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Distance Education: Challenges and Advantages in the Era of Digitalisation

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Abstract: *The relevance of this article stems from the fact that the use of effective digital technologies in higher education requires both theoretical analysis and empirical research. These technologies are evolving rapidly, offering access to an almost unlimited range of educational resources. The article aims to present the results of theoretical and empirical studies on the role of digital technologies in distance education. The research focuses on how students assess both the strengths and opportunities, as well as the weaknesses and threats, of using digital technologies in learning within higher education institutions. The findings are discussed, followed by key conclusions. The use of digital technologies in students' educational and cognitive activities is closely linked to e-learning and distance learning technologies.*

Keywords: *distance education; higher education; technology; digitalisation; e-learning.*

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1. Introduction

The significance of this article lies in the emergence of new trends and perspectives in the development of educational organisations during society's digital transformation. This transformation introduces new benchmarks for shaping the digital education system.

The study hypothesises that digital technology implementation in higher education depends on balancing technological accessibility with the preservation of cognitive and communicative aspects of learning. This balance contributes to minimising potential risks. The article aims to identify subjective factors shaping students' perceptions of the digital educational environment. These factors are regarded as a foundation for the further development of digital transformation strategies in higher education institutions.

According to Antoniuk and Vakaliuk (2021), digital transformation represents a vast body of knowledge and skills. It also includes modelling methods that enable the optimal transformation of technological systems and accelerate their impact on society in line with corporate strategies and defined priorities. Educational organisations act as active participants in this process of digital transformation and adapt to the "new reality" of their development. In response to challenges stemming from technological innovation, a significant number of them are currently developing dedicated digital strategies.

The development and implementation of such strategies require staff with specific competences. These include digital literacy and skills, which have become essential components in the overall transformation of education. Therefore, the effective use of digital opportunities in education depends on the presence of personnel with appropriate qualifications and competences in digital literacy.

2. Theoretical Framework

Improvements in the current functioning of an educational institution are often linked to efforts by management and staff to reinterpret their accumulated experience in developing education as a system. This is achieved through the use of various digital tools that target specific elements and processes (Lin, 2022). Examples include monitoring the teaching activities of academic staff. They also involve overseeing operational processes such as the design and updating of educational programmes. Other tasks include preparing timetables and selecting and allocating teaching staff, as well as carrying out many additional functions.

Methodological protocol. The study employed a mixed-methods exploratory sequential design.

1. *Theoretical stage*: Digitalisation criteria were conceptualised based on an analysis of the TAM (Technology Acceptance Model) and SWOT models.

2. *Empirical stage*: A descriptive quantitative study was conducted (n = 250) using an author-developed questionnaire (Likert scale, 1–5), validated through expert assessment.

3. *Statistical analysis*: Descriptive statistics (M, G) were used to rank the influencing factors. The SWOT approach enabled the classification of students' subjective assessments into internal strengths and weaknesses, and external opportunities and threats.

The digitalisation of individual elements within the managed system is closely tied to the introduction of digital technologies. This, in turn, requires substantial investment. Institutions must purchase equipment, acquire software, train staff, and carry out monitoring and evaluation to assess the effectiveness of the transformed processes.

The success of an educational institution depends on the speed and accuracy with which it develops and operates its digital management model. In this context, the notion of "entrepreneurial thinking" can even be applied to the functioning of an educational institution. Analytical research must therefore be aligned with the needs and expectations of stakeholders engaged in the digital transformation of the education system (Bykov, 2019).

In higher education, human resources and digital transformation are inseparably connected (Zatonatska et al., 2020). It is, therefore, imperative to analyse the role of digital technologies in

improving performance rates among educators, as well as the institution's overall functioning. It is also crucial to weigh both the advantages and disadvantages of such an initiative to prevent or mitigate possible difficulties in the future.

It follows that the goal is to prevent or minimise any negative impact on staff resulting from the introduction of digital technologies into their daily work. Overall, information support for digital transformation in educational institutions should be consistent, well-planned, and focused on two main objectives: 1) achieving an effective strategy that meets all requirements without harming the institution's functioning; and 2) creating specialised digital educational resources to enhance access to education through online learning.

