

Educational Technology Leadership for Digital Transformation in Chinese Higher Education: A Contextualized Conceptual Framework

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Abstract

Digital investment does not necessarily alter how universities teach, conduct research, or organize services. Existing transformation frameworks specify areas of change, while leadership studies identify relevant attributes and practices; the relationships linking these contributions remain insufficiently specified across organizational levels. This conceptual article develops a contextualized explanation for Chinese higher education through an integrative synthesis anchored in Xiao and Wang's three transformation domains and five layers. Five interacting leadership processes are distinguished: strategic educational sensemaking; infrastructure and data orchestration; enabling professional capability and faculty agency; distributed experimentation and adaptive scaling; and responsible governance and evidence-informed evaluation. Eight propositions specify investment alignment, indirect paths through coordination and professional action, and conditions affecting participation, scaling, and persistence. The contribution lies in relating these processes to different transformation problems and specifying where their effects depend on organizational support, prior trust, and domain-specific maturity. Chinese policy priorities and institution-level variation define the context of application rather than establish national uniqueness. A literature comparison, synthesis matrix, and proposition-level research agenda distinguish inherited concepts from the relationships proposed here. The framework offers an analytical guide for institutional reflection and future research; it is neither an empirically validated causal model nor a validated diagnostic instrument.

Keywords: educational technology leadership, digital transformation, higher education, Chinese university, faculty agency, distributed leadership, digital governance

1. Introduction

Digital transformation is now embedded in the strategic vocabulary of universities. Higher education institutions invest in learning management systems, smart classrooms, data platforms, artificial intelligence applications and digitally mediated services in the expectation that technology will improve educational quality, institutional efficiency and student experience. However, the presence of technology does not itself demonstrate transformation. A university may operate multiple platforms while preserving teacher-centered pedagogy, fragmented administrative processes and rigid departmental boundaries. It may collect large quantities of data without establishing reliable standards for data quality, access, interpretation or ethical use. It may also require teachers to adopt new systems while providing insufficient time, professional support or influence over the design of those systems. These gaps explain why digital transformation is better understood as an organizational and educational change process than as a procurement program (Alenezi, 2021; Bond et al., 2018; Castro Benavides et al., 2020; Mohamed Hashim et al., 2022).

The distinction is especially relevant to Chinese higher education. Kang and Xu (2025) map the development of Chinese scholarship on higher education digital transformation, while Xiao and Wang (2022) organize transformation around talent cultivation, scientific research, and management and services. Their five-layer account covers digital data, environments, functions, organizational structures, and institutional systems. It also addresses people, institutional safeguards, educational demand, and the expansion of micro-innovations. We therefore use it as a structural starting point, not as a technology-only model to which leadership is introduced for the first time.

The Ministry of Education of the People's Republic of China (MOE, 2025) calls for data sharing across university teaching, research, management, and services, and for the digital transformation of institutional, disciplinary, and programme

evaluation. Zhang's (2025) account of Wuhan University illustrates an institutional attempt to connect teaching, curriculum, evaluation, and services. Policy statements establish priorities, and institutional accounts illustrate possible arrangements; neither establishes the prevalence or effectiveness of those arrangements across Chinese universities.

The unresolved problem concerns the relationships through which institutional intentions become changes in practice. A structural account of transformation does not by itself specify how shared priorities affect investment decisions, how coordination enables workflow redesign, or when professional discretion and local trials become sustained organizational change. Bygstad et al. (2022), for example, distinguish the digitalization of education from the digitalization of subjects and examine their integration in a shared digital learning space. Such work already recognizes integration as an organizational challenge. The present article asks how particular leadership processes can address that challenge across transformation layers, and under what conditions their effects may weaken or fail.

Leadership scholarship supplies complementary explanations. Ehlers (2020) treats digital leadership in institutional terms, and Jameson et al. (2022) identify the need for greater conceptual and methodological maturity. Ghamrawi and Tamim (2023) identify five digital leadership attributes, including governance, while Jing et al. (2025) examine strategic foresight, resource coordination, technology awareness, and culture building among Chinese university leaders. These contributions preclude a claim that strategy, coordination, or governance is new. Our concern is the specification of relationships between leadership practices, intermediate changes, and domain-specific outcomes, alongside the limits of transferring findings between institutional settings.

The article asks: Through which leadership processes, and under which institutional conditions, can digital resources support sustained transformation in Chinese higher education? It makes three related contributions. First, it links a structural account of transformation to specified leadership processes rather than equating a transformation layer with a leadership stage. Second, it distinguishes leadership practices from intermediate conditions such as faculty capability and agency, and develops propositions about coordination, participation, and scaling. Third, it makes institutional support, prior trust, and maturity-sensitive priorities explicit boundary conditions. The novelty claimed is relational integration and qualification, not the invention of five wholly new constructs or evidence of their effectiveness.

The argument is conceptual and does not claim empirical confirmation. Teaching provides the most developed application, particularly for the faculty-level propositions. Research and administrative services remain additional domains in which selected organizational propositions can be examined with appropriate actors and outcomes. The framework is situated in Chinese higher education, but similarities with other policy-intensive systems are questions for comparison rather than established generalizations.

2. Conceptual Method

2.1 Source Selection and Analytical Scope

This article uses an integrative conceptual synthesis rather than a systematic review or meta-analysis. Its purpose is to connect complementary explanations and formulate contestable relationships, consistent with the distinction between theory synthesis and empirical testing discussed by Jaakkola (2020). Source identification in the original manuscript was purposive and iterative, involving reading, backward citation tracing, and targeted searches. For this revision, targeted web searches and checks of publisher records, DOI-linked pages, and official documents supplemented that source base. This supplementary work is not presented as a retrospective systematic database search.

