

Development of the digital ecosystem of higher education in Ukraine under conditions of digitalisation and digital transformation of society

Desenvolvimento do ecossistema digital do ensino superior na Ucrânia em um contexto de digitalização e transformação digital da sociedade

Desarrollo del ecosistema digital de la educación superior en Ucrania en el contexto de la digitalización y la transformación digital de la Sociedad

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Abstract

The relevance of the study is determined by the acceleration of digitalization and digital transformation of society, which enhances the role of higher education institutions as complex socio-technical systems and key actors in the formation of digital and artificial intelligence competencies. In this article, digitalization is considered as the process of introducing and using digital technologies, while digital transformation is interpreted as a systemic change in management logic, pedagogical practices, and data use within the digital ecosystem of a higher education institution. The aim of the study is to identify and characterize the key managerial, pedagogical, and analytical dimensions of the digital ecosystem of higher education in the context of digitalization and digital transformation of

society. The methodological basis consists of systemic and ecosystem approaches, content analysis of scientific publications, and secondary analysis of open international monitoring. As a result, the feasibility of interpreting the digital ecosystem of a higher education institution as an integrated socio-technical system is substantiated, and it is shown that indicators of digital experience and the use of artificial intelligence can be used as proxy indicators of its maturity.

Keywords

Digital Transformation, Digitization, Digital Ecosystem Higher Education, Education Managers, Digital Technologies.

Resumo

A relevância do estudo é determinada pela aceleração da digitalização e da transformação digital da sociedade, o que reforça o papel das instituições de ensino superior como sistemas sociotécnicos complexos e atores-chave na formação de competências digitais e em inteligência artificial. Neste artigo, a digitalização é considerada como o processo de introdução e uso de tecnologias digitais, enquanto a transformação digital é interpretada como uma mudança sistêmica na lógica de gestão, nas práticas pedagógicas e no uso de dados dentro do ecossistema digital de uma instituição de ensino superior. O objetivo do estudo é identificar e caracterizar as principais dimensões gerenciais, pedagógicas e analíticas do ecossistema digital do ensino superior no contexto da digitalização e da transformação digital da sociedade. A base metodológica consiste em abordagens sistêmicas e ecossistêmicas, análise de conteúdo de publicações científicas e análise secundária de monitoramento internacional aberto. Como resultado, é comprovada a viabilidade de interpretar o ecossistema digital de uma instituição de ensino superior como um sistema sociotécnico integrado, e é demonstrado que indicadores de experiência digital e o uso de inteligência artificial podem ser utilizados como indicadores substitutos de sua maturidade.

Palavras-chave

Transformação Digital, Digitalização, Ecossistema Digital do Ensino Superior, Gestores Educacionais, Tecnologias Digitais.

Resumen

La relevancia del estudio viene determinada por la aceleración de la digitalización y la transformación digital de la sociedad, lo que refuerza el papel de las instituciones de educación superior como sistemas sociotécnicos complejos y actores clave en la formación de competencias digitales y en inteligencia artificial. En este artículo, la digitalización se considera el proceso de introducción y uso de tecnologías digitales, mientras que la transformación digital se interpreta como un cambio sistémico en la lógica de gestión, las prácticas pedagógicas y el uso de datos dentro del ecosistema digital de una institución de educación superior. El objetivo del estudio es identificar y caracterizar las dimensiones clave de gestión, pedagógicas y analíticas del ecosistema digital de la educación superior en el contexto de la digitalización y la transformación digital de la sociedad. La base metodológica consiste en enfoques sistémicos y ecossistémicos, el análisis de contenido de publicaciones científicas y el análisis secundario de datos de seguimiento internacional de acceso abierto. Como resultado, se corrobora la viabilidad de interpretar el ecosistema digital de una institución de educación superior como un sistema sociotécnico integrado, y se demuestra que los indicadores de la experiencia digital y el uso de la inteligencia artificial pueden utilizarse como indicadores sustitutivos de su madurez.

Palabras clave

Transformación Digital, Digitalización, Ecosistema Digital de la Educación Superior, Gestores Educativos, Tecnologías Digitales.