The use of digital technologies can improve or develop new educational products. It also helps optimise processes that provide educational opportunities and, in turn, contributes to the institution's digital transformation (Bygstad et al., 2022).

Key participants in this "restructuring" process include students, lecturers, enterprises, organisations, digital service providers, and government authorities at both federal and regional levels. Still, the purpose of introducing digital solutions broadens the landscape of the educational process. In terms of society, digitalisation allows one to promote the country's economic development by cultivating in-demand skills and improving social infrastructure.

Digital transformation removes the constraints of time and space and focuses efforts on expanding access to education. It also places the institution's human resources at the centre of implementing innovative technologies. In addition, they play a key role in adapting educational programmes to meet learners' knowledge and competence requirements (Roshchin et al., 2022).

From a technical perspective, digital tools are designed to assist educational leaders in organising and managing teaching, research, and other institutional processes. Technologies such as the Internet of Things, information architecture, virtualisation, digital applications, business frameworks, and workplace management systems are among the most significant to implement (Zhao et al., 2021).

Internet access allows information to be obtained from anywhere in the world and is not confined to a single institution. Knowledge sources include digital platforms, applications, web browsers, and other tools. These tools, characteristic of the digital age, enable multiple users to access the same information simultaneously from different locations. For educational institutions, this innovation represents more of an opportunity for development than a threat.

Educational institutions are expected to increasingly adopt a five-stage approach: identification, planning, creation, evaluation, and interaction (Jonak et al., 2020).

The authors of this article believe that these stages can be interpreted as follows:

- identifying aspects necessary for implementing technological innovations, business activities, and digital strategies;
- preparing conditions for implementing digital transformation processes using various methods and resources;
- developing staff competencies for those who will later oversee digital transformation processes;
- evaluating and managing risks based on data analysis that reflects the effectiveness of process digitalisation.

Institutions must also develop and actively use the necessary information resources, creating a system for their management (Livingstone & Helsper, 2007). For example, this may involve establishing specialised departments responsible for developing and implementing digital technologies in educational and other institutional processes. Digital transformation affects all aspects of teaching and learning and, more broadly, the goals of education (Annuš et al., 2023).

Digital tools provide lecturers and students opportunities for self-monitoring, ongoing assessment, and interim evaluation of learning outcomes. This forms the basis for adjusting educational programmes and the technologies used to deliver them. It also enhances the operational efficiency of institutional management. Educational institutions frequently use analytics to monitor

the effectiveness of various processes. Diagnostic and forecasting functions within management systems enable institutions to manage numerous tasks while leveraging computing capabilities for research.

Electronic libraries and databases have long provided access to a wide range of educational and scientific materials. Institutions can also develop personal IT infrastructures to ensure rapid student access to information sources containing educational resources and to support educational initiatives (Kaplan & Haenlein, 2016).

With the digitalisation of processes related to creating and delivering educational products, educators gain far greater opportunities to apply a "creative approach". This allows for more effective use of digital tools to improve both the content of educational resources and the methods of their delivery.

Lecturers who use digital tools in their teaching and possess digital competence can manage their work time without compromising the quality of the educational process. The implementation of most such technologies is generally not costly, which allows them to be widely adopted in teaching practice. It is possible to enhance the flexibility and practical focus of learning through digital platforms that manage tasks and track student progress.

Digital tools also encourage more active interaction between teacher and student (Scherer et al., 2019). They provide opportunities for direct and feedback-based communication, which increases the teacher's engagement with students' achievements in mastering educational programmes (Kostetskyi, 2023).

Over time, these trends could form a specialised digital learning ecosystem within each educational institution. The main components of this are the following: teacher and student training, partnerships, learning and teaching techniques, support and feedback, planning and organisation, and learning technologies.

The features of online learning can be divided into positive and negative aspects. Among the positive aspects, the first is that economic changes linked to digitalisation are undoubtedly driving the digital transformation of education. The second is the democratisation of access to knowledge. Conditions are changing in ways that allow learners to use not only traditional methods but also digital resources such as open educational platforms that provide opportunities for self-education. In this regard, a third advantage of online learning can be identified.

