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TRANSFORMATIONAL LEADERSHIP AND ARTIFICIAL INTELLIGENCE IN UNIVERSITY EDUCATIONAL MANAGEMENT: A LITERATURE REVIEW

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ABSTRACT
This study presents a bibliographic literature review on transformational leadership and artificial intelligence in university educational management, based on the analysis of 22 scientific articles published between 2019 and 2025 in the Scopus and ERIC databases. The selected studies address topics such as learning analytics, academic prediction, personalized teaching, administrative automation, and intelligent decision-making systems. The findings indicate that the integration of artificial intelligence improves operational efficiency, strengthens institutional management, and enables more personalized and adaptive educational environments. Common patterns were identified regarding real-time feedback, curriculum adaptation, and academic risk prevention. However, ethical challenges remain, particularly those related to algorithmic transparency, data privacy, and the digital divide. The review concludes that the convergence of transformational leadership and emerging technologies is a strategic pathway to building more effective, inclusive, and learning-centered models of educational governance.

Keywords: Transformational leadership, artificial intelligence, educational management, higher education, digital transformation

INTRODUCTION

According to the United Nations Educational, Scientific and Cultural Organization (UNESCO, 2021), the use of artificial intelligence for leadership in educational management represents a strategic advancement in decision-making, institutional planning, and the improvement of pedagogical processes. Furthermore, the World Bank (2025a) states that this technology enables real-time analysis of large data volumes, identification of student performance patterns, dropout risk forecasting, and optimization of resource allocation, thereby strengthening both administrative and academic efficiency. According to UNESCO (2024), educational institutions that integrate AI tools have increased the effectiveness of their leadership interventions by up to 35%, fostering more personalized and results-oriented learning environments. The implementation of this technology facilitates evidence-based management, promotes

curricular innovation, and enables educational leaders to anticipate the needs of their contexts (UNESCO, 2025).

Currently, over 1.5 billion students are part of educational systems where artificial intelligence has not yet been fully integrated into school management (UNESCO, 2021). Only 17% of educational institutions use AI-based tools to strengthen pedagogical leadership and strategic decision-making (UNESCO, 2024). Each year, 83 countries adopt educational innovations with AI, while 47 others still resist its implementation due to distrust or lack of infrastructure (UNESCO, 2025). The main barriers include resistance to change, fear of dehumanizing the educational process, and lack of awareness about the organizational potential of these emerging technologies (World Bank, 2025a).

According to the World Bank (2024), in Latin America, approximately 120,000 schools face challenges in adapting their management models to the use of artificial intelligence, especially in rural areas or those with low connectivity. Furthermore, only seven countries in the region have developed regulatory frameworks that incorporate AI into the educational system (World Bank, 2023). As the World Bank (2025b) warns, 38% of school principals fear that the use of these tools might reduce their autonomy or replace essential human functions. The lack of digital training, limited investment in educational innovation, and negative perceptions of AI hinder its acceptance in leadership and institutional governance processes (World Bank, 2024).

According to the Ministry of Education of Peru (2023a), over 70,000 public educational institutions still do not use artificial intelligence in either pedagogical or administrative management. Only 134 pilot schools have participated in innovation projects involving AI within the framework of limited programs (Ministry of Education of Peru, 2025). As noted by the Secretariat of Digital Government of Peru (2024), 26% of school principals report not trusting artificial intelligence as a leadership tool, considering it either inaccurate or invasive. This distrust is exacerbated by the absence of clear educational policies, weak digital infrastructure, and limited training of school leaders in the strategic use of emerging technologies (Ministry of Education of Peru, 2023b).

The present study is justified by the need to understand how transformational leadership models, in interaction with the emerging use of artificial intelligence, can redefine educational management in complex and ever-changing scenarios. Digital transformation has exposed structural weaknesses in school leadership systems, particularly regarding data-driven decision-making, personalized learning, and administrative efficiency. At the same time, traditional leadership faces serious limitations in adapting to disruptive technological environments, which undermines pedagogical innovation, institutional performance, and educational equity. In many contexts, leadership teams lack the skills to integrate AI tools into their management practices, thus missing the opportunity to optimize resources, improve academic monitoring, and anticipate training needs. Analyzing this convergence between leadership and artificial intelligence provides scientific evidence for building more agile, inclusive, and learning-centered models of educational governance. In this sense, the proposed systematic review acquires strategic relevance by offering a critical synthesis of the available knowledge and guiding future research and educational policies based on transformative and technologically integrated approaches.

The complexity of educational management in the current context is intensified by the limited capacity for transformational leadership and the scarce integration of advanced technological tools such as artificial intelligence into institutional processes. Many educational institutions, especially in developing countries, face structural barriers and

shortcomings in leadership competencies, hindering effective strategic planning, efficient resource utilization, and evidence-based decision-making. The lack of innovation in leadership styles prevents the creation of collaborative and adaptive environments, while limited understanding of the potential of artificial intelligence restricts its application in areas such as assessment, learning personalization, or administrative automation. This disconnection between leadership and technology constrains opportunities for continuous improvement, inclusion, and educational excellence. Accordingly, this study aims to conduct a bibliographic review of the scientific literature on the relationship between transformational leadership and artificial intelligence in higher education management, identifying how these dimensions converge in digital transformation contexts to enhance institutional effectiveness, address theoretical gaps, and guide future research on intelligent educational governance.