The retained literature spans 1995–2025 and combines foundational leadership and agency scholarship, higher education studies, and policy or professional guidance. Supplementary searches completed in September–October 2026 used combinations of 'higher education digital transformation', 'digital leadership', 'faculty agency', 'organizational trust', 'generative AI governance', and 'Chinese university', alongside exact-title searches. Sources were accessed through scholarly publisher platforms, including Springer Nature, ScienceDirect, and MDPI, and official MOE, UNESCO, and Jisc records. These are access sources, not a claim of exhaustive coverage of bibliographic databases. Studies were selected for an explicit construct, relevant organizational relationship, contextual evidence, or a counterexample to the emerging argument. Material confined to product promotion or adoption counts without explanatory value was not used to derive propositions. Foundational work from other educational settings was retained only with its transfer limitations acknowledged. Policy documents establish intended priorities; they are not treated as evidence of causal effects.

2.2 Theory Integration and Proposition Development

The analysis used three operations. First, transformation layers were read as sites of change and associated coordination problems, rather than as a predetermined sequence of leadership actions. Second, selected explanations were compared by construct, actor, analytical level, and scope of evidence. Third, related practices were grouped by their immediate function: interpreting priorities, coordinating resources, enabling professional action, connecting trials to wider use, and governing risk and evaluation. These functions organize five proposed processes; the number five is a parsimonious analytical choice, not an empirically established exhaustive taxonomy. Appendix A records the source-to-process mapping,

including inherited concepts and the extensions proposed here. Table 1 compares existing approaches, Table 2 connects layers with processes, and Table 3 specifies how the propositions could be examined.

Several distinctions guide the synthesis. Digitization concerns converting information into digital form; digitalization concerns the use of digital technologies to modify activities; digital transformation concerns more extensive changes in organizational functions, relationships, and capabilities (Castro Benavides et al., 2020; Kang & Xu, 2025). Technology adoption denotes initial or continued use and is not, by itself, evidence of transformation. Digital leadership is the broader field of leadership associated with digitally mediated change. We use educational technology leadership for the practices through which actors organize such change around educational and institutional purposes. Avolio et al. (2000) provide a related e-leadership perspective on technology-mediated social influence; the terms are connected but are not used as interchangeable labels for individual technical competence.

Leadership is treated as distributed across formal authority, professional expertise, and situated interaction (Spillane, 2006). This does not imply that distribution always improves outcomes or that formal authority is dispensable. Professional agency is understood as an achievement of situated action arising through the interaction of actors' capacities with cultural, structural, and material conditions, whereas capability concerns the knowledge and skills available to act. These are possible intermediate conditions, not synonyms for leadership. Agency and technology-integration scholarship informs this distinction (Priestley et al., 2015; Ertmer & Ottenbreit-Leftwich, 2010), but evidence from school settings does not automatically generalize to university faculty.

Educational technology leadership is therefore defined here as a context-sensitive set of practices through which formal and informal actors interpret educational purposes, coordinate digital resources, enable professional action, organize experimentation, and govern the use and evaluation of technology. The definition describes practices without defining leadership by successful outcomes. Each proposition below specifies a proposed relationship and its domain. The synthesis identifies plausible explanations rather than estimating effect sizes, establishing temporal order, or demonstrating that alternative explanations have been eliminated.

3. From a Structural Transformation Framework to a Leadership Problem

Xiao and Wang's (2022) framework provides a strong basis for identifying what universities attempt to transform. Its three domains reflect the core functions of higher education. Talent cultivation includes curriculum, teaching, learning spaces, student support and practical activity. Scientific research includes research organization, collaboration, equipment, data and emerging research paradigms. Management and services include administrative coordination, integrated information platforms, institutional decision-making and responsive support for staff and students.

The five layers describe the scope and depth of change. Digital data concerns representations, definitions, quality, and access; digital environments concern platforms, networks, devices, and support arrangements; digital functions concern teaching, research, and service workflows; digital organizational structures concern roles and interdepartmental relationships; and digital institutional systems concern the coordinated configuration of those elements. The original account allows different routes of development (Xiao & Wang, 2022). We retain the structural distinction without assuming that every institution must complete one layer before addressing another.

The distinction makes it possible to identify gaps between technological provision and changes in work. As an illustration, a university may digitize student records while leaving responsibilities for correcting inconsistent data unresolved. A research platform may provide access without changing rules for sharing or reusing research materials. Such examples specify possible analytical problems; they are not findings from cases collected for this article. They indicate why the same technical investment can require several leadership processes and why any one process may operate across multiple layers.

The proposed extension is a many-to-many relationship between transformation layers and leadership processes. Data standards may require both orchestration and governance; workflow redesign may require sensemaking, professional support, and experimentation. These are explanatory connections, not a one-to-one allocation of five mechanisms to five layers. Table 2 makes the mapping explicit. The new propositions concern how practices influence intermediate changes and outcomes, whereas the layers identify what is changing. Reciprocal learning is possible, but specific feedback paths remain propositions for process research rather than confirmed causal loops.

Chinese contextualization is specified through conditions that can vary within the country. First, the coordinated policy agenda documented by MOE (2025) makes the translation of broad priorities into institution-specific choices salient. It does not establish that policy pressure uniformly causes symbolic compliance. Second, institutional missions and capabilities require differentiated responses: a research-intensive university, a local teaching institution, and a vocational institution may face different transformation problems. Jing et al. (2025) provide evidence from leaders in Zhejiang and Guangdong, but those settings cannot represent the full national system. Hallinger's (2018) contextual approach supports examining such variation instead of treating nationality as a sufficient explanation.

Third, the relationship between formal coordination and local discretion is an empirical contextual condition, not a fixed characterization of every Chinese university. Fourth, maturity can differ between teaching, research, and services within the same institution. These conditions enter the framework through the scope for local sensemaking (P1), access to support and recognition (P3-P4), arrangements for sharing and scaling (P5), and maturity-sensitive priorities (P8). Evidence from a particular discipline or institution is used to identify possible conditions, not to infer uniform national behavior. Which combinations are especially consequential in China requires comparative research.

Xiao and Wang's (2022) safeguard, action, and operational routes already address people and institutional arrangements, teaching-centered change, and demand-led micro-innovation. We adopt these orientations and extend them by specifying relationships that can be examined separately: between sensemaking and investment alignment, between coordination and workflow redesign, and between locally initiated trials and sustained adoption beyond their originating unit. This extension identifies distinct constructs, intermediate processes, and possible failure conditions rather than simply renaming the original routes as leadership functions.