1. Introduction

Rapid digitalization and digital transformation of society are changing the role of higher education institutions, which are increasingly seen as complex socio-technical systems integrated into national and global digital ecosystems. In this context, the digitalization of universities goes beyond the implementation of individual information technologies and, subject to managerial and organizational integration, transforms into a digital transformation that encompasses management, pedagogical practices, data analytics, and the use of artificial intelligence (Bygstad *et al.*, 2022; Fernández *et al.*, 2023; Gkrimpizi *et al.*, 2024). At the same time, recent studies have documented the fragmentation of digital initiatives, the asymmetry of the digital experience of students and teachers, and the rapid spread of artificial intelligence tools compared to institutional governance mechanisms, which highlights the problem of assessing the maturity of digital ecosystems in higher education institutions from a management perspective (Carmo *et al.*, 2025; Mohamed Hashim *et al.*, 2022; Alzahrani *et al.*, 2023; Swiecki *et al.*, 2022; Alshatti Schmidt *et al.*, 2025).

In view of the above, the aim of this work is to identify and characterize the key managerial, pedagogical, and analytical dimensions of the digital ecosystem of a higher education institution in the context of the digital transformation of society, as well as to explore the possibilities of using quantitative indicators of international monitoring to assess its maturity and practical effectiveness.

2. Literature Review

An analysis of current scientific works indicates a growing interest in digital transformation and the formation of digital ecosystems of higher education institutions, which are considered as complex socio-technical systems that integrate managerial, pedagogical and technological components (Bygstad *et al.*, 2022; Mohamed Hashim *et al.*, 2022; Fernández *et al.*, 2023; Gkrimpizi *et al.*, 2024). Research emphasizes the crucial role of strategic management, institutional maturity and alignment of digital initiatives with the overall development strategy of the HEI. At the same time, fragmented “project digitalization” is considered a factor that reduces the effectiveness of changes (Carmo *et al.*, 2025; Kayanja *et al.*, 2025; Paños-Castro *et al.*, 2024; Gkrimpizi *et al.*, 2024).

Educational data analytics and artificial intelligence are important components of the digital ecosystem, enabling personalized learning, process automation, and decision support, but they also pose ethical, organizational, and academic challenges (Alzahrani *et al.*, 2023; Viberg *et al.*, 2022; Zhu *et al.*, 2022; Swiecki *et al.*, 2022; Alshatti Schmidt *et al.*, 2025; Ruano-Borbalan, 2025). Bibliometric studies confirm the rapid expansion of this interdisciplinary field and the formation of thematic clusters related to management, analytics, pedagogical innovation, and ethics (Zhao & Zhou,

2024; Hong *et al.*, 2025; Nazyrova *et al.*, 2025). Empirical studies and international reports demonstrate the unevenness of digital transformation: positive experiences in using the digital environment are combined with different levels of digital readiness of teachers and slow adaptation of institutional policies to the development of generative AI (Jisc, 2024a, 2024b, 2025; Higher Education Policy Institute & Kortext, 2025; EDUCAUSE, 2025).

The digitalization of higher education is also considered in the context of the Fourth Industrial Revolution and sustainable development, where universities act as both consumers and generators of digital innovations (Cherep *et al.*, 2025; Gorokhova, 2025; Polinkevych *et al.*, 2024; Mohamed Hashim *et al.*, 2022). Practical studies of the implementation of “smart classrooms”, hybrid learning and paperless administrative systems show that the success of digital transformation depends primarily on the integration of technologies into pedagogical and administrative processes, and not only on the level of technical equipment (Petchamé *et al.*, 2023; Paños-Castro *et al.*, 2024; Kayanja *et al.*, 2025). Particular attention is paid to the development of digital competencies of teachers, the effectiveness of professional development programs and the need for their support at the institutional policy level (Trujillo-Juárez *et al.*, 2025; Kleimola *et al.*, 2025). In modern conditions, digital technologies and AI systems are also considered as tools for increasing the resilience and adaptability of higher education institutions to social and economic challenges (Tulai *et al.*, 2025; Baranovska *et al.*, 2025). Despite a significant amount of scientific research, the issues of operationalizing the digital ecosystem of higher education institutions as an integrated management object, quantifying its maturity based on comparable indicators, and coordinating the rapid implementation of artificial intelligence tools with policies on educational quality, ethics, and academic integrity remain insufficiently addressed.

3. Materials and Methods

The methodological basis of the study was the system and ecosystem approaches, which allow us to consider the digital ecosystem of a higher education institution as a holistic socio-technical system within which technological, pedagogical, managerial and analytical components interact. To achieve the goal of the study, theoretical and empirical methods were combined.