THEORETICAL FRAMEWORK

According to Eaton et al. (2024), historical changes in leadership theory began with James MacGregor Burns, who introduced the concept of transformational leadership in 1978, emphasizing the leader's capacity to influence collective moral consciousness. This approach diverges from the transactional model focused on rewards and sanctions (da Silva Lessa & da Silva, 2024). Additionally, Thomas (2024) highlights that this perspective redefines leadership as an influence process that mobilizes followers toward higher goals through shared values and vision. The inspirational role of the leader fosters deep emotional bonds and elevates collective motivation (Eaton et al., 2024). Moreover, da Silva Lessa and da Silva (2024) note that Bernard Bass expanded the theory by introducing four key dimensions: idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration. This structure enabled the application of the model in complex educational and organizational contexts (Thomas, 2024).

From McCalla's (2023) perspective, the theory of artificial intelligence in education emerged in the 1970s as an intersection of computer science, cognitive psychology, and pedagogy. This approach aimed to replicate human functions such as reasoning and problem-solving in automated environments (McLaren & Nguyen, 2023). Furthermore, Ahn and Lim (2025) argue that Dr. John Self was a key figure in this evolution, having designed intelligent tutoring systems capable of diagnosing errors and adapting content based on student performance. These technologies introduced immediate and personalized feedback (McCalla, 2023). Based on McLaren and Nguyen (2023), the theory has evolved into virtual environments that use adaptive algorithms, data analytics, and language processing to personalize instruction. These applications enhance student autonomy, increase motivation, and improve learning outcomes (Ahn & Lim, 2025).

According to Greimel et al. (2023), transformational leadership is characterized by building a shared vision based on mutual trust and emotional commitment between leaders and followers. This leadership model inspires improvement and institutional engagement (Ystaas et al., 2023). Based on Alessa (2021), this type of leadership promotes structural and cultural changes within organizations, creating spaces for dialogue, innovation, and the breakdown of traditional paradigms. Transformational leaders encourage critical reflection in the face of challenging environments (Greimel et al., 2023).

As stated by Ystaas et al. (2023), the effectiveness of transformational leadership relies on a symbiotic relationship between leaders and collaborators, in which both evolve in

terms of values and goals. This interaction strengthens collective self-esteem and drives sustained organizational transformations (Alessa, 2021). Regarding idealized influence, Greimel et al. (2023) affirm that the leader acts with integrity and ethical conviction, becoming a moral role model. This positioning generates admiration and genuine commitment among team members (Ystaas et al., 2023). On inspirational motivation, Alessa (2021) notes that transformational leaders communicate clear, ambitious, and collective visions, emotionally motivating groups. This style mobilizes the team toward meaningful and elevated goals (Greimel et al., 2023). Finally, Ystaas et al. (2023) state that intellectual stimulation and individualized consideration allow the leader to foster cognitive autonomy and personal development. These dimensions promote creativity, mutual respect, and interpersonal trust as core components of effective leadership (Alessa, 2021).

According to Lin and Yu (2024), artificial intelligence in education is defined as the use of computational systems that imitate human cognitive functions to facilitate teaching-learning processes. These systems interpret information, adjust pedagogical strategies, and autonomously respond to student progress (Pham & Sampson, 2022). As explained by Benvenuti et al. (2023), one of the main characteristics of educational AI is its ability to adapt to individual needs through predictive analytics and content personalization. This technology recognizes behavioral patterns and anticipates difficulties (Lin & Yu, 2024). According to Pham and Sampson (2022), intelligent tutoring systems, adaptive platforms, virtual assistants, and automated assessment tools represent various applications of AI in education. These tools enhance teaching effectiveness, reduce inequality, and improve learning outcomes (Benvenuti et al., 2023). As Lin and Yu (2024) emphasize, artificial intelligence also promotes educational inclusion by adapting to diverse learning styles, paces, and contexts. Moreover, it provides teachers with mechanisms for curriculum analysis, performance prediction, and data-driven academic management (Pham & Sampson, 2022).

METHODOLOGY

This study was conducted through a bibliographic review of scientific literature, focusing on transformational leadership models and the emerging role of artificial intelligence in educational management. Searches were carried out in the Scopus and ERIC databases using the following keywords: transformational leadership, artificial intelligence, educational management, digital transformation, and school governance. This process enabled the identification of 22 scientific articles published between 2022 and 2025, all relevant to the critical analysis of the phenomenon. To ensure the relevance and quality of the selected studies, precise inclusion and exclusion criteria were applied throughout the screