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HOUGHTON STREET REVIEW JOURNAL
ISSN: 2058-5519|Impact factor-15.9
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UDC 378.1:004

ALIGNING DIGITAL TRANSFORMATION WITH INSTITUTIONAL OUTCOMES IN HIGHER EDUCATION: A CONCEPTUAL MODEL (IDTAM) OF GOVERNANCE, CAPABILITIES AND FEEDBACK

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Doi: https://doi.org/10.5281/zenodo.23982862

Abstract:

Purpose: Digital transformation has become a strategic priority for higher education institutions, yet buying and installing technology does not by itself produce institutional change. Fragmented projects, gaps in staff competence, weak data governance and the loose coupling of digital strategy with decision-making often prevent durable results. This article develops a conceptual model that aligns institutional governance, digital capabilities, organizational processes and institutional outcomes.

Design/methodology/approach: The study is a model-building conceptual article based on an integrative review of 28 purposively selected academic, policy and national sources (2015–2026), comparative concept mapping against five analytical dimensions, and theory-based model construction drawing on dynamic capabilities and organizational learning theory.

Findings: The Institutional Digital Transformation Alignment Model (IDTAM) comprises five interdependent dimensions: strategic governance alignment, digital capability development, institutional process integration, responsible data and AI governance, and outcome-based institutional learning. The concept mapping shows that existing frameworks treat the first four dimensions extensively, while the explicit feedback from measured outcomes to later strategic, budgetary and staffing decisions is rarely formalized. Three propositions and an initial set of 11 indicators, classified as input, process, output or outcome measures, are offered.

Originality/value: The model formalizes a double-loop feedback mechanism linking digital investment, measurable results and subsequent management decisions, and shows how it can be adapted to institutions at different levels of digital maturity, with Uzbekistan's rapidly expanding university sector as the reference context.

Research limitations: The model and indicators have not yet been validated empirically; the review is selective rather than systematic.

Keywords: digital transformation, higher education, institutional governance, digital maturity, dynamic capabilities, organizational learning, responsible artificial intelligence, Uzbekistan

Highlights

• Digital transformation in universities is treated as an alignment problem, not a technology problem.
- IDTAM links five dimensions: governance, capabilities, processes, data/AI governance and outcomes.
- Concept mapping of 12 frameworks shows that outcome-to-decision feedback is rarely formalized.
- Eleven indicators separate digital inputs, institutional capabilities and institutional outcomes.

HSR (LONDON),
HOUGHTON STREET REVIEW JOURNAL
ISSN: 2058-5519|Impact factor-15.9
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- The model is staged for universities at initial, developing and advanced levels of digital maturity.

1. Introduction

Few universities today lack a digital strategy, a learning management system or an electronic records platform. What many of them lack is evidence that these investments have changed how the institution teaches, decides and serves its students. Cloud-based information systems, educational data analytics and, more recently, generative artificial intelligence (AI) expand what a university can do, but they do not dictate what it will do. Whether a new platform improves academic advising or simply digitizes an inefficient procedure depends on organizational structures, decision routines, professional competences and institutional culture far more than on the platform itself (Vial, 2019; Kane et al., 2015).

International policy has moved in the same direction. The European Commission's Digital Education Action Plan 2021–2027 sets two strategic priorities, fostering a high-performing digital education ecosystem and enhancing digital skills and competences, and frames both as matters of institutional capacity rather than equipment (European Commission, 2020). The OECD Digital Education Outlook 2023 likewise focuses on the governance of digital education ecosystems rather than on technology adoption rates (OECD, 2023). UNESCO's guidance on generative AI adds a further layer, asking institutions to protect human agency, data privacy and inclusion when they introduce AI tools into teaching and research (Miao & Holmes, 2023).

Uzbekistan offers an instructive setting for this problem. The Concept for the Development of the Higher Education System until 2030 commits the country to digitalizing educational processes and modernizing university management (Decree No. UP-5847, 2019), while the Digital Uzbekistan 2030 Strategy places education among the priority sectors of the digital economy (Decree No. UP-6079, 2020). These commitments coincide with rapid expansion: according to the national statistics committee, the number of students reached 1,535 thousand at the start of the 2025/26 academic year, nearly double the 808.4 thousand recorded in 2021/22 (Anhor.uz, 2026), and 215 higher education institutions, including branches, were operating in 2025/26 (Ta'lim xabarlari, 2026). The number of institutions authorized to train specialists in distance mode rose from 21 to 52 during 2025 alone (Ministry of Higher Education, Science and Innovation, 2025). National policy documents define the strategic direction, but they cannot by themselves ensure that the digital projects of an individual university are coherent with one another or with that university's results.

Research on digital transformation in higher education already identifies strategic planning, governance, staff development and organizational culture as components of institutional change (Carmo et al., 2025; Mohamed Hashim et al., 2022), and maturity models stress that assessment should cover academic, administrative and research processes rather than infrastructure alone (Bravo-Jaico et al., 2025; Rodríguez-Abitia & Bribiesca-Correa, 2021). What remains underdeveloped is the link that closes the loop: a mechanism through which the measured effects of digital initiatives return to the institution's next round of strategy, budgeting, staff development and process redesign. Without that link, a university can install modern systems while keeping disconnected procedures and making the next investment on the same assumptions as the last.

This article therefore asks: how can higher education institutions align digital technologies, institutional governance, organizational capabilities and institutional outcomes within a single model of continuous improvement? The aim is to develop such a model and to make it testable. Three objectives follow from this aim: (1) to identify the core institutional dimensions of digital transformation reported in the literature; (2) to specify the conceptual relationships between digital

HSR (LONDON),
HOUGHTON STREET REVIEW JOURNAL
ISSN: 2058-5519|Impact factor-15.9
http://houghtonstreetreview.com/index.php/hsr

capabilities, management decisions and outcomes, including the feedback mechanism; and (3) to propose measurable indicators for subsequent empirical validation.

The contribution is conceptual. The article integrates five dimensions into the Institutional Digital Transformation Alignment Model (IDTAM) and adds an explicit outcome-to-decision feedback mechanism grounded in organizational learning theory. No claim of absolute priority is made; the originality of the model should be judged against a wider body of literature in future work. The remainder of the paper reviews the theoretical background (Section 2), describes the method (Section 3), presents the model, its propositions and indicators (Section 4), discusses implications and limitations (Section 5) and concludes (Section 6).

2. Literature review and theoretical background

2.1. Digital transformation as institutional change

The literature distinguishes three increasingly demanding processes. Digitization converts information from analog to digital form; digitalization uses digital technologies to change individual processes; digital transformation changes the organization itself. Vial's (2019) review of the information systems literature defines digital transformation as "a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies" (p. 118). The definition is useful for universities because it places the entity, not the technology, at the center, and because Vial's framework treats structural changes, organizational barriers and both positive and negative impacts as part of the same process.

In a university, teaching, research, academic administration, student support and external engagement are tightly interdependent. Local modernization in one of these areas can therefore have a limited effect when the adjacent processes stay unchanged: an online application system that feeds data into a manually maintained student register saves little time for anyone. Systematic reviews of digital transformation in higher education confirm that research and practice have often concentrated on particular technologies or functions rather than on the institution as a whole (Benavides et al., 2020; Fernández et al., 2023). Gkrimpizi et al. (2023), classifying the barriers reported in the literature, show that organizational and human barriers, such as missing strategy, resistance to change and shortages of skills, are at least as prominent as technological ones.

2.2. Strategy, governance and dynamic capabilities

Institutional governance determines how priorities are set, how resources are allocated, who is accountable and how performance is evaluated. In a digital environment it also regulates access to data, the selection of projects and the appraisal of new technologies. Kane et al. (2015) summarized the managerial side of this argument in the phrase that strategy, not technology, drives digital transformation. Studies of universities support the point: Mohamed Hashim et al. (2022) argue that higher education strategy must address staff, students, infrastructure and pedagogy together, and Carmo et al. (2025) identify strategic planning, governance, capacity building and organizational culture as recurrent components of digital transformation in the management of higher education institutions.

The dynamic capabilities perspective explains why alignment, rather than asset accumulation, matters. Teece et al. (1997) define dynamic capabilities as the organization's ability "to integrate, build, and reconfigure internal and external competences to address rapidly changing environments" (p. 516). Applied to universities, the perspective implies that the value of a digital system lies in how the institution senses needs, mobilizes resources and reconfigures its routines around the system. A

HSR (LONDON),
HOUGHTON STREET REVIEW JOURNAL
ISSN: 2058-5519|Impact factor-15.9
http://houghtonstreetreview.com/index.php/hsr

capability that is never reconfigured in response to evidence remains an ordinary capability, however modern the technology behind it.