At the first stage, a content analysis of modern scientific works and analytical reports on the digital transformation of higher education, the development of digital ecosystems, educational analytics and the use of artificial intelligence tools was carried out. This made it possible to clarify the conceptual framework and identify key components of the digital ecosystem of higher education institutions.

At the second stage, a secondary analysis of quantitative data from the study by Paska *et al.* (2024), conducted among 116 undergraduate students of various specialties in Ukraine, was conducted. The results obtained were used as an empirical basis for evaluating the practices of using digital technologies and online platforms in higher education institutions.

At the third stage, a comparative analysis of the indicators of the use of different groups of digital tools was carried out, in particular, communication platforms, learning management systems, artificial intelligence tools and online educational resources, which made it possible to identify structural imbalances in the digital ecosystem.

The interpretation of the results was carried out from the standpoint of managerial and ecosystem approaches, where the frequency of use of digital technologies was considered as an indirect indicator of the maturity, integration and manageability of the digital ecosystem. To expand the analytical context, the results of international monitoring of digital experience and the application of artificial intelligence in higher education were also used without direct statistical comparison with local data. The proposed methodology ensures consistency between the research objective, the data sources used and the analysis procedures and combines the assessment of digitalization practices with the managerial interpretation of the processes of digital transformation of HEIs.

4. Results

The digital ecosystem of a higher education institution should be considered as a multi-level socio-technical system in which participants in the educational process, digital platforms, data and management mechanisms interact. In this context, digitalization means the introduction of digital technologies, while digital transformation involves profound changes in management, organization of the educational process and use of data through the formation of a holistic digital ecosystem of the higher education institution (Bygstad *et al.*, 2022).

In modern research, the digitalization of higher education is considered through institutional-management, system-ecosystem and practice-oriented approaches that focus on strategy, interaction of technological components and real practices of using digital solutions (Carmo *et al.*, 2025; Fernández *et al.*, 2023; Gkrimpizi *et al.*, 2024). Important components of the digital ecosystem are educational analytics and artificial intelligence tools that support pedagogical and management decisions, although their application is accompanied by ethical challenges and problems of academic integrity.

Thus, the digital ecosystem of HEIs is an integrated architecture that ensures the sustainability of managerial and pedagogical changes and creates the prerequisites for the digital transformation of

the university (Bygstad *et al.*, 2022; Alzahrani *et al.*, 2023; Swiecki *et al.*, 2022; Alshatti Schmidt *et al.*, 2025). To reflect the relationships between its components, an extended model of the digital ecosystem of HEIs is presented in Table 1. This approach is consistent with the need to clearly define the content of digital transformation and use case studies to analyze transformation initiatives in higher education (Gkrimpizi *et al.*, 2024; Fernández *et al.*, 2023).

Table 1

Structural components of the digital ecosystem of a higher education institution and their functional interrelationships in the process of transforming the educational environment

Component	Typical elements (included)	Key functions in the ecosystem	Functional relationships (input → output)	Risks/bottlenecks of transformation
Infrastructure	Campus network; Wi-Fi/eduroam; data center or cloud; cybersecurity; SSO/IAM; classroom devices; AV/smart classrooms; technical support	ensuring the availability, reliability, and security of digital services; load scaling; continuity of learning	<i>input</i> : educational service and security policy requirements → <i>output</i> : stable access channels, identity management, secure data environments	infrastructure fragmentation; access inequality; cyber incidents; vendor dependency; technical debt
Management	digital transformation strategy; digital governance; data regulations; budgeting; IT project portfolio; procurement; change management; QA procedures; ethics and academic integrity policies	alignment of goals, resources, and responsibilities; process standardization; quality control; legitimization of innovation	<i>input</i> : analytics data, stakeholder needs, external regulations → <i>output</i> : policies, KPIs, decisions, standards, roadmaps	“Project-based” approach without a system; resistance to change; lack of data/ethics policies; disconnect between IT and academic units
Pedagogical	digital course design; blended/hybrid learning; assessment methods; academic communication; support for self-regulation; digital competencies of teachers and students	ensuring learning outcomes through digital scenarios; increasing engagement; updating assessment and feedback	<i>input</i> : technological capabilities of platforms, analytics recommendations → <i>output</i> : learning scenarios, digital materials, valid assessment practices	formal “transfer of lectures online”; low digital didactics; conflict between innovation and integrity
Technological	LMS; SIS/ERP; electronic document management; library systems; video platforms; collaboration services; integrations (API); LTI; mobile applications; AI tools (generative, recommendation)	digitization of core processes (learning, administration, communications); service integration; routine automation; personalization	<i>input</i> : infrastructure + pedagogical/management requirements → <i>output</i> : digital services, transactional data, new opportunities (automation/personalization)	“Islands” of platforms without integration; data duplication; undefined rules for AI use; privacy risks