This advantage relates to a new approach to the quality of digital learning materials, the content of educational resources, and the accessibility of information. A fourth strength is the creation and implementation of online courses that allow content to be updated quickly. Such an approach makes it possible to design individual learning trajectories for students. This gives them the opportunity to deepen and broaden their knowledge and skills, leading to the acquisition of additional specialisations.

This feature of the educational process can be seen as the fifth benefit of online learning. At the same time, "live communication" among learners remains important, as it simplifies the transfer of information and enriches it with emotional elements. However, the clear structuring of learning material, its quality, and in some cases its conciseness are also significant. The option to use additional specialised resources in the form of online courses, often offered free of charge by universities, helps to overcome rigid and outdated views. It also ensures that materials can be updated, making the educational process flexible, convenient, and interactive. Furthermore, both students and teachers save time and money by avoiding the need to travel to the place of study.

From the teachers' perspective, distance learning also brings positive features (Zawacki-Richter, 2020). Firstly, they gain access to vast resources of the latest information technologies, which they can master independently. This allows them to improve their professional organisation skills. Secondly, they have the chance to enhance their qualifications by learning from the experience of other educators.

Despite these benefits, online learning also has negative aspects. The first is the lack, or rather the near absence, of a legal and regulatory framework for distance education. The second is

the underdeveloped mechanisms for recognising students' achievements on educational platforms such as Coursera, edX, and Udacity. The third problem is that teachers' and students' equipment quickly becomes outdated, while internet connections are often unstable. A fourth challenge relates to technical risks. These include hacker attacks on the content of distance courses and the limited capacity of university platforms to support the simultaneous presence of a large number of learners.

The illustration contributes to developing a general education institution's ecosystem, supporting the digital transformation of its processes. As can be seen, the centre of such a system is digital technology. In the future, lecturers are expected to use these technologies independently to create digital solutions for the development and delivery of educational products. In this context, it is essential to expand the underlying framework to enhance teaching. At the same time, one can consider multimedia apps, cloud-based solutions, and learning management systems (LMS) as the key agents in this process.

It is essential that each ecosystem includes evaluation of outcomes, considering both the quality of the educational product and the cost of implementing innovations.

Distance learning formats are already used in educational institutions. Their development and scaling offer clear opportunities for advancing the education system itself. However, the "support and feedback" component requires new professional roles. It follows that all the participants in the educational process should be provided with the necessary technical, learning or other solutions when working with digital technologies.

The "planning" component represents an organisational resource connected to managing digital education initiatives. Digital innovations should be evaluated at every stage. This evaluation should take into account staff readiness, technical capabilities, and cost-effectiveness in creating conditions for successful adoption. It is crucial to offer vast opportunities for the staff to improve their digital literacy outside the institution's settings.

In line with the "lifelong learning" component, it is necessary to support the staff in their efforts to adapt to the rapidly changing educational environment. It implies helping lecturers master current online teaching technologies and methodologies while developing pedagogical and technological skills.

In the future, the quality of educational programme delivery is likely to improve as lecturers review and adapt content in response to society's digital transformation. The "student engagement" component focuses on preparing learners for "work in the future". It aims to equip students with the knowledge and skills demanded in the labour market, where all areas of society are undergoing digital transformation.

A detailed analysis of works by Bygstad et al. (2022) and Zhao et al. (2021) shows two vectors of digitalisation: infrastructural and anthropocentric. Rather than focusing solely on technical aspects, the adapted Technology Acceptance Model (TAM) by Scherer et al. (2019) points to the vital impact of the internal attitudes held by users. Therefore, this study focuses on students' subjective assessment of the system's strengths and weaknesses. This focus enables the verification of theoretical models of digital transformation through the real experiences of educational service users.

3. Empirical Research

Research Aim. The study aims to identify the strengths, weaknesses, opportunities, and threats of digital technologies in educating students in natural sciences and technical fields at the university. It also seeks to assess students' attitudes towards the effectiveness of these technologies.