4. Theoretical Differentiation and Competing Explanations

Existing approaches are useful but address different explanatory tasks. Attribute-based typologies describe what leaders bring to an initiative; structural frameworks identify areas of institutional change; distributed leadership and agency perspectives explain participation and professional action. These approaches need not be mutually exclusive. Ghamrawi and Tamim (2023), for example, include governance and report that participants regarded higher-level authority as helpful in reducing implementation conflict. It would therefore be inaccurate to portray all existing work as individualistic or all centralized decisions as harmful. The unresolved task is to distinguish coordination that enables action from control that reduces opportunities for local judgment.

A second issue is the distinction between adoption and transformation. Bond et al. (2018) empirically examine digital media perceptions and use in German higher education, whereas Røe et al. (2022), in a Perspective article, argue for pedagogical redesign rather than report an intervention test. These sources differ in both their question and the type of support they provide. Adoption measures can be appropriate for an adoption study; they become insufficient when used as the sole evidence for a broader claim about changed teaching or institutional capability. The present framework therefore separates platform use from sustained changes in workflows, pedagogy, and cross-unit practice.

A third issue concerns the relationship between infrastructure and professional action. Reviews by Castro Benavides et al. (2020) and Gkrimpizi et al. (2023) already identify organizational and human factors alongside technology. We do not attribute technological determinism to those reviews. Instead, we use their synthesis to motivate a distinction between resource availability and the practices that make resources usable across units. Orchestration and professional enablement are treated as different processes because a reliable system can coexist with limited time, weak pedagogical support, or little influence over implementation.

Trust provides a particularly useful competing explanation. Drawing on 68 interviews across eight European study programs, Laufer et al. (2025) describe both supportive trust and cases in which responsibilities were delegated without adequate resources or guidance. Their focus on leaders' trust in staff differs from staff trust in institutional decision-makers. The present framework keeps these directions distinct: delegated discretion informs professional enablement, whereas P6 concerns staff's prior trust in governance. The latter is a proposed extension that requires direct examination, not a tested result of that study. Likewise, the analysis of GenAI guidance from the top 50 U.S. universities by An et al. (2025) establishes variation in policy content and audiences, not the causal effect of that guidance on participation.

Finally, Jisc's digital transformation framework identifies areas for institutional development (Jisc, 2023a), and its companion maturity model supports structured assessment within those areas (Jisc, 2023b). Neither provides a test of the leadership relationships proposed here. We propose that the fit between leadership priorities and documented domain-specific needs affects the persistence of changed practices. Table 1 summarizes what is adopted, what remains unresolved for the present question, and what is proposed. The comparison is selective and does not claim that these are the only relevant theories.

Table 1. Existing approaches and the proposed conceptual contribution

Approach and sources	Contribution retained	Limit for the present question	Proposed extension
Structural transformation Xiao & Wang (2022)	Three domains, five layers, institutional safeguards, and innovation routes.	Does not formulate the eight micro-leadership relationships specified here.	Connect layers to multiple processes; distinguish intermediate changes and conditions (P1-P8).
Digital leadership Ehlers (2020); Ghamrawi & Tamim (2023); Jing et al. (2025)	Strategy, culture, coordination, governance, and relevant attributes.	Attributes and perceptions alone do not identify the process from allocation to sustained practice.	Separate sensemaking, orchestration, and workflow redesign (P1-P2).
Distributed leadership and agency Spillane (2006); Priestley et al. (2015); Vangrieken et al. (2017)	Situated leadership, ecological agency, professional autonomy, and collaboration.	Transfer to university digital work requires specified support and outcome conditions.	Distinguish enablement from support capability and agency; qualify persistence and diffusion (P3-P5).
Trust and governance Laufer et al. (2025); An et al. (2025)	European interview evidence on delegation; U.S. guideline analysis of stakeholder-specific governance issues.	Trust direction and policy content are not tests of the proposed staff-trust interaction.	Separate prior staff trust, governance design, and voluntary participation (P6-P7).
Transformation and maturity Bygstad et al. (2022); Jisc (2023a, 2023b)	Integration across digitalization processes; institutional developments and structured maturity assessment.	A maturity profile does not specify effects of matching leadership priorities to constraints.	Propose independently assessed domain-specific fit and subsequent persistence (P8).

Note. The comparison distinguishes inherited concepts from the proposed integration; it does not claim an exhaustive review of competing theories.

5. A Contextualized Framework of Educational Technology Leadership

The framework contains five interacting organizational processes, denoted M1-M5. They describe what actors do, rather than five personality attributes, five transformation layers, or five compulsory stages. Their analytical separation rests on immediate function, although activities can overlap in practice. Each subsection distinguishes a process from its proposed intermediate conditions and outcomes. Figure 1 displays the selected relationships developed in P1-P8; it does not imply that every possible connection among the processes has been theorized or tested.

5.1 Strategic Educational Sensemaking

Strategic educational sensemaking (M1) is the collective interpretation of policy signals, technological possibilities, and institutional needs to identify actionable priorities. Sensemaking scholarship links collective interpretation to action (Weick et al., 2005). Here it is observed in problem-framing discussions, negotiation between units, and the reasons recorded for choosing projects. Investment alignment is a separate outcome: the extent to which actual resource allocations address those agreed priorities. This distinction prevents the proposition from defining successful sensemaking merely as alignment. Strategy and culture are established concerns in digital leadership (Ehlers, 2020; Jing et al., 2025); the proposed extension links the interpretive process to observable allocation decisions.

This mechanism begins with purpose. Leaders must ask which student, teacher, research or service problem a proposed technology is intended to address. For talent cultivation, the problem may involve feedback quality, access to resources, flexible participation or active learning. For research, it may involve data sharing, equipment access or interdisciplinary collaboration. For services, it may involve fragmented procedures or delayed support. The framework proposes that purpose-driven framing may reduce the risk that the institution purchases technology because it is fashionable or because peer institutions have done so.