Analytical (data & AI)	data warehouses; ETL; metadata; data quality; learning analytics; BI dashboards; dropout risk monitoring; prediction models; MLOps/Model governance (if available)	transition to evidence-based management and learning support; early risk detection; measurement of change effectiveness	<i>input</i> : event data from LMS/SIS/ERP + access policies → <i>output</i> : indicators, dashboards, recommendations for management and pedagogy	distrust of analytics; ethical/legal restrictions; misunderstanding of metrics; “analytics for reporting” rather than learning
Interoperability and standards (cross-cutting issue)	single reference books; data standards; integration bus; integration governance; technical and ethical protocols	ensuring ecosystem integrity; reducing duplication; scaling services	<i>input</i> : service interaction needs → <i>output</i> : coordinated processes, seamless user trajectories	“Manual” integrations; reference book inconsistencies; vendor dependency; blocking ecosystem development
Human capital (intersecting contour)	digital literacy; professional development; roles (data steward, instructional designer); motivation; culture of innovation	ecosystem's ability to develop; acceptance and scaling of change	<i>Input</i> : strategy/policies + department requests → <i>Output</i> : competent teams, sustainable practices, reduced resistance	competency gap; staff overload; gap between “technically possible” and “organizationally ready”

Source: created by the author based on (Bygstad *et al.*, 2022; Fernández *et al.*, 2023; Gkrimpizi *et al.*, 2024; Alzahrani *et al.*, 2023; Paulsen & Lindsay, 2024; Swiecki *et al.*, 2022; Alshatti Schmidt *et al.*, 2025)

The system logic of the digital ecosystem of HEIs is based on the interaction of technological, pedagogical and managerial circuits, while infrastructure and analytics perform a supporting function and ensure change management. A developed analytical circuit contributes to both managerial processes and support for learning through feedback and self-regulation mechanisms (Paulsen & Lindsay, 2024). At the same time, the use of analytics and artificial intelligence is accompanied by ethical challenges and problems of academic integrity and assessment (Alzahrani *et al.*, 2023; Swiecki *et al.*, 2022; Alshatti Schmidt *et al.*, 2025).

A key role in digital transformation is played by education managers, who ensure the transition from individual IT initiatives to a holistic strategy for the development of the digital ecosystem of HEIs, integrating technological solutions with organizational changes and the development of digital competencies of staff (Bygstad *et al.*, 2022). The effectiveness of such changes depends on the ability of management to coordinate digital initiatives, ensure their coherence and control risks (Carmo *et al.*, 2025). The lack of a holistic vision of digital transformation leads to fragmentation of digital initiatives and a decrease in their effectiveness (Gkrimpizi *et al.*, 2024; Fernández *et al.*, 2023).

The integration of AI tools requires the formation of policies regarding the transparency of their use, authorship, data protection and ensuring the quality of education, and the main barriers are mainly organizational in nature (Swiecki *et al.*, 2022; Alshatti Schmidt *et al.*, 2025; Batsurovska *et al.*, 2024). An important task is also to create a data-driven management culture, where analytical information is used to improve the educational environment, and not just for reporting (Alzahrani *et al.*, 2023; Paulsen & Lindsay, 2024).

Assessing the level of digitalization of HEIs should take into account not only the availability of infrastructure and platforms, but also the quality of digital experience, the maturity of management practices, and the level of integration of AI into educational and administrative processes (Bygstad *et al.*, 2022; Carmo *et al.*, 2025; Alzahrani *et al.*, 2023; Alshatti Schmidt *et al.*, 2025). The empirical assessment of the digital ecosystem is carried out through the analysis of real practices of using digital technologies. The generalized results of the local study are presented in Table 2 and their interpretation is supplemented by the materials of Appendices A–D, in particular Tables B.1–B.3. In this approach, the data in Table 1 and Table 2 are considered as a reflection of the structural configuration of the digital ecosystem of higher education institutions.

