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COMPARATIVE ASSESSMENT OF THE FUNCTIONAL CAPABILITIES OF DIGITAL PLATFORMS AND INFORMATION SYSTEMS IN HIGHER EDUCATION INSTITUTIONS UNDER DIGITAL TRANSFORMATION

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Abstract. *This article examines the functional capabilities of digital platforms and information systems used in higher education institutions under conditions of digital transformation. The study focuses on how such systems support management automation, electronic data exchange, document-related processes, monitoring, interoperability, usability, and information security. A comparative assessment framework was developed to identify functional strengths, limitations, overlaps, and areas requiring further improvement. The research combined systematic, comparative, and functional analysis with expert-oriented assessment and grouping methods. Seven evaluation criteria were defined: functional coverage, process automation, data exchange, integration and interoperability, monitoring and control, usability, and information security. Each criterion was interpreted through a three-level qualitative scale reflecting high, medium, or low functional performance. The analysis shows that the effectiveness of institutional digitalization depends not only on the availability of individual digital tools but also on the coherence of their functions and their capacity to exchange data across organizational processes. Fragmented systems may create duplicate operations, repeated data entry, information discontinuities, and additional administrative workload. The proposed framework therefore emphasizes interoperability, coordinated functionality, secure data processing, and management transparency as essential characteristics of an effective digital environment. The study offers a structured methodological basis for comparing digital platforms without limiting the assessment to a specific software product. Its practical value lies in supporting higher education institutions in identifying functional gaps, prioritizing modernization measures, improving digital governance, and developing a more integrated, reliable, and efficient institutional information environment for sustainable management and evidence-based decision-making across academic, administrative, strategic, operational, and institutional development processes sustainably.*

Keywords: *digital transformation; higher education; digital platforms; information systems; functional capabilities; comparative assessment; automation; interoperability; information security; digital governance.*

INTRODUCTION

Digital transformation has become a structural component of institutional development in higher education. It is no longer limited to the introduction of individual software products or the conversion of paper-based procedures into electronic form. Instead, it increasingly concerns the redesign of management processes, data flows, organizational interaction, decision-making practices, and the digital infrastructure through which universities coordinate their activities. International research similarly treats digital transformation as an institution-wide change involving technology, information, processes, people, and strategy rather than as a narrowly technical modernization initiative [1, 6].

The growing volume of institutional data and the increasing complexity of academic and administrative processes have strengthened the role of digital platforms and information systems in higher education management. These tools can accelerate information processing, automate repetitive operations, support document-related activities, improve monitoring, and provide managers with more timely information. At the same time, the presence of several digital systems does not automatically create an effective digital environment. OECD analyses emphasize that fragmented digital ecosystems and insufficient interoperability can require repeated data entry, limit data reuse, and reduce the value of information for decision-making [2, 3]. UNESCO also stresses that technology should be assessed in relation to institutional needs, governance, sustainability, and evidence of actual value rather than adopted as an end in itself [8].

This creates a practical and scientific problem for higher education institutions: digital platforms may differ considerably in functional coverage, automation capacity, data exchange mechanisms, integration possibilities, monitoring tools, usability, and security. When these differences are not assessed systematically, institutions may face overlapping functions, duplicated operations, isolated datasets, inconsistent information flows, and unnecessary administrative costs. Conversely, a structured comparison can reveal which functions are sufficiently developed, which are partially implemented, and which require modernization. The object of this research was the digital management environment of higher education institutions. The subject of the research was the set of functional capabilities through which digital platforms and information systems support institutional management and information exchange. The aim was to develop and apply a structured comparative framework for assessing these functional capabilities and to identify priority directions for improving their use under digital transformation. To achieve this aim, the study pursued four objectives: first, to systematize the principal functions expected from institutional digital platforms; second, to establish comparable evaluation criteria; third, to organize these criteria into a reproducible assessment procedure; and fourth, to formulate practical directions for reducing functional fragmentation and strengthening digital governance. The research question was formulated as follows: which functional characteristics should be assessed to determine whether digital platforms and information systems adequately support the digital transformation of higher education management?

The scientific novelty of the study lies in treating functional assessment as a multidimensional management problem rather than a simple inventory of software features. The proposed approach integrates seven dimensions—functional coverage, process automation, data exchange, integration and interoperability, monitoring and control, usability, and information security—within one comparative framework. This makes it possible to assess digital systems from the perspective of their contribution to institutional processes and to identify functional gaps without tying the methodology to a particular software product. The study therefore provides a basis for more consistent decisions concerning digital modernization, integration priorities, and the development of a coordinated institutional information environment.

