, Zoom, Google Meet, etc.) are used. With the assistance of the Ministry of Education and Science of Ukraine, since 2022, the university has been using free and extended access for 230 licences of Zoom Meetings for Education with unlimited connection time for up to 1000 people at a time, as well as Google Workspace for Education's Teaching and Learning Upgrade with the ability to conduct and record video meetings of training sessions for up to 250 participants and store them directly in the Google Drive cloud storage. Along with this, agreements have been concluded and the digital content of the online educational platforms Coursera (5200 courses and 2200 projects on the Coursera for Campus service), Udemy (13 thousand courses) is used (Kremen *et al.*, 2022).

The digitalisation of education is directly related to the formation of the components of digital competence of lecturers and students. Ukrainian researchers E. Chernovol *et al.* (2023) provide a structure of digital competence, which includes information and media competence, technical competence, communication competence, and consumer competence.

The implementation of the Digital Competence Development Concept by 2025 includes the following key directions: fostering and enhancing digital skills and competencies within society; increasing public awareness of potential risks associated with Internet usage; regulating state policy in the area of digital skills through legal tools and making appropriate amendments to legislation to clearly define the role of digital education and competencies in social life; coordinating actions among executive bodies to promote the development of digital skills and competencies, and creating indicators for monitoring progress in these areas.

Educational institutions at all levels have begun to realise that digitalisation can offer them a number of advantages and new strategies (approaches) to teaching students. In particular, the intensive development of technologies such as augmented reality (AR), virtual reality (VR), artificial intelligence, robotics, blockchain, media education, cloud-based environments,

gamification, STEM/STEAM education have a key impact on the development of digital content for all levels of education (Kremen, 2019).

In addition to the development of immersive learning technologies using virtual and augmented reality, voice interfaces, automation of learning processes (robotic communication), machine analysis of user actions, learning and testing results (using artificial intelligence), certification using blockchain technologies, to trends in education development include inclusiveness and gamification technologies, user identification and personalisation of the learning process, microlearning, socialisation of educational programs, including the exchange of user experience, association by interests and professional competences, a team approach to learning and working in common information bases.

At the same time, the aforementioned "Strategy for the Development of Higher Education in Ukraine for 2022-2032", in the section "Digitalisation", states in particular that "education is currently lagging behind digitalisation, and more efforts are needed to take advantage of the tools and strengths of new technologies, while addressing potential misuses such as cyber intrusion and privacy concerns" (Order of the Cabinet of Ministers of Ukraine № 286-p, 2022).

The Strategy states that the main weaknesses of higher education institutions that affect the quality of higher education at the institutional level and its perception are insufficient implementation of modern standardised models of institutional management; low level of student centricity, in particular, insufficient implementation of opportunities for people with special needs; insufficient consideration of stakeholders' interests in determining the content and areas of training, weak feedback from participants in the educational process; low efficiency of the system of ensuring academic integrity (only 7.7 per cent of higher education institutions have a fully prepared infrastructure for teaching people with special needs, and almost 15 per cent of higher education institutions have not started adapting the infrastructure at all) (Order of the Cabinet of Ministers of Ukraine № 286-p, 2022).

Some researchers also point out the existing problems of digitalisation of HEIs. In particular, K. Haliuk (2022) notes that new educational opportunities that are opening up with the use of modern digital technologies have not yet been realised. Scholars V. Kremen *et al.* (2022) in their scientific report to the General Meeting of the National Academy of Pedagogical Sciences of Ukraine "Scientific and Methodological Support for the Digitalisation of Education in Ukraine: Status, Problems, Prospects", 18-19 November 2022, noted, in particular, that "...the provision of the educational process with the necessary modern equipment and high-quality Internet remains insufficient". This refers to both the technical equipment of educational institutions and the availability of the necessary devices for students and lecturers. The effectiveness of the use of digital tools and systems in the educational process is negatively affected by the

insufficient level of digital literacy of teachers and lecturers, their lack of experience and skills in the digital environment, and their poor methodological preparedness for the use of digital learning technologies. There is a shortage of digital tools and electronic educational resources for the full educational and methodological support of the educational process at different levels of education (Kremen *et al.*, 2022).

According to researcher E. Hrom (2022), to address the challenges of digitalisation in Ukrainian higher education institutions, a series of strategic measures regarding the implementation of digital technologies is necessary. These measures include: effectively enhancing the qualifications of the teaching staff to work with digital technologies in the educational process; creating specialised elective courses for students that utilise digital technologies in various fields, including online courses; developing a modern digital educational environment that supports collaborative work on projects, documentation, organising debates, and assessments; establishing an internal regulatory framework that would govern the use of online courses in the educational process and account for the results of their completion; and reorienting universities to teach basic disciplines using the concept of open online courses and courses based on open licenses.

Progressive directions for the development of digital technologies and the digitalisation of education were outlined in a scientific report presented at the general meeting of the National Academy of Educational Sciences of Ukraine titled "Scientific and Methodological Support for the Digitalization of Education in Ukraine: Status, Problems, Perspectives", which took place on November 18-19, 2022. The report focused on the development of scientific and methodological approaches to digitalisation in education, particularly on enhancing the qualifications of scientific, educational, and leadership personnel in the field of education. These include the following: development of a national concept and sectoral, territorial and corporate programmes for the development of digital competence of researchers, research and teaching staff and management personnel of education; further systematic and comprehensive digitalisation of educational, scientific, methodological, organisational activities of higher postgraduate education institutions based on the deployment, administration and use of public and corporate digital cloud-based platforms and services; research of fundamental and applied problems of digital and logistical support for the digitalisation of postgraduate education (Kremen *et al.*, 2022).

The analysis of the state of development of digital technologies and digitalisation of higher education institutions, the study of scientific literature and research on this issue allows us to draw the following conclusions.

Conclusions

Digital technologies and digitalisation of national education are crucial for ensuring its new quality, compliance with the requirements of today and achieving

high positions in the world educational ranking; there are significant shortcomings in the implementation of opportunities in view of modern digital technologies, a shortage of digital tools and electronic educational resources, and an insufficient level of digital competence of lecturers and students. The main challenges for higher education institutions in Ukraine include the digitalisation of internal processes, the development of digital marketing to enhance interactions among all stakeholders, such as teachers, students, administration, and applicants. Effective digitalisation of education is closely linked to the level of digital literacy and competence, as well as the ability of teachers and students to effectively use digital technologies. This constitutes one of the key tasks in the digital transformation of education.

Prospective directions for the development of digital technologies and digitalisation of higher education

include: systematic scientific and methodological support for the digitalisation processes in education in Ukraine; equipping higher education institutions with computer tools and national electronic educational resources such as electronic textbooks, digital education platforms, learning management systems, mobile applications, interactive educational content with elements of virtual and augmented reality, 3D models, and simulations; focusing on the targeted development of digital competencies among key participants in the educational process, particularly teachers, researchers, and students; implementing certification to verify the informational and digital competencies of academic and teaching staff; encouraging educational entities to develop and effectively use digital resources, information systems, and technologies; and modernising the content and methodologies of teaching to reflect current digital educational trends.

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