Research objectives are as follows: 1) to examine students' positive perceptions of digital technologies in learning; 2) to identify the challenges and risks associated with the digitalisation of the educational process; 3) to analyse statistical indicators (mean and standard deviation) regarding the strengths and weaknesses of digital technologies; and 4) to draw conclusions on ways to optimise the use of digital technologies in higher education.

Sample Data. The study was conducted during the 2024-2025 academic year in the form of a descriptive quantitative survey. It involved 250 first to fourth-year students in natural sciences and technical programmes.

The toolkit was developed using a modified SWOT matrix to assess internal strengths/weaknesses and external opportunities/risks. The assessment was conducted on a 5-point Likert scale.

Data were processed using methods of descriptive statistics, including the arithmetic mean (M) and standard deviation (SD), to assess the consistency of respondents' opinions.

Research Methods. Observation, analysis and synthesis of scientific sources, interviews, surveys, experimental work, and statistical processing of quantitative and qualitative data were employed.

A range of methods was applied to gain a comprehensive understanding of students' attitudes towards digital technologies in education and to evaluate their strengths and weaknesses. The main methods included observation, literature analysis and synthesis, interviews, surveys, and statistical processing of the collected data. Among these, the survey method was particularly important, as it enabled the collection of structured information from a large group of respondents (250 students pursuing natural sciences and technical fields).

The questionnaire was designed to fully address the study's aim: to determine the strengths and weaknesses of digitalising the educational process and students' views on its effectiveness. The survey focused on three groups of indicators: 1) *strengths of digital technologies* (comfort, objectivity, and diversity of application); 2) *weaknesses and risks* (reduced personal interaction, difficulties in assessing cognitive abilities, and potential loss of motivation); and 3) *general trends* in students' perception of digitalisation.

These indicators were selected to compare the advantages and disadvantages of digitalisation with the practical demands of higher education. They were also chosen to align with current international approaches to evaluating educational quality.

The characteristics of students categories were taken into account during the formulation of the questions. Natural science students focus more on the practical application of knowledge and objectivity of assessment. Meanwhile, engineering students pay more attention to the functionality and technicality of digital learning tools. This led to some differences in question design: for example, in natural sciences, emphasis was placed on the quality of knowledge assessment and development of thinking skills. In technical fields, the priority was given to the flexibility of digital platforms and remote communication with teachers.

An empirical study was conducted to assess the advantages and disadvantages of using digital tools in higher education settings, particularly in natural sciences and technology.

The empirical study evaluated the strengths and opportunities of using digital technologies in the learning process for students in natural sciences and technical fields. It also examined the weaknesses and threats associated with their use. Methods included observation, literature analysis and synthesis, experimental work, interviews, surveys, and statistical processing with both quantitative and qualitative analysis.

*Empirical Assessment of Digital Technologies by Students***.** Students identified the most significant strengths of digital technologies in learning and creative activities as follows:

- *Objectivity of test-based assessment* (M = 4.28, SD = 0.77).
- *Availability of diverse digital applications for remote interaction with lecturers* (M = 4.13, SD = 0.95).
- *Consistency of lecturer requirements applied to all students* (M = 4.03, SD = 1.01).

These indicators are considered the most significant and highlight the advantages of digital technologies most appreciated by students. Among them, the objectivity of test-based assessment received the highest rating. Knowledge and skill testing is the most frequently used and

long-established criterion for evaluating learning outcomes, especially for generating knowledge and applying it in familiar situations. Notably, this indicator showed the lowest variance in the empirical data.

Table 1. Students' perceived strengths of using digital technologies in learning

Strengths	Mean (M)	Standard deviation (SD)
Objectivity of test-based assessment	**4.28**	0.77
The availability of diverse digital technologies for remote interaction with lecturers	4.13	0.95
Consistency of lecturer requirements applied to all students	4.03	1.01

Source: The authors' own conception

The greatest variation in this group of parameters relates to the consistency of lecturer requirements applied to all students. The authors of this article believe this is largely due to the choice of specific digital technology tools.