Sensemaking also requires boundary setting. Disciplinary tasks and institutional missions can justify different uses of the same technology. Shared purposes need not require identical tools or uniform teaching designs. We expect dialogue that includes the units implementing a project to expose incompatible assumptions before resources are committed. This expectation depends on some discretion to adjust local decisions; where allocations are entirely prescribed externally, the proposed relationship should be weaker.

The proposed process is thus interpretive and allocative: actors make competing aims discussable, select priorities, and use them to justify investment. It does not imply that all participants agree or that a strategy document proves shared understanding. P1 concerns variation between initiatives or units with comparable resources and discretion, and should be examined using evidence about both deliberation and subsequent decisions.

Proposition 1: Within institutions that retain discretion over digital investment, more extensive cross-unit educational sensemaking is associated with greater subsequent alignment between project resource allocations and explicitly agreed educational priorities.

5.2 Infrastructure and Data Orchestration

Infrastructure and data orchestration (M2) concerns the coordination of platforms, standards, decision rights, and support services across organizational boundaries. It differs from infrastructure quantity or technical sophistication. Xiao and Wang (2022) identify integration problems, while Bygstad et al. (2022) examine the connection of digitalization processes. Building on these accounts, we propose that shared priorities influence workflow redesign partly through decisions about interoperability, data responsibility, and usable support. The claimed indirect path concerns a proposed process rather than an estimated mediation effect.

Orchestration requires clear decision rights: who maintains data, authorizes access, corrects errors, and coordinates changes between units. Its boundary with M5 is functional. M2 organizes operational coordination; M5 establishes legitimate limits, review, and accountability. A policy can specify appropriate data use without resolving incompatible definitions, and an integrated platform can operate without trusted governance. Neither process can therefore be used as a proxy for the other.

Support architecture is also relevant. Landa et al. (2023) report an association between leader support and technology integration in a survey of 192 academic staff in Tanzanian universities, but the hypothesized mediation through technological knowledge was not statistically significant. These faculty-level findings do not test institution-level orchestration or cross-unit workflow redesign. We extend the argument by proposing that coordinated support reduces handoff failures and makes agreed priorities actionable across units. Faculty professional learning is developed separately under M3.

Infrastructure orchestration is particularly important when universities adopt generative artificial intelligence. Institution-wide licenses may improve access, but they also create questions about data residency, model transparency, student equity and the relationship between commercial platforms and university knowledge. Leaders must coordinate procurement with pedagogy and governance rather than treating these as separate phases.

Proposition 2: Within cross-unit digital initiatives, infrastructure and data orchestration form an indirect pathway linking strategic educational sensemaking to subsequent redesign of teaching, research, or service workflows; the relevant workflow and organizational level must be specified for each application.

5.3 Enabling Professional Capability and Faculty Agency

Enabling professional capability and faculty agency (M3) comprises sustained professional support and meaningful opportunities to influence the design of digital work. Capability denotes relevant knowledge and skill; agency denotes the contextually achieved exercise of informed professional judgment in shaping practice (Priestley et al., 2015). Opportunities to participate and exercise discretion are enabling conditions, not agency itself. These are distinguishable intermediate conditions. Training participation is not a sufficient measure of either, and faculty willingness to use a platform is not equivalent to agency.

Leadership practices include pedagogical consultation, situated professional learning, access to expertise, and participation in implementation decisions. Ertmer and Ottenbreit-Leftwich (2010) connect knowledge, beliefs, confidence, and culture, whereas Landa et al. (2023) find neither a significant knowledge-to-integration link nor significant mediation through technological knowledge. This null result cautions against assuming that knowledge mediates every support effect; P3 requires separate tests of capability and situated agency pathways. Iqbal et al. (2025) additionally identify professional development and pedagogical challenges in Chinese university language curricula. This discipline-specific evidence motivates attention to professional support but does not establish the proposed agency pathway across all disciplines. The extension here separates the provision of support from capability, agency, and observed changes in teaching.

Workload and recognition affect whether professional judgment can be enacted repeatedly. Protected redesign time and credible recognition are therefore treated as contextual supports, not as additional measures of agency. Professional learning contributes to capability development in P3; workload and recognition qualify the agency-to-practice relationship in P4. This avoids placing all forms of support into an undifferentiated predictor. The possibility that discretion without resources becomes an additional burden, discussed by Laufer et al. (2025), is especially relevant to this distinction.

Professional agency does not imply unrestricted individual choice. Vangrieken et al. (2017) distinguish autonomy and collaboration rather than treating them as opposites. In this framework, faculty can exercise agency within shared requirements for quality, accessibility, and appropriate data use. Participation in design is a leadership practice; evidence of agency concerns how faculty use judgment to shape action in particular situations, rather than the availability of discretion alone. This distinction allows the relationship to fail empirically, for example when consultation does not influence decisions or professional learning does not become usable capability.

Proposition 3: In teaching-related digital initiatives, sustained pedagogical support and meaningful faculty participation in design are associated with subsequent pedagogical redesign through distinguishable pathways involving faculty capability and faculty agency.

Proposition 4: The positive relationship between faculty agency and the persistence of pedagogical redesign is stronger where protected redesign time and institutional recognition are available than where those supports are absent.

5.4 Distributed Experimentation and Adaptive Scaling

Distributed experimentation and adaptive scaling (M4) connect trials initiated by different units with decisions about wider use. Distributed leadership locates relevant expertise beyond formal officeholders (Spillane, 2006), and Xiao and Wang (2022) emphasize demand-led micro-innovation. We retain these ideas while separating local trial activity, transfer arrangements, and sustained use outside the originating unit. The number of pilots is an input to this process, not evidence that scaling has occurred.

Local experiments may reveal educational value, implementation problems, or reasons to stop. Wider use requires accessible knowledge about what changed, for whom, and under which conditions. Evaluation, cross-unit knowledge sharing, and support for local adaptation are therefore specified as transfer arrangements. They can be present or absent independently of the amount of experimentation. The proposed relationship does not assume that every successful pilot should expand, or that unchanged replication is desirable.