Table 2

Structure of digital technology use by students of higher education institutions in Ukraine (%)

Group of digital technologies	Specific tools	Share of use, %
Communication platforms	Telegram	90
	Zoom	86
	Google Meet	77.6
	Viber	75.9
Learning management platforms	Google Classroom	75.9
	Moodle	3.4
	Blackboard	0
Artificial intelligence tools	ChatGPT	67
Visual and didactic design tools	Canva	60.3
	CapCut	36.2
	Quizizz	31
Interactive and collaborative tools	Kahoot!	19
	Microsoft Teams	13
	Miro	6

	Padlet	6
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Source: summarized by the author based on the results of empirical research by Paska *et al.* (2024)

The results of data analysis indicate that the digital ecosystem of HEIs operates in conditions of high intensity of use of communication and publicly available platforms, while institutional LMS demonstrate a significantly lower level of engagement. The predominance of Telegram, Zoom, Google Meet and ChatGPT indicates the dominance of flexible, informal and situational digital practices over systemically integrated solutions. Such asymmetry between the individual digital experience of students and the level of institutional digital maturity confirms the feasibility of considering the digital ecosystem of HEIs as a socio-technical system with uneven development of its components, which requires targeted management intervention.

The results obtained mainly reflect the level of digitalization of the educational process, that is, the intensity of use of individual digital platforms and services. At the same time, the presence of such practices is not a direct confirmation of digital transformation, which involves institutional coordination, management regulation, analytical support for decision-making and integration of technologies into a single digital ecosystem of HEIs.

To illustrate the practices of using digital tools by students, the generalized results of a local empirical study are presented, which are presented as a representative example of digital experience in the national context.

Analytical data indicate the predominance of communication services over institutional learning management systems in digital practices of students of higher education institutions. The highest indicators are Telegram (90.5%) and Zoom (86.2%), while ChatGPT (67.2%) and Canva (60.3%) demonstrate the active spread of learning support tools. The low level of use of Miro, Padlet (6.0% each) and LearningApps (10.3%) indicates the underuse of the potential of digital technologies.

The results of the analysis indicate the concentration of the use of online resources around several national platforms: Vseosvita (47.4%), Prometheus (15.8%) and Duolingo (10.5%). In contrast, global MOOC platforms (Coursera, EdX, Udemy) have minimal indicators (1.0% each), which indicates a weak integration of international resources into formal education. This indicates the structural nature of digitalization and limited coordination of digital development.

The development of the digital ecosystem of higher education in Ukraine requires a transition from project-based digitalization to systemic digital governance, consistent with the HEI development strategy. Important areas include the formation of policies on the use of AI, the

development of digital competencies of personnel, and the strengthening of the analytical circuit and inter-institutional interaction to ensure the sustainability of digital transformation.

5. Discussion

The results of the study confirm that the digital transformation of higher education should be considered as a systemic change in management approaches, pedagogical practices and data use within the digital ecosystem of HEIs, and not just as the introduction of technologies. They are consistent with approaches that treat the digital ecosystem as an integrated digital educational environment (Bygstad *et al.*, 2022; Gkrimpizi *et al.*, 2024), but partially contradict studies where digital transformation is reduced to process automation without taking into account managerial maturity (Kayanja *et al.*, 2025; Paños-Castro *et al.*, 2024). This confirms the decisive role of the management-analytical circuit in ensuring the integrity of the digital ecosystem of HEIs.

Comparison with international studies revealed both similarities and differences. Positive assessments of the digital educational environment and the spread of AI tools confirm previous findings (Alshatti Schmidt *et al.*, 2025; Nazyrova *et al.*, 2025), while the asymmetry of digital experiences of students and teachers and the lag of institutional policies from AI practices partially contradict optimistic assessments of digitalization (Petchamé *et al.*, 2023). This can be explained by the different levels of managerial readiness of HEIs and the uneven distribution of resources and digital competencies (Carmo *et al.*, 2025; Trujillo-Juárez *et al.*, 2025).

The results also indicate that learning analytics and artificial intelligence are becoming tools for the transformation of pedagogical and managerial decisions (Alzahrani *et al.*, 2023; Paulsen & Lindsay, 2024). At the same time, the risks of “analytics for accountability” are increasing, as are the challenges of academic integrity and assessment in the context of the spread of generative AI (Swiecki *et al.*, 2022; Ruano-Borbalan, 2025). This indicates the importance of clear institutional policies, ethical principles and data management mechanisms.