Students are aware that using digital technologies at the university can have negative consequences. However, these can be minimised through proper organisation of the learning process and the use of digital technologies that are appropriate for each specific case.

Some of the identified weaknesses include:

- The challenge of optimally combining traditional and digital learning methods (M = 3.33, SD = 1.01).
- Reduced direct interaction between students and lecturers (M = 3.47, SD = 1.11).
- Limited opportunities to develop oral and written communication skills (M = 3.53, SD = 1.28).

Students rated the following risks slightly higher:

- Insufficient ability to assess skills, competences, and methods of activity (M = 3.72, SD = 1.07).
- Difficulty in evaluating students' logical reasoning (M = 3.72, SD = 1.18).
- Reduced motivation to learn when students have inadequate proficiency in digital technologies (M = 3.76, SD = 1.10).

Table 2. Students' perceived weaknesses and threats of using digital technologies in learning

Weaknesses / Threats	Mean (M)	Standard deviation (SD)
Challenge of optimally combining traditional and digital technologies	3.33	1.01
Reduced direct interaction between students and lecturers	3.47	1.11
Limited opportunities to develop oral and written communication skills	3.53	1.28
Insufficient ability to assess skills and methods of activity	3.72	1.07
Difficulty in evaluating students' logical reasoning	3.72	1.18
Reduced motivation to learn due to inadequate digital technology proficiency	3.76	1.10

Source: The authors' own conception

The revealed trend (the lowest score for the item "optimality of combination", M = 3.33) indicates a methodological gap between technological provision and didactic needs. A high standard deviation (SD = 1.28) for the item "speech development" reflects the heterogeneity of students' adaptation to digital communication. This confirms the hypothesis that digitalisation without adequate cognitive support carries the risk of reducing the quality of the "educational product".

Research into students' assessments of the strengths, weaknesses, opportunities, and limitations of digital learning can support the development of new, highly effective pedagogical practices. At the current stage of digitalisation in education, these practices can be successfully implemented in higher education institutions. The obtained results show that students place great importance on digital technologies. They mostly value its power in ensuring objective assessment and accessibility in the context of distance education. Accordingly, a low SD concerning the "objectivity of test-based assessment" indicator proves a broad consensus among students.

The data regarding the high assessment of objectivity of control (M = 4.28) align with the findings of Scherer et al. (2019). The researchers believe that evaluation transparency serves as a key driver of technology adoption. At the same time, the identified risk of decreased motivation (M = 3.76) confirms concerns raised by Zawacki-Richter (2020) concerning "digital fatigue".

These findings suggest that the educational model discussed in the hypothesis should not be purely digital but should instead be hybrid. This approach helps to compensate for the deficit of social capital (communication) identified in the survey.

4. Conclusion

Therefore, the effective implementation of digital technologies requires their optimal combination with traditional teaching methods. Such a methodology safeguards personal communication, promotes the development of crucial skills, and magnifies the full potential of educational delivery within a digital landscape.

The results of the study partially confirmed the hypothesis. The digital educational product is perceived by students as effective only in terms of instrumental support (tests and access to databases). However, the methodological confusion between "perception" and "opportunities" indicates the need to implement clear digital hygiene protocols. The main challenge of transformation lies not in technical equipment, but in the development of methods. These methods should address the complexity of assessing logical reasoning (M = 3.72) in a distance learning format.

The article reveals that the majority of students have a positive outlook on technological progress. They view these tools as effective for assessing knowledge and as a means to improve access to education.

The most apparent benefits are considered to be the impartial nature of examinations based on testing, the freedom inherent in distance education and the standardised criteria for every learner. Unfortunately, some challenges still exist. They include difficulties in assessing practical and cognitive skills, limited personal communication, and the risk of reduced motivation to learn.

The optimal use of digital technologies in higher education is possible only if they are combined with traditional forms of learning. At the same time, pedagogical practices should take into account the specifics of certain disciplines and groups of students.

Statement on the Use of Artificial Intelligence

The authors confirm that AI-based tools were used exclusively for linguistic refinement and improvement of academic style. The authors retain full responsibility for the content, analysis, and conclusions presented in the article.

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