2.3. Digital competence of staff and organizations

Digital competence includes technical skills, digital pedagogical competence, data literacy, the critical evaluation of AI outputs and the ability to change professional practice. The European framework DigCompEdu describes 22 educator competences organized in six areas, ranging from professional engagement to facilitating learners' digital competence (Redecker, 2017). At the organizational level, the DigCompOrg framework describes digitally competent educational organizations through seven thematic elements, including leadership and governance practices, professional development, assessment practices and infrastructure (Kampylis et al., 2015). The relationship between governance and competence runs in both directions. Leadership creates the conditions for learning and adoption, while the experience of teachers and administrative staff helps leadership correct the strategy. Policy documents emphasize the same coupling of competences with institutional capacity (European Commission, 2020).

2.4. Data, AI and responsible governance

Data analytics and AI promise earlier identification of students at risk, faster administrative services and better-informed management, but they also introduce risks of privacy violations, unreliable outputs, bias and over-reliance on automated decisions. A review of 146 studies on AI applications in higher education found that research concentrated on profiling and prediction, assessment and evaluation, adaptive systems and intelligent tutoring, with little critical reflection on ethical risks or on the pedagogical grounding of these tools (Zawacki-Richter et al., 2019). Studies of learning analytics policy in higher education similarly report that institutional adoption is held back by limited stakeholder engagement, weak links to pedagogy, insufficient training and unresolved questions of privacy and ethics (Tsai & Gašević, 2017; Daniel, 2015).

Normative frameworks have converged on a recognizable set of principles. Jobin et al. (2019), analyzing 84 AI ethics guidelines, found convergence around transparency, justice and fairness, non-maleficence, responsibility and privacy. Floridi and Cowls (2019) propose five principles, namely beneficence, non-maleficence, autonomy, justice and explicability. UNESCO's guidance translates such principles into education-specific recommendations centered on human agency, data protection and inclusion (Miao & Holmes, 2023). For institutional governance, the practical question is less which principles apply than who in the university is responsible for applying them to a specific tool before it is deployed.

2.5. Digital maturity and institutional outcomes

Digital maturity refers to the level of development of the organizational capabilities, processes, governance mechanisms and culture needed to use technology effectively. Bravo-Jaico et al. (2025) propose a maturity assessment that covers teaching and learning, academic and administrative management, digital governance, and research and innovation. Rodríguez-Abitia and Bribiesca-Correa (2021), comparing universities with other sectors, reported that universities lagged behind in digital transformation and pointed to leadership and culture as critical factors. Both studies caution against equating maturity with the number of installed systems or the share of courses delivered online. Such counts are inputs; they say nothing on their own about the quality of teaching, administrative efficiency or the student experience.

A meaningful assessment therefore needs to distinguish digital resources (infrastructure, software, investment, training), institutional capabilities (staff competence, quality of governance,

HSR (LONDON),
HOUGHTON STREET REVIEW JOURNAL
ISSN: 2058-5519|Impact factor-15.9
http://houghtonstreetreview.com/index.php/hsr

process integration, organizational readiness) and institutional outcomes (accessibility of services, efficiency of procedures, quality of decisions and of the student experience). The distinction mirrors the input–process–output logic familiar from quality management, in which improvement depends on returning the results of each cycle to the planning of the next (Deming, 1986). The same logic appears in the higher education quality literature as "quality work", the everyday practices through which staff make quality arrangements meaningful rather than formal (Elken & Stensaker, 2018).

2.6. National context and research gap

In Uzbekistan, strategic documents set the goals of modernizing higher education and developing digital technologies (Decree No. UP-5847, 2019; Decree No. UP-6079, 2020). National studies have examined the content and essence of the digitalization of higher education (Mamarasulov, 2023), strategies for the digital transformation of the higher education system (Begaliyeva, 2025) and practical problems of using digital technologies in university management, including the integration of information systems and the use of data in decision-making (Berdiyev, 2025). These works, like much of the international literature, describe what should be digitized and which obstacles arise. Less attention has been paid to the mechanism by which an institution learns from its own digital initiatives, that is, how measured results alter the next set of decisions. In organizational learning terms, most frameworks support single-loop learning (correcting implementation errors within existing goals) but leave double-loop learning (revising the goals and assumptions themselves) implicit (Argyris & Schön, 1978). The present article addresses this gap.