For this framework, we propose five design principles for scaling; their effectiveness requires empirical assessment. First, pilots should begin with explicit problems and expected outcomes. Second, participants should document design decisions and implementation conditions, not only final results. Third, evaluation should include student experience, learning quality, staff workload, accessibility and risk. Fourth, leaders should distinguish transferable principles from context-specific features. Fifth, scaling should include adaptation rather than replication. A practice effective in one discipline may require substantial redesign elsewhere.

The theoretical extension is the connection between distributed trial activity and sustained cross-unit reuse under explicit transfer conditions. Communities of practice and cross-unit networks may provide routes for sharing, but their presence does not guarantee usable learning. P5 should therefore compare actual transfer arrangements and subsequent practices, including abandoned or unsuccessful trials, rather than only institutional accounts of successful innovation.

Proposition 5: Greater local digital experimentation is associated with sustained adoption of adapted practices beyond the originating unit when evaluation, cross-unit knowledge sharing, and adaptation support are stronger; experimentation alone is expected to have a weaker association with such diffusion.

5.5 Responsible Governance and Evidence-Informed Evaluation

Responsible governance and evidence-informed evaluation (M5) concern how institutions justify rules, allocate accountability, review risks, and judge educational value. Responsible identifies the normative orientation of the process, not a label automatically assigned to every institutional policy. For empirical examination, the relevant properties are specified separately: rule transparency, opportunities for affected groups to contribute, proportionate controls, and credible review or redress. Governance practices are distinct from staff perceptions of the trustworthiness of decision-makers. Critical accounts of educational technology and datafication motivate examination of how institutional purposes and accountability are negotiated (Selwyn, 2017; Williamson, 2017).

AI provides a current application. An et al. (2025) identify stakeholder-specific patterns in U.S. university GenAI guidance, including course policy, integrity, and privacy. UNESCO's guidance (Miao & Holmes, 2023) supplies a human-centered normative orientation. These sources support examining the content and scope of governance but do not establish that a particular policy causes innovation. Rules governing sensitive research data, classroom assessment, and administrative decisions may require different safeguards and cannot be evaluated through a single permissiveness score.

Following Mayer et al. (1995), trust is distinguished from perceived trustworthiness and risk-taking behavior. For P6, prior organizational trust means staff willingness, before the initiative, to accept vulnerability in relying on institutional decision-makers. Perceptions of competence and integrity may inform this willingness but should not be treated as identical to trust. It is distinct from leaders' trust in staff, from staff participation in writing a policy, and from trust that develops after implementation. Prior trust may influence whether governance commitments are regarded as credible. This is a proposed contextual relationship, not a causal effect demonstrated by the conceptual synthesis. If later trust is studied as an outcome, it must be measured at a separate time point.

Evaluation supplies feedback about intended and unintended consequences. Relevant evidence includes pedagogical redesign, research coordination, service responsiveness, accessibility, staff workload, and the persistence of changed practices. Platform registrations and equipment counts describe provision or use, not these outcomes. M5 connects evaluation to decisions about revising priorities, adapting a pilot, or discontinuing it; that feedback function complements the participation relationships specified in P6-P7 and should be investigated through longitudinal process evidence.

The argument distinguishes the design of governance from its intensity. Explicit limits can support legitimate coordination, whereas unclear purposes or inaccessible review can make participation less attractive. A competing expectation is that strong controls increase reported compliance without increasing voluntary experimentation. P7 therefore concerns voluntary innovation participation, measured separately from mandatory system use. It does not predict that every restriction is harmful or that consultation guarantees positive outcomes.

Proposition 6: Staff's prior trust in institutional decision-makers strengthens the positive relationship between transparent, participatory governance arrangements and their subsequent voluntary participation in educational technology innovation.

Proposition 7: At comparable levels of institutional requirements, greater transparency, meaningful staff input, and accessible review in digital governance are associated with higher subsequent voluntary participation in educational technology innovation than opaque governance without those features.

5.6 Integration across Domains and Maturity Levels

The three transformation domains identify different outcomes, rather than three interchangeable indicators of success. Teaching outcomes can include changes in assessment and learning design; research outcomes can include changes in data-sharing workflows or collaboration; service outcomes can include changes in handoffs, responsiveness, and accessibility. P3-P4 are teaching-specific. P1-P2 and P5-P8 can be examined in other domains only after relevant actors, practices, and outcomes have been defined. The framework does not assume that all domains should receive equal investment or reach the same maturity simultaneously.

Drawing on Jisc's maturity model for UK higher education (Jisc, 2023b), we define domain-specific maturity here as a profile of existing resources, coordination, professional capability, and review arrangements, rather than an overall university ranking. This profile is our analytical adaptation; applying it in China requires local assessment rather than assuming direct equivalence. Maturity-sensitive leadership means selecting priorities in response to evidenced constraints. Where basic access is unreliable, additional experimentation may not address the immediate barrier; where access is reliable but workflows remain fragmented, coordination may be more relevant. These are conditional expectations, not prescribed universal stages. A measure of fit must be assessed independently of the later outcome to avoid defining successful priorities as well-matched by definition.

Proposition 8: Within a specified transformation domain, leadership priorities that address independently identified maturity constraints are associated with more persistent changes in practice than uniform priorities that disregard those constraints, after accounting for initial resources and institutional mission.

6. Framework Integration and Illustrative Application

Table 2 connects the five transformation layers with leadership processes and relevant propositions. The mapping is many-to-many: it identifies candidate explanations for a problem rather than assigning a single process to each layer. Figure 1 presents the principal relationships. Table 3 then specifies constructs, analytical levels, possible evidence, and research designs. Its indicators are starting points for measurement development, not validated scales or diagnostic thresholds.