LITERATURE REVIEW

Research on digital transformation in higher education has developed from technology-centered discussions toward broader institutional and governance perspectives. Castro Benavides et al. [6], in a systematic literature review, showed that digital transformation in higher education is multidimensional and that early approaches rarely addressed the institution holistically. Their findings are important because they shift the analytical focus from isolated technologies to relationships among organizational actors, processes, infrastructure, and strategy. More recent research has reinforced this view. Fernández et al. [1] analyzed 184 digital transformation initiatives across 39 universities and found that institutional transformation involves not only technology adoption but also changes in information, processes, human factors, and strategy. The two studies converge on the need for integrated institutional approaches, although the latter provides a more practice-oriented picture of actual university initiatives.

A second stream of literature focuses on digital ecosystems and interoperability. The OECD Digital Education Outlook 2023 conceptualizes an effective digital education ecosystem as a combination of management tools, educational tools, governance arrangements, and human capabilities [2]. Its companion study, covering 29 countries and jurisdictions, demonstrates that digital governance varies considerably and that the availability of digital tools alone does not ensure a coherent ecosystem [4]. Vincent-Lancrin and González-Sancho [3] identify interoperability as the capacity to combine and use data from different digital tools coherently and efficiently. Their analysis distinguishes technical, semantic, organizational, and legal interoperability and shows that weak interoperability can make data exchange error-prone and resource-intensive. This perspective is particularly relevant to higher education management because functional value depends not only on what an individual system can do but also on how effectively it communicates with other components of the institutional environment.

A third research direction concerns barriers, maturity, and organizational readiness. Singun [5] synthesized studies published between 2019 and 2024 and grouped barriers to digital transformation into major dimensions including digital strategy, governance, resources, competence, organizational culture, and ethics. Similarly, the systematic review on barriers to digital transformation in higher education identified twenty distinct obstacles, confirming that technical limitations are only one part of a broader institutional challenge [9]. These findings suggest that functional assessment should not be restricted to software performance; it should also consider usability, governance, and the institutional conditions required for effective use.

Digital maturity research provides another basis for comparative evaluation. Studies of university digital maturity increasingly use multidimensional models to assess how deeply digital technologies are embedded in institutional activities. Research published in 2024 reported observable differences in digital maturity between universities, supporting the need for structured diagnostic tools rather than binary judgments about whether an institution is “digital” [10]. Bravo-Jaico et al. [11] further demonstrated that digital transformation maturity can vary across actors and institutional dimensions, including governance and administrative management. A 2026 framework by Yilmaz et al. [12] used six main and twenty-four sub-dimensions and combined interviews with a survey, illustrating the continuing movement toward more formalized and measurable maturity assessment.

The literature also emphasizes the human and strategic dimensions of digital transformation. Farias-Gaytan, Aguaded, and Ramirez-Montoya [7] connect digital transformation with digital literacy and institutional complexity, indicating that technological change requires corresponding development of competencies and organizational adaptation. Bisri, Putri, and Rosmansyah [13], reviewing 66 studies, identify success factors that extend beyond infrastructure and include governance and implementation capacity. Rêgo et al. [14] similarly show that digital transformation changes skill requirements and creates new expectations for higher education institutions. These studies collectively support the inclusion of usability and user-oriented functionality in comparative assessment.

At the policy level, UNESCO’s 2023 Global Education Monitoring Report warns that evidence on the added value of education technology remains uneven and that technology should be evaluated in relation to relevance, equity, scalability, and sustainability [8]. This argument complements the OECD emphasis on interoperability and governance: both imply that the existence of technology is insufficient evidence of successful transformation.

Despite substantial research on digital transformation, maturity, barriers, and digital ecosystems, a practical gap remains in the comparative assessment of the functional capabilities of institutional digital platforms at the management level. Existing studies often evaluate transformation at the organizational or policy level, while platform-level comparisons may focus narrowly on technical features. The present study addresses this gap by integrating seven functional criteria into a single comparative framework. The framework links technological capabilities with management requirements and is designed to identify functional strengths, limitations, overlaps, and integration priorities without depending on a named software solution.

METHODOLOGY

The study was designed as a structured comparative and functional assessment of digital platforms and information systems used in higher education management. A qualitative comparative design was selected because the purpose was not to estimate causal effects or compare commercial software products, but to establish a reproducible set of functional criteria that could be applied across different institutional digital environments.