3. Materials and methods

3.1. Research design

The study is a conceptual article of the model type in Jaakkola's (2020) classification: it builds a model that specifies relationships among constructs and derives testable propositions. It rests on an integrative review of selected academic publications and international and national policy documents, following the guidance of Torraco (2005) and Whittemore and Knafl (2005) for integrating diverse kinds of sources. The study is not a systematic review or meta-analysis. It does not claim an exhaustive search of all databases, a PRISMA screening procedure or a statistically representative sample of publications, and its conclusions should be read accordingly.

3.2. Source selection

Sources were selected purposively from Scopus- and Web of Science-indexed journals, Google Scholar and the official repositories of the European Commission, the OECD, UNESCO and the national legislation database of Uzbekistan (lex.uz). Three criteria guided inclusion: (a) the source addresses digital transformation, digital maturity, digital competence or the governance of data and AI at the level of the institution or system; (b) it offers a framework, a set of dimensions or a policy position that can be compared with others; (c) it was published between 2015 and 2026, with earlier works admitted only when they supply foundational theory (dynamic capabilities, organizational learning, quality management). The resulting corpus comprises 28 sources: 14 peer-reviewed journal articles and conference papers, 6 policy, framework and practitioner reports, 3 national studies, and 5 national legal acts and official statistical publications. Foundational theoretical and methodological works (on dynamic capabilities, organizational learning, quality management and conceptual research design) are cited separately.

HSR (LONDON),
HOUGHTON STREET REVIEW JOURNAL
ISSN: 2058-5519|Impact factor-15.9
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3.3. Analytical procedure

The analysis proceeded in three stages. First, each source was read for the dimensions, components or principles it proposes. Second, these were coded deductively against five analytical categories derived from the research question: strategic governance, organizational capabilities (competence), process integration, responsible use of data and AI, and outcomes with feedback to decisions. Each source was coded as addressing a category explicitly (the category is a named dimension or core theme), partially (the category is mentioned but not developed) or not at all. Third, the categories were combined into a conceptual model, and the relationships between them were specified with reference to dynamic capabilities and organizational learning theory. The coding is interpretive and was performed by a single author, which is acknowledged as a limitation in Section 5.5.

3.4. Model development principles

Three principles guided model construction: institutional integration of digital initiatives with university strategy; measurability of organizational and educational consequences; and continuous use of evaluation results to adjust resources, staff development and processes. The five dimensions are treated as interdependent components, not as independent conditions each of which guarantees success on its own. The effectiveness, predictive validity and applicability of the model are left to future empirical testing.

4. Results

4.1. Concept mapping of existing frameworks

Table 1 summarizes how twelve influential frameworks and reviews address the five analytical categories. The pattern is consistent. Strategic governance and competence development are treated explicitly by most sources, and process integration is central to both general and higher-education-specific models. Responsible governance of data and AI is explicit in the AI-ethics and analytics literature but only partial in general digital transformation frameworks. The fifth category, a formalized mechanism through which measured outcomes revise subsequent strategic and resource decisions, is the least developed: most frameworks assess outcomes or maturity, but few specify how the results of assessment are fed back into the next planning cycle.

Table 1. Concept mapping of selected frameworks against the five analytical dimensions

Source	D1 Strategic governance	D2 Digital capabilities	D3 Process integration	D4 Data and AI governance	D5 Outcome feedback
Vial (2019)	+	(+)	+	(+)	(+)
Kane et al. (2015)	+	+	(+)	–	–
Kampylis et al. (2015), DigCompOrg	+	+	(+)	(+)	(+)
Redecker (2017), DigCompEdu	–	+	–	(+)	–

HSR (LONDON),
HOUGHTON STREET REVIEW JOURNAL
ISSN: 2058-5519|Impact factor-15.9
http://houghtonstreetreview.com/index.php/hsr

Source	D1 Strategic governance	D2 Digital capabilities	D3 Process integration	D4 Data and AI governance	D5 Outcome feedback
Tsai and Gašević (2017)	+	+	(+)	+	(+)
Jobin et al. (2019)	(+)	–	–	+	–
Rodríguez-Abitia and Bribiesca-Correa (2021)	+	+	+	(+)	(+)
Mohamed Hashim et al. (2022)	+	+	(+)	(+)	–
Gkrimpizi et al. (2023)	+	+	(+)	(+)	–
Miao and Holmes (2023), UNESCO	(+)	+	–	+	(+)
Carmo et al. (2025)	+	+	+	(+)	(+)
Bravo-Jaico et al. (2025)	+	(+)	+	+	(+)
IDTAM (this study)	**+**	**+**	**+**	**+**	**+**

Note: + = the dimension is explicit or a core theme; (+) = mentioned but not developed; – = not addressed. Source: author's interpretive coding of the cited works.