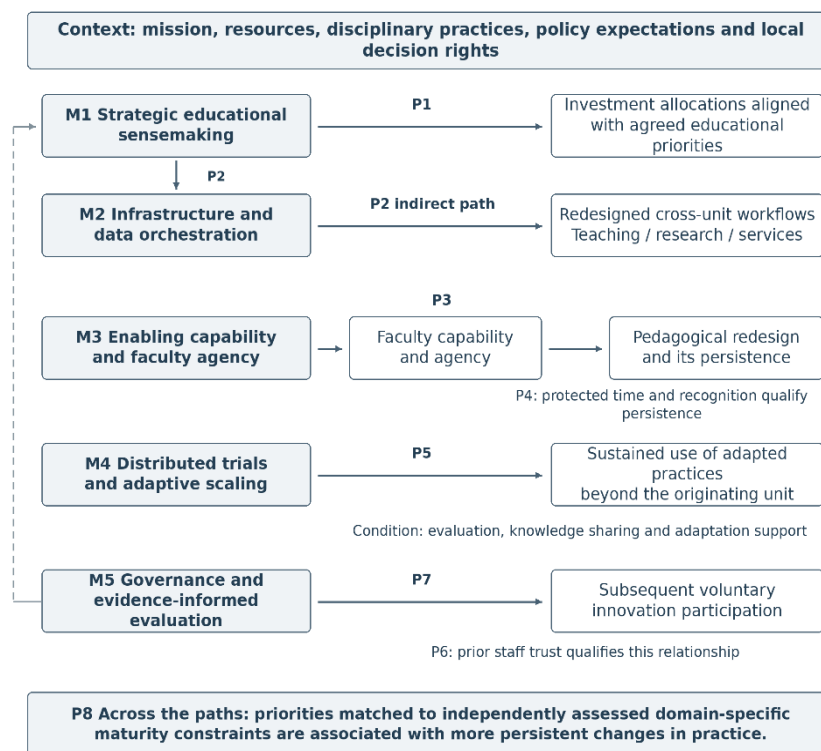


Figure 1. Proposed leadership processes, intermediate changes, and contextual conditions

Note. Horizontal paths summarize the relationships in P1-P7; rows are not stages. P2 specifies an indirect path from M1 through M2. Protected time and recognition qualify P4, transfer arrangements qualify P5, and prior staff trust qualifies P6. P8 concerns the fit of priorities to domain-specific maturity. The feedback line represents an additional process expectation discussed in the text, not an established effect. All relationships require empirical examination.

The framework can guide structured institutional reflection. First, specify a problem in a domain and layer using observable evidence, such as repeated service handoff failures or unchanged assessment practices despite platform use. Second, examine candidate explanations: absent operational coordination (M2), limited professional support or discretion (M3), weak transfer arrangements (M4), or unclear rules (M5). Third, compare explanations against staff accounts, documents, workflow records, and relevant outcome evidence. This procedure generates questions and competing explanations; it does not assign an institutional maturity score or identify a proven intervention.

For example, low participation in a teaching platform may coexist with reliable access. Interviews and workload records might instead suggest that redesign time is unavailable, or policy documents might reveal uncertainty about data use. These illustrative possibilities point to different constructs in P3-P4 or P6-P7 and would need to be investigated rather than inferred from low use alone. A research-data initiative or administrative workflow would require different actors and outcome evidence. Institutions should evaluate any proposed response locally before wider use.

Table 2. Transformation layers, leadership processes, and proposition links

Transformation layer	Candidate leadership problem	Relevant processes	Proposition link
Digital data	Incompatible definitions, unclear ownership, or uncertain purposes of use.	M2 coordinates standards and responsibility; M5 clarifies legitimate use and review.	P2 workflow coordination; P6-P7 participation in data-intensive initiatives.
Digital environment	Platforms and support exist but remain disconnected or inaccessible.	M2 connects infrastructure and services; M3 supports professional use.	P2 operational pathway; P3 teaching application; P8 priority fit.
Digital functions	Digital tools leave teaching, research, or service workflows largely unchanged.	M1 frames the problem; M2 supports coordination; M3 and M4 support redesign and trials.	P1-P3; P4 where teaching redesign must persist.
Digital organizational structure	Roles, handoffs, and recognition arrangements obstruct wider change.	M2 clarifies responsibilities; M3 supports situated professional action; M4 links units.	P2 cross-unit workflows; P4 support; P5 transfer beyond a pilot.
Digital institutional system	Useful local changes remain disconnected from wider priorities and review.	M1 links priorities; M4 supports adaptive diffusion; M5 returns evaluative evidence.	P5 sustained reuse; P6-P7 participation; P8 domain-specific priorities.

Note. Layers are conceptually adapted from Xiao and Wang (2022). Problems, process mappings, and proposition links are developed here. M1-M5 denote the processes in Section 5; the mapping is many-to-many.

Table 3. Proposition-level constructs and possible empirical designs

Claim and constructs	Level and illustrative evidence	Design and boundary checks
P1 Cross-unit sensemaking → investment alignment.	Project/unit: deliberation records and representation; subsequent allocation decisions matched to stated priorities.	Follow decisions over time; compare initiatives with similar resources. Establish local discretion; do not measure sensemaking by alignment. Longitudinal process tracing or repeated measures of the indirect path. Specify teaching, research, or service outcome; consider resource and procurement constraints.
P2 Sensemaking → orchestration → workflow redesign.	Cross-unit initiative: shared standards, resolved decision rights, support coordination; documented changes in handoffs or workflows.	Repeated multi-source data; distinguish the two intermediate constructs. Use multilevel models only with adequate sampling. Teaching domain.
P3 Support and design participation → capability/agency → pedagogical redesign.	Faculty within departments: sustained support, influence on decisions, demonstrated skills, accounts and observations of judgment enacted in specific decisions, and changed course artifacts.	Examine interactions using longitudinal data and matched cases. Separate support from agency; account for workload and initial expertise.
P4 Time and recognition qualify agency → persistence.	Faculty/department: protected time and recognition arrangements; continued use of redesigned pedagogy across teaching cycles.	Compare transferred, stopped, and isolated pilots. Follow adaptation and resources; pilot counts are not diffusion measures.
P5 Transfer arrangements qualify experimentation → sustained cross-unit reuse.	Pilot and receiving units: evaluated trials, sharing records, adaptation support, and maintained reuse beyond the originating unit.	Measure trust before the initiative. Distinguish leaders trusting staff and later trust as an outcome. Test the interaction, not only main effects.
P6 Prior staff trust qualifies governance → voluntary participation.	Staff within initiatives: baseline trust in decision-makers; governance features; later voluntary trial or co-design participation.	Compare comparable requirements or follow policy changes. Use records and staff accounts; consider selection, risk, and reverse causation.
P7 Governance transparency, staff input, and review → voluntary participation.	Initiative/staff: policy clarity, influence on policy design, review access; voluntary innovation participation distinct from mandated use.	Prospective comparative cases or panel data. Assess fit before outcomes; account for initial resources and mission. No assumption of equal domain maturity.
P8 Priority fit to maturity constraints → persistence of changed practice.	Institution-domain: independently documented constraints and priorities; maintained changes in teaching, research, or service practice.	