The research procedure was conducted in three stages. In the first stage, relevant academic and policy literature on digital transformation, digital ecosystems, interoperability, digital maturity, governance, usability, and information security was reviewed. Concepts repeatedly associated with the effective functioning of institutional digital systems were extracted and grouped. This procedure produced seven principal assessment criteria: functional coverage; process automation; data exchange; integration and interoperability; monitoring and control; usability; and information security.

In the second stage, each criterion was operationalized through a functional interpretation. Functional coverage represented the breadth of management and information tasks supported by the system. Process automation represented the extent to which repetitive operations could be performed with reduced manual intervention. Data exchange covered the reception, transfer, and processing of information. Integration and interoperability represented the ability to interact with other information resources and systems. Monitoring and control covered the capacity to track process status and management outcomes. Usability represented interface accessibility, information retrieval, and user adaptability. Information security covered data protection, access-right management, reliability, and secure storage.

A three-level qualitative scale was then used to standardize interpretation. A high level indicated that the relevant function was fully implemented and comprehensively supported practical processes. A medium level indicated that the function existed but was subject to limitations, incomplete coverage, or restricted integration. A low level indicated that the function was limited or required substantial improvement. This scale was chosen because it enables transparent comparison where detailed quantitative operational data are not uniformly available across institutions.

In the third stage, the seven criteria were organized into a comparative matrix and interpreted in relation to institutional digital-management requirements. The analysis focused on identifying functional strengths, functional duplication, gaps in data exchange, limitations in interoperability, and areas requiring modernization. No individual software product was ranked, because the study sought to develop a transferable assessment framework rather than to produce a vendor-specific evaluation. This design allows another researcher to reproduce the procedure by applying the same seven criteria and three-level interpretation scale to a defined set of institutional systems.

ANALYSIS AND RESULTS

The comparative procedure produced a seven-criterion assessment framework. The resulting structure covered three broad functional domains: operational support, information coordination, and governance assurance. Operational support included functional coverage and process automation; information coordination included data exchange and integration/interoperability; governance assurance included monitoring and control, usability, and information security.

Table 1 presents the seven criteria and their operational assessment directions.

Table 1.

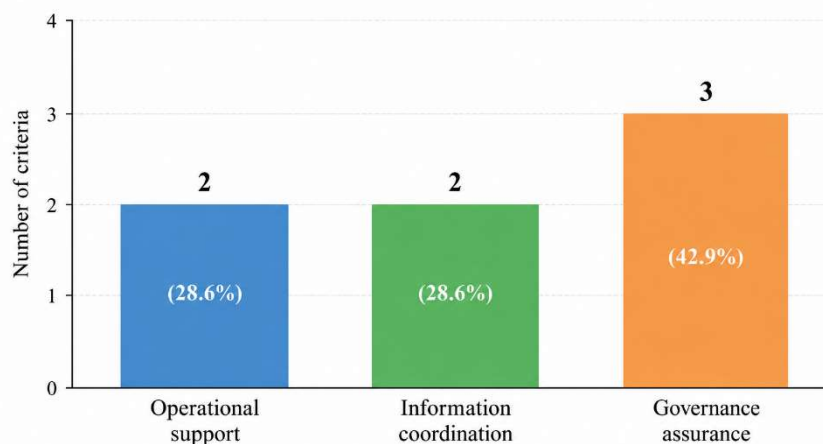
Functional criteria for comparative assessment

№	Assessment criterion	Content of the criterion	Assessment direction
1	Functional coverage	Range of management and information functions performed by the	Completeness of functions

		system	
2	Process automation	Ability to perform repetitive operations automatically	Degree of automation
3	Data exchange	Ability to receive, transmit, and process information	Efficiency of information exchange
4	Integration and interoperability	Ability to interact with other information systems and resources	Compatibility and interoperability
5	Monitoring and control	Ability to track process status and control outcomes	Management transparency
6	Usability	Interface accessibility, information retrieval, and ease of use	User adaptability
7	Information security	Data protection, access-right management, reliability, and storage	Reliability and security

The framework contained seven criteria in total. Two criteria (28.6%) addressed operational support, two criteria (28.6%) addressed information coordination, and three criteria (42.9%) addressed governance assurance. This distribution ensured that the framework did not evaluate digital systems solely by the number of automated functions but also incorporated cross-system interaction and governance-related capabilities.