4.2. The Institutional Digital Transformation Alignment Model (IDTAM)

The main conceptual result is the Institutional Digital Transformation Alignment Model. IDTAM defines digital transformation in higher education as the continuous alignment of strategic goals, organizational capabilities, digital processes, responsible governance and institutional outcomes, with periodic reassessment of all five. The model is shown in Figure 1 and its dimensions are described below.

Dimension 1: Strategic governance alignment. Its components are an approved digital strategy, accountable leadership, coordination between academic and administrative units, transparent selection of digital projects and the alignment of goals with resource allocation. Its task is to prevent the fragmentation of initiatives and to ensure that each contributes to the university's overall priorities. In practical terms, a project that cannot state which institutional objective it serves and who is accountable for its results should not pass the selection stage.

Dimension 2: Digital capability development. This dimension covers digital competence in teaching and learning, data literacy, digital leadership, change management, an understanding of the possibilities and limits of AI, and continuous professional development (Redecker, 2017; Kampylis et al., 2015). Staff development is treated as a permanent institutional function rather than a one-time event, and its targets are set by diagnosed competence gaps rather than by the availability of training offers.

Dimension 3: Institutional process integration. This dimension concerns the extent to which digital systems make student registration, academic advising, assessment, research administration, internal communication and reporting coherent with one another. Its main components are

HSR (LONDON),
HOUGHTON STREET REVIEW JOURNAL
ISSN: 2058-5519|Impact factor-15.9
http://houghtonstreetreview.com/index.php/hsr

interoperability of systems, reduction of repeated data entry, consistency of working procedures and accessibility of digital services. Integration is judged by actual procedures and the quality of services, not by the number of platforms.

Dimension 4: Responsible data and AI governance. This dimension includes data protection and information security, rules of data access, transparent appraisal of AI applications, human oversight of significant automated decisions, bias monitoring and clear accountability for digital decisions. It builds on UNESCO's human-centered approach to generative AI (Miao & Holmes, 2023) and on the principles identified in AI ethics guidelines (Jobin et al., 2019; Floridi & Cowls, 2019), and it treats responsible governance as a baseline condition of digital development rather than a later add-on.

Dimension 5: Outcome-based institutional learning. This dimension connects the implementation of digital initiatives with institutional improvement through regular evaluation, measurement of educational and administrative outcomes, feedback from students and staff, review of resource allocation and adjustment of strategy. The results of evaluation are required to inform subsequent strategic and operational decisions. This is the dimension that Table 1 shows to be least developed in existing frameworks.