Note. These are theoretical propositions and illustrative indicators, not confirmed causal effects, validated measures, or diagnostic thresholds. Arrows summarize proposed relationships. Designs must assess alternative explanations and distinguish analytical levels.

7. Discussion

7.1 Theoretical Contributions

The first contribution is a connection between structural transformation and leadership processes. Xiao and Wang's (2022) domains and layers remain the objects of explanation, while M1-M5 organize candidate processes acting across them. The framework specifies relationships between deliberation and investment (P1), and between deliberation, orchestration, and workflow redesign (P2). It does not claim that leadership is absent from prior transformation scholarship or that the five processes are sufficient conditions for success. Table 1 identifies the narrower relational contribution relative to existing accounts.

The second contribution is to distinguish leadership practices from the professional and organizational conditions through which change may occur. P3-P5 separate support and participation from capability, agency, persistent pedagogical redesign, and cross-unit reuse. Formal coordination and distributed initiative can coexist. Ghamrawi and Tamim's (2023) participants described benefits of higher-level authority, while Laufer et al. (2025) show why discretion without support can be problematic. These findings motivate a conditional account rather than a universal preference for either centralization or distribution. The propositions remain open to contrary evidence.

The third contribution is the explicit qualification of proposed effects. Workload and recognition (P4), transfer arrangements (P5), prior trust (P6), governance design (P7), and maturity fit (P8) identify conditions and distinctions that aggregate leadership scores can obscure. Faculty reservations may concern educational quality, workload, or data use, but they may also reflect other constraints. The framework requires those explanations to be examined rather than classifying all resistance as either irrational avoidance or informed professional critique.

The critical implication is that a visible initiative can meet implementation targets without changing professional practice. Conversely, useful local innovation may fail to spread because organizational conditions differ between units. Studying

these divergences is more informative for the framework than treating adoption and transformation as equivalent. Alternative explanations include available resources, procurement constraints, prior pedagogical expertise, and externally imposed requirements; empirical designs must consider them explicitly.

The framework also distinguishes desirable governance principles from empirically demonstrated consequences. Transparency and participation are proposed explanatory properties, while equity and educational value are criteria for evaluating outcomes. Neither an ethical policy statement nor a high participation rate proves that an initiative is fair or educationally effective. This distinction limits normative claims and prevents the theory from becoming true by definition.

7.2 Boundary Conditions and Limitations

Chinese contextual implications concern the interaction of a coordinated policy agenda with institution-level missions, capabilities, and professional work. The policy context gives sensemaking and local adaptation particular relevance, but it does not imply national uniformity. Evidence from particular provinces, universities, or disciplines must be kept at that scope. Comparisons within China should examine whether decision rights, resource constraints, and implementation expectations alter the proposed relationships. Comparisons outside China should examine comparable conditions rather than using country labels as causal variables.

The synthesis has several limitations. Purposeful source selection and reliance on a principal structural framework may privilege compatible explanations and underrepresent alternative traditions. Targeted supplementary searches do not establish exhaustive coverage, and the matrix is an account of the argument rather than an independently replicated coding study. Much of the supporting literature concerns teaching or particular technologies; transferring explanations to research and services remains a theoretical extension. Broad labels such as institutional maturity and trust require context-sensitive measurement. Finally, the propositions establish neither effect sizes nor causal identification. Longitudinal and comparative studies must test timing, reverse relationships, competing explanations, and cases in which expected relationships are absent.

8. Implications for University Policy and Practice

As provisional implications of the conceptual analysis, universities can make digital plans more assessable by linking proposed resources to specific educational or organizational problems (P1-P2). Plans should state which workflow or practice is expected to change, who is involved, and what evidence would indicate improvement or harm. These are questions for institutional review, not a guarantee that following the framework will produce transformation.

Cross-functional arrangements may help connect technical, academic, research, and service expertise. Their value depends on clear responsibility and usable decision processes, not the number of committees. Institutions can examine whether decision rights, data definitions, support routes, and review arrangements address the problem at hand. Coordination should preserve opportunities for local expertise to challenge assumptions and should be assessed against subsequent changes in work.

For teaching initiatives, institutions can examine whether professional learning, design participation, protected time, and recognition form a coherent support arrangement (P3-P4). Consultation should be assessed by its influence on decisions, and training by whether it develops relevant capability. A request for faculty initiative without resources may shift burdens rather than enable agency. These considerations should be evaluated using staff experience and evidence of sustained pedagogical redesign.

For pilots, evaluation and knowledge sharing can make decisions to stop, adapt, or extend an initiative more explicit (P5). Evidence should include implementation conditions and costs, not only favorable outcomes. Any expansion should test whether the receiving unit has the resources and professional conditions needed to adapt the practice. An unsuccessful pilot can still provide useful information if its limitations are documented.

AI governance should distinguish uses and audiences, make purposes and limits understandable, and provide routes for review (An et al., 2025; Miao & Holmes, 2023). The appropriate safeguards for assessment, research materials, and administrative decisions can differ. P6-P7 direct attention to voluntary engagement and prior trust, but do not substitute for evaluating the educational or ethical acceptability of a specific use.