Despite the limitations associated with the use of secondary data from international monitoring, the results can be used to benchmark digital development and identify management gaps. Overall, the digital transformation of higher education requires a transition from fragmented technological solutions to systematic management of the digital ecosystem based on data, analytics and institutional policies. Further research should be aimed at assessing the maturity of digital ecosystems and studying national models of their development.

6. Conclusions

The study substantiates the feasibility of analyzing digitalization and digital transformation of higher education through the prism of the digital ecosystem of HEIs as a multi-level socio-technical system. It was found that the use of digital tools reflects the level of digitalization, while digital transformation is associated with the coordination of management decisions, data integration, the development of analytics and the formation of policies regarding digital technologies and artificial intelligence.

Empirical data revealed a structural asymmetry of the digital ecosystem of HEIs: the dominance of communication platforms and open digital services with a low level of use of institutional learning management systems and analytical tools. This indicates the prevalence of informal digital practices and the overtaking of students' digital experience over the managerial maturity of HEIs.

The rapid spread of artificial intelligence tools in the absence of clear institutional policies for their application was also revealed, which, along with new opportunities, creates risks for academic integrity, assessment and data management. This confirms the need for proactive management of AI integration.

The scientific novelty of the study lies in the combination of ecosystem and management approaches with the use of quantitative indicators as indicators of the maturity of the digital ecosystem. The practical significance of the results is associated with the possibility of their use to identify gaps in digital development and develop strategies for the transition from fragmented digitalization to systemic digital transformation.

Prospects for further research lie in the creation of models for assessing the maturity of digital ecosystems of HEIs and the study of mechanisms for integrating artificial intelligence and learning analytics into the development strategy of higher education.

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8. Appendix A

Description of empirical tools (questionnaires)

Structure of the questionnaire “Use of digital technologies in the educational activities of higher education students”

The questionnaire was used in the empirical study by Paska *et al.* (2024) and included 10 questions aimed at identifying practices of using digital tools and online educational platforms in students' learning activities.

Block 1. General information

- Respondent's age (17–18; 19–20; 21–25 years old)
- Field of study

Block 2. Level of digital awareness

3. How would you rate your understanding of the concepts of “digital education” and “digital technologies”?

(high; above average; average; below average; low)

Block 3. Practices of using digital tools

4. Which digital tools do you use most often in teaching? (multiple choice)

Block 4. Online educational platforms

5. Which online educational platforms do you use in the learning process? (multiple choice)

Block 5. Effectiveness assessment

6. How do you assess the effectiveness of using digital technologies in teaching?

7. Do digital tools facilitate access to educational materials?

Block 6. Problems and suggestions

8. What shortcomings do you see in the use of digital technologies?

9–10. Your suggestions for improving the digital educational environment of higher education institutions.

9. Appendix B

Table B.1

Functional classification of digital tools

Functional outline	Tools	Analytical significance
Communication	Telegram, Zoom, Google Meet, Viber	Provides operational interaction, but does not form institutional memory
Educational and administrative (LMS)	Google Classroom, Moodle, Blackboard	Responsible for formalizing the learning process
Innovative (AI)	ChatGPT	Indicator of early adoption of AI
Visual-didactic	Canva, CapCut, Quizizz, Kahoot!	Support for active and visual learning
Collaborative	Microsoft Teams, Miro, Padlet	Potential for group work and project-based learning

Table B.2

Key gaps in the digital ecosystem of higher education institutions

Type of gap	Empirical manifestation	Management significance
Institutional	LMS < 5%, messengers > 75%	Lack of a managed digital core
Analytical	Lack of learning analytics	Inability to implement evidence-based management
Innovative	ChatGPT 67.2% without policies	Risks to academic integrity
Pedagogical	Low use of interactive tools	Limited digital didactics

Table B.3

Comparative interpretative framework

Measure	Ukrainian practices (Paska <i>et al.</i> , 2024)	International trends (Jisc, EDUCAUSE)
Communication	Dominance of messengers	Platform communication
LMS	Marginal use	Institutional core
AI	Proactive, informal	Regulated, policy-driven
Analytics	Absent	Active development