Figure 1. Distribution of assessment criteria by direction



As shown in Figure 1, governance assurance accounts for the largest share of the assessment framework (42.9%), while operational support and information coordination each represent 28.6%. This distribution indicates that the proposed framework places particular emphasis on monitoring and control, usability, and information security, while maintaining a balanced consideration of automation, functional coverage, data exchange, and interoperability.

A three-level interpretation scale was established to make the assessment procedure uniform. Table 2 summarizes the scale. The scale generated three possible functional states: effective, partially

effective, and insufficient. It was designed as an ordinal diagnostic instrument rather than as a statistical index.

Table 2.

Scale for evaluating functional capabilities

Assessment level	Description	Functional status
High	The function is fully implemented and comprehensively covers practical processes	Effective
Medium	The function exists, but some capabilities or integration mechanisms are limited	Partially effective
Low	The function is limited or requires further improvement	Insufficient

The assessment sequence consisted of three consecutive stages: identification and systematization of functions; comparison against the seven criteria; and synthesis of functional strengths, limitations, duplication, and integration gaps. The resulting framework therefore contained seven assessment criteria, three interpretation levels, and three procedural stages. These outputs constitute the methodological results of the study. Because institution-specific system logs, user-survey data, and vendor-level measurements were not part of the source dataset, no software-specific numerical ranking was produced.

DISCUSSION

The results indicate that the functional effectiveness of a higher education digital environment should be understood as a combination of coverage, coordination, and governance rather than as the number of digital tools available. This interpretation is consistent with Fernández et al. [1], who argue that digital transformation extends across information, processes, people, and strategy, and with Castro Benavides et al. [6], who identify the lack of holistic transformation approaches as a recurring limitation in higher education research.

The strong emphasis placed on data exchange and interoperability in the proposed framework is also supported by OECD research. Vincent-Lancrin and González-Sancho [3] show that insufficient interoperability increases the need for repeated data entry, reformatting, and manual processing. Accordingly, a platform may possess extensive internal functionality while still contributing only partially to institutional transformation if its data remain isolated. The present framework therefore treats integration as an independent assessment dimension rather than assuming that it follows automatically from functional coverage.

The inclusion of monitoring, usability, and information security reflects the broader governance perspective found in recent digital maturity and barrier studies. Singun [5] and the systematic classification of digital transformation barriers [9] demonstrate that governance, competence, resources, and organizational factors shape transformation outcomes. Similarly, maturity studies [10–12] support multidimensional evaluation because different institutional areas can develop at different rates. These findings reinforce the need to distinguish between the existence of a function and its effective institutional use.

The proposed three-level scale offers practical simplicity but also creates a limitation. High, medium, and low categories are useful for diagnostic comparison, yet they do not provide the precision of validated weighted indices or statistical maturity models. In addition, the present study did not rank named software products or use institution-specific operational logs. Consequently, the framework should be regarded as a structured assessment instrument that requires empirical validation in a defined institutional setting before it can support numerical benchmarking.

Future applications should therefore combine the seven criteria with measurable indicators, user surveys, system logs, expert validation, and, where appropriate, weighting procedures. Such validation would make it possible to determine whether some criteria have greater influence on management efficiency and to establish quantitative thresholds for different maturity levels. The framework can nevertheless serve as a preliminary diagnostic tool for identifying fragmentation, duplicated functionality, integration gaps, and governance priorities in higher education digital environments.

CONCLUSION

The study developed a comparative framework for assessing the functional capabilities of digital platforms and information systems in higher education institutions under digital transformation. Seven criteria were identified as central to such assessment: functional coverage, process automation, data exchange, integration and interoperability, monitoring and control, usability, and information security. Their combined use provides a broader view of digital-system effectiveness than an assessment based only on the presence of individual technological functions.

The study concludes that institutional digital transformation requires not only the expansion of digital tools but also the coordination of their functions and information flows. Functional duplication, restricted data exchange, and weak interoperability can reduce the management value of otherwise capable systems. Higher education institutions should therefore prioritize the harmonization of digital functions, automated data exchange, interoperable architectures, effective monitoring, user-oriented interfaces, and secure information processing.

The practical contribution of the proposed approach is its applicability to different institutional environments without dependence on a specific software product. It can be used as a diagnostic basis for identifying functional gaps and establishing modernization priorities. Future research should empirically validate the framework using institutional data, expert assessment, user surveys, and system-performance indicators and should develop quantitative weights and thresholds for the seven criteria.

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