Finally, evaluation should distinguish inputs, changed practices, and valued outcomes. Student learning, accessibility, research coordination, service responsiveness, and staff workload should be assessed using measures appropriate to the domain. Institutions can examine whether their priorities respond to independently documented constraints (P8). The illustrative use described in Section 6 requires local evaluation and further development before it could become a validated diagnostic instrument.

9. Research Agenda

Table 3 translates each proposition into a possible empirical task. Construct development should first establish that leadership practices, intermediate conditions, and outcomes are distinguishable. For example, items measuring professional support should

not also define agency, and measures of sensemaking should not include the investment alignment they are intended to explain. Interviews, document analysis, and cognitive testing of measures can precede larger surveys. Indicator choices should be validated with the relevant actors rather than adopted solely from the illustrative table.

P1-P2 require evidence about decisions and workflows at project or organizational-unit level. P3-P4 involve faculty within departments and may require multilevel designs if the sampling structure and number of clusters support them. Repeated observations should establish whether support precedes capability or agency changes and whether changes in teaching persist. A cross-sectional association or statistical indirect effect is insufficient to establish the proposed causal process.

P5 is suited to comparative process studies following trials and their transfer across units. Researchers should trace what is adapted, what support is supplied, and whether reuse continues beyond initial sponsorship. Evaluation can include stopped and failed trials. The feedback expectation in Figure 1 can be examined by asking whether evaluation findings alter later strategy, resource coordination, or pilot selection; that pathway is not separately established by P1-P8.

For P6-P7, prior staff trust, governance design, and subsequent voluntary participation should be measured separately. Designs can compare similar initiatives with different governance arrangements or examine policy changes over time, while considering selection and reverse causation. For P8, maturity constraints and the fit of priorities should be assessed before outcomes are observed. Comparative cases can examine differences by mission, discipline, and domain without assuming that one institution-wide maturity score captures them all.

Outcomes should extend beyond self-reported use. Teaching studies can examine course and assessment artifacts, observation, and student experience; research studies can examine coordination or data-sharing practices; service studies can examine workflow records and accessibility. Quantitative evidence should be interpreted with accounts of implementation and unintended consequences. Learning gains or efficiency improvements must be evaluated separately from the presence of changed practices.

Negative and null cases are essential. Resources may remain insufficient despite coherent leadership practices; high reported trust may coexist with low participation; and a locally useful innovation may not transfer. Such cases can revise the boundary conditions or show that a proposed relationship is unnecessary, weaker than expected, or mis-specified. The framework is intended to support that possibility of revision rather than function as a checklist whose success is assumed.

10. Conclusion

This article develops a contextualized conceptual account of how leadership processes may connect digital resources with changes in university practice. Its contribution is to link transformation layers to specified organizational processes, distinguish leadership practices from intermediate conditions and outcomes, and qualify their relationships through support, trust, and maturity. The five processes are analytical categories assembled from existing scholarship; the proposed integration and eight propositions remain open to empirical challenge.

For Chinese higher education, the framework directs attention to how institutional actors interpret coordinated policy priorities while addressing differences in mission, resources, and professional practice. Its teaching-related propositions have a more developed foundation than its extensions to research and services. Future studies should examine those differences, competing explanations, and unsuccessful initiatives before making broad claims about effectiveness or transferability.

The immediate practical contribution is an organized set of questions and candidate relationships for institutional reflection. The framework does not establish a validated diagnostic tool or a universally effective sequence of reform. Its value will depend on whether subsequent research can distinguish its constructs, evaluate its propositions, and show when the proposed processes explain sustained changes beyond technology adoption.

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Appendix A Conceptual Synthesis Matrix

Table A1. Source roles and derivation of the leadership processes

Process	Selected conceptual basis	Transformation problem	Synthesis and proposed extension
M1 Strategic educational sensemaking	Weick et al. (2005); Ehlers (2020); Jing et al. (2025); MOE (2025). Interpretation and strategy; policy as context.	Functions and institutional systems: translating broad priorities into local choices.	Retain strategic interpretation; distinguish deliberation from actual allocations and specify discretion as a condition (P1).
M2 Infrastructure and data orchestration	Xiao & Wang (2022); Bygstad et al. (2022). Integration and coordination.	Data, environments, functions, and structures: fragmented standards and handoffs.	Separate coordinated action from infrastructure provision; propose the indirect workflow path (P2), as an extension of the integration arguments, not a tested mediation effect.
M3 Enabling capability and agency	Priestley et al. (2015); Ertmer & Ottenbreit-Leftwich (2010); Vangrieken et al. (2017); Iqbal et al. (2025); Landa et al. (2023). Professional action and learning; Landa's knowledge mediation was not significant.	Teaching functions and structures: usable expertise and opportunities for professional action within workload and recognition conditions.	Separate leadership practices, intermediate conditions, and teaching outcomes; treat agency as situated action rather than available discretion; distinguish capability development from persistence supports (P3-P4).
M4 Distributed trials and adaptive scaling	Spillane (2006); Xiao & Wang (2022). Distributed expertise and micro-innovation.	Functions, structures, and institutional systems: isolated pilots and transfer problems.	Distinguish trial activity from transfer arrangements and sustained wider use; propose conditional diffusion (P5).
M5 Responsible governance and evidence-informed evaluation	Mayer et al. (1995); Laufer et al. (2025); An et al. (2025); Miao and Holmes (2023); Selwyn (2017); Williamson (2017). Trust and governance.	All layers: legitimate data use, participation, review, and evaluation.	Distinguish prior staff trust from governance properties and outcomes (P6-P7); use evaluation as a feedback question. Maturity fit across processes is specified separately in P8 (Jisc, 2023b).

Note. Sources provide conceptual premises, contextual evidence, or normative guidance. Proposed extensions remain the argument of this article; citations do not imply that the original studies tested P1-P8. The matrix documents an interpretive synthesis rather than independent coding or exhaustive literature coverage.