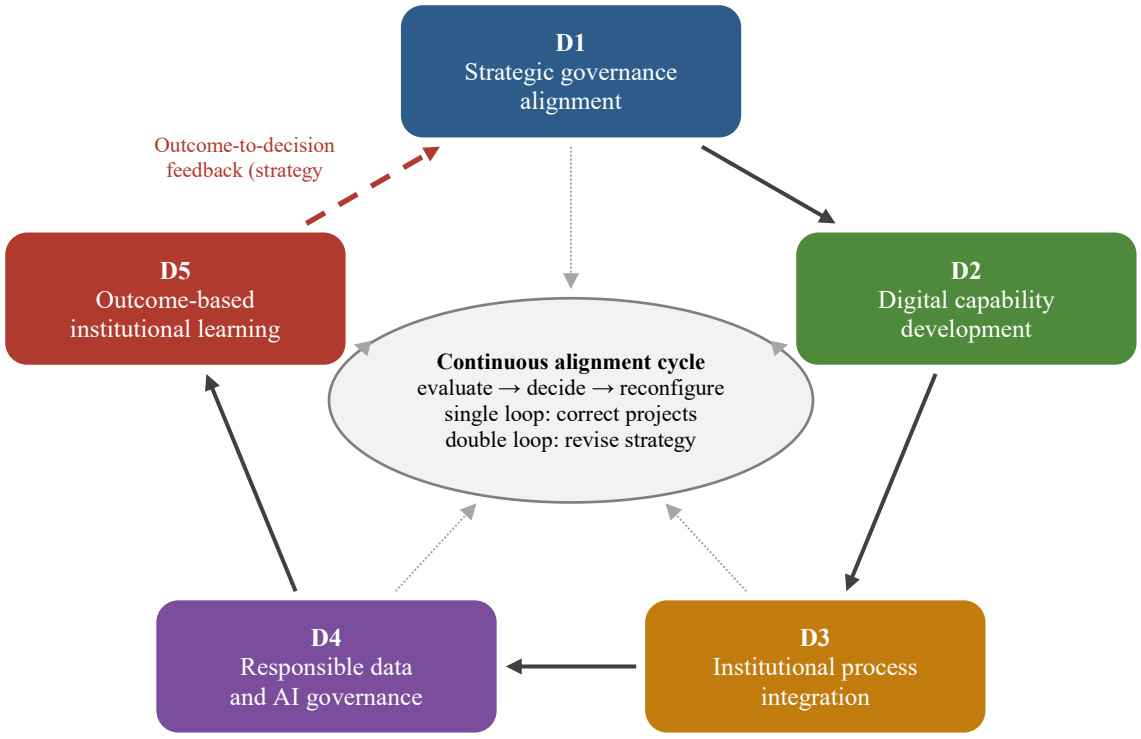


Figure 1. The Institutional Digital Transformation Alignment Model (IDTAM)
Source: developed by the author.

4.3. Structural relationships and propositions

The five dimensions form a continuous cycle of institutional learning. Strategic governance sets priorities and accountability; capability development prepares staff; process integration turns

HSR (LONDON),
HOUGHTON STREET REVIEW JOURNAL
ISSN: 2058-5519|Impact factor-15.9
http://houghtonstreetreview.com/index.php/hsr

capabilities into coherent practice; responsible governance supplies the necessary safeguards; and outcome evaluation determines how far the initiatives contribute to institutional goals. The findings then enter the next cycle of planning and resource allocation. In compact form the cycle reads: strategic alignment → capability development → process integration → responsible implementation → outcome evaluation → strategy revision. This is an analytical scheme, not an empirically established causal sequence. In practice the dimensions may develop in parallel and influence each other; a data-protection review, for instance, may force a redesign of a process before any staff training takes place.

Two loops can be distinguished within the cycle, following Argyris and Schön (1978). In the single loop, evaluation results correct the implementation of a given project: a poorly used advising platform is reconfigured, or training is repeated. In the double loop, evaluation results revise the strategic assumptions that justified the project in the first place: the university may conclude that student advising needs more advisers rather than another platform, and redirect its budget accordingly. IDTAM requires both loops to be documented, because the second is the one most often missing in practice.

The model also distinguishes the immediate results of a project from institutional effects. Launching a digital student-support platform is a project result. Shorter response times, improved accessibility or higher student satisfaction may be institutional effects, but only when they are confirmed by appropriate data collected before and after implementation.

Three propositions follow from the model. ***Proposition 1:*** the contribution of digital investment to institutional performance depends not only on the availability of technology but on its alignment with institutional priorities. ***Proposition 2:*** the relationship between technology adoption and institutional outcomes is conditioned by staff capabilities, process integration and responsible governance. ***Proposition 3:*** continuous improvement is more achievable when evaluation results are systematically incorporated into subsequent strategic and operational decisions. These propositions are theoretically grounded hypotheses and require empirical testing.

4.4. Proposed indicators for institutional evaluation

To make the model operational, an initial set of 11 indicators is proposed (Table 2). Each indicator is classified by type, following the distinction between resources, capabilities and outcomes made in Section 2.5. The indicators are instruments for future application, not results of an empirical measurement carried out in this study.

Table 2. Proposed indicators for evaluating institutional digital transformation

Dimension	Indicator	Type	Measurement method	Possible data source
D1 Strategic governance	Alignment of digital initiatives with institutional priorities	Process	Percentage of initiatives assessed against strategic objectives	Project portfolio register
D1 Strategic governance	Projects with assigned accountability	Process	Share of projects with a named responsible manager and target results	Project charters

HSR (LONDON),
HOUGHTON STREET REVIEW JOURNAL
ISSN: 2058-5519|Impact factor-15.9
http://houghtonstreetreview.com/index.php/hsr

Dimension	Indicator	Type	Measurement method	Possible data source
D2 Digital capabilities	Staff who completed targeted training	Input	Percentage of the target group trained in a given period	Human resources records
D2 Digital capabilities	Demonstrated digital competence	Output	Results of competence assessment (e.g., self-assessment against DigCompEdu levels, verified by observation)	Competence assessment
D3 Process integration	Interoperability of core information systems	Output	Audit against predefined interoperability criteria	IT audit
D3 Process integration	Duration of key administrative procedures	Outcome	Comparison of baseline and repeated measurements	Process logs, service records
D4 Data and AI governance	Initiatives that passed a data and AI risk assessment	Process	Share of initiatives for which such an assessment is applicable	Risk register
D4 Data and AI governance	Accessibility of digital services	Output	Audit against accessibility criteria	Accessibility audit
D5 Outcomes	Student satisfaction with digital services	Outcome	Standardized student survey	Annual survey
D5 Outcomes	Achievement of digital project targets	Outcome	Share of targets achieved by the planned date	Project evaluation reports
D5 Institutional learning	Use of evaluation results in subsequent plans	Process	Documented changes in decisions (budget, staffing, process design) attributable to evaluation	Minutes, strategic plans

Source: developed by the author.

HSR (LONDON),
HOUGHTON STREET REVIEW JOURNAL
ISSN: 2058-5519|Impact factor-15.9
http://houghtonstreetreview.com/index.php/hsr

To apply the model, a university needs to define operational criteria for each indicator, establish baseline values, select data sources and set the frequency of measurement. When adapting the indicators, the distinction between digital resources, institutional capabilities and outcomes should be preserved, so that an increase in inputs is not reported as an improvement in results. The last indicator in Table 2 is the direct operationalization of the feedback mechanism: it counts decisions that changed because of evidence, not reports that were produced.

4.5. Staged application by level of digital maturity

Universities differ in funding, infrastructure, culture, regulatory environment and staff competence, so the same model cannot be applied identically everywhere. IDTAM keeps the five-dimension structure constant but allows the emphasis within each dimension to change with the level of digital maturity. Table 3 outlines three illustrative stages. They are scenarios for planning, not empirically confirmed stages of development.

Table 3. Illustrative priorities of IDTAM at different levels of institutional digital maturity

Dimension	Initial level	Developing level	Advanced level
D1 Strategic governance	Approve a digital strategy; appoint accountable leadership	Introduce transparent project selection linked to the budget	Manage digital initiatives as a portfolio with periodic rebalancing
D2 Digital capabilities	Basic digital and data literacy for all staff	Role-specific training based on diagnosed gaps	Digital leadership, change management and AI literacy programs
D3 Process integration	Reliability of core systems; single student record	Interoperability of key systems; removal of duplicate data entry	End-to-end digital services designed around student journeys
D4 Data and AI governance	Data protection rules and access rights	Risk assessment procedure for new tools, including AI	Bias monitoring and human oversight of significant automated decisions
D5 Outcome-based learning	Baseline measurement of selected indicators	Annual evaluation with student and staff feedback	Documented double-loop revision of strategy and resource allocation

Source: developed by the author.

5. Discussion

5.1. From technology adoption to institutional change

The model shifts the analytical focus from the acquisition of technology to institutional coordination. A university can introduce modern systems while preserving fragmented administrative

HSR (LONDON),
HOUGHTON STREET REVIEW JOURNAL
ISSN: 2058-5519|Impact factor-15.9
http://houghtonstreetreview.com/index.php/hsr

procedures, inconsistent data practices or insufficient staff preparation; in that case digitalization reproduces existing problems at higher speed. IDTAM proposes to analyze governance, capabilities, processes, responsible implementation and evaluation within one structure, which is consistent with multidimensional approaches to digital transformation (Carmo et al., 2025; Vial, 2019). The model does not assume that all dimensions are equally important for every university. Their weight depends on institutional goals, resources and digital maturity, which is why Table 3 shifts emphasis across stages and why the model does not fix numerical weights.

The distinctive element of IDTAM is its fifth dimension. Maturity models such as those of Bravo-Jaico et al. (2025) and Rodríguez-Abitia and Bribiesca-Correa (2021) tell an institution where it stands; IDTAM adds a requirement about what the institution does with that information. In dynamic capabilities terms, measurement is part of sensing, but transformation occurs only when the institution reconfigures resources and routines in response (Teece et al., 1997). Without the documented feedback loop, a maturity score risks becoming another report rather than a basis for decisions, a risk that the quality literature has long associated with compliance-oriented quality arrangements (Elken & Stensaker, 2018).

5.2. Implications for university management

University leadership can use the five dimensions to check whether digital projects correspond to institutional priorities before they are funded. Staff development programs can be targeted at diagnosed competence gaps rather than general awareness. Process integration should be assessed by actual procedures and the quality of services, not by the number of platforms. Requirements of responsible data and AI governance should be built into the planning stage, when changing a design is still inexpensive. Evaluation results can then be used in decisions about future investment and organizational change. In the Uzbek context, where enrolment nearly doubled in four years and the number of institutions offering distance education more than doubled in a single year (Anhor.uz, 2026; Ministry of Higher Education, Science and Innovation, 2025), the pressure to scale digital services quickly makes the selection and evaluation disciplines of Dimensions 1 and 5 especially relevant. At the same time, the article does not show that implementing the model necessarily reduces costs or improves educational outcomes; these effects require empirical verification.

5.3. Responsible artificial intelligence and accountability

AI can support administrative processes, feedback on student work, research and institutional analytics. Its use also carries risks of breaches of confidentiality, unreliable outputs, bias and excessive dependence on automated decisions (Zawacki-Richter et al., 2019; Jobin et al., 2019). UNESCO stresses the importance of human agency, data protection and the ethical integration of generative AI (Miao & Holmes, 2023). Within IDTAM, the university assigns responsibility for appraising each AI application, identifying its risks and arranging human oversight in proportion to the nature and possible consequences of the application. A chatbot answering timetable questions and a model that flags students for academic probation do not warrant the same level of scrutiny, and the model's risk-assessment indicator (Table 2) is designed to make that proportionality explicit and auditable.

5.4. Applicability in different institutional contexts

Because universities differ in resources and maturity, a model built in a well-resourced institution may need adaptation elsewhere. An institution with limited infrastructure may first concentrate on reliable systems, staff training and the integration of core processes, while a more mature institution may focus on interoperability, analytics, AI risk management and outcome evaluation (Table 3). These are possible scenarios, not empirically confirmed results. The context of

HSR (LONDON),
HOUGHTON STREET REVIEW JOURNAL
ISSN: 2058-5519|Impact factor-15.9
http://houghtonstreetreview.com/index.php/hsr

rapid system expansion, as in Uzbekistan, adds a further consideration: new and fast-growing institutions may adopt digital systems before their administrative procedures stabilize, which creates an opportunity to design integrated processes from the outset but also a risk of locking in poorly designed procedures.

5.5. Limitations and future research

The study has several limitations. The model is conceptual and has not been tested empirically. The literature review is selective rather than systematic, and the concept mapping in Table 1 is an interpretive coding by a single author, so other readers could classify some sources differently. The indicators have not been formally validated, which leaves their reliability and construct validity open. The model does not assign numerical weights to its dimensions. Future research should test IDTAM in universities with different levels of digital maturity and resources, combining document analysis, surveys of students and staff, interviews with leaders and longitudinal performance indicators. A Delphi study with experts in higher education management could refine the indicators before field testing, and confirmatory factor analysis on survey data could test whether the five dimensions are empirically distinct.

6. Conclusion

This article has proposed the Institutional Digital Transformation Alignment Model (IDTAM) for the conceptual analysis and management of digital transformation in higher education institutions. The model integrates strategic governance alignment, digital capability development, institutional process integration, responsible data and AI governance, and outcome-based institutional learning.

Three conclusions follow. First, digital transformation should be evaluated through the alignment of strategic priorities, organizational capabilities, implementation processes and measurable outcomes, not merely by the fact that technologies have been adopted. Second, the main conceptual contribution of the model is a feedback mechanism that links institutional evaluation with decisions on strategy, professional development, process redesign and resource allocation, distinguishing single-loop correction of projects from double-loop revision of strategic assumptions; the concept mapping indicates that this mechanism is the least formalized element of existing frameworks. Third, the eleven proposed indicators, classified as input, process, output and outcome measures, provide an initial basis for an institutional assessment instrument that can be staged according to digital maturity.

The effectiveness of the model has not yet been confirmed empirically. Further work should establish its applicability in different higher education systems and determine whether institutional alignment does in fact support more effective and sustainable digital transformation.

Declarations

Funding: This research received no external funding.
Conflict of interest: The author declares no conflict of interest.
Data availability: No new data were generated or analyzed in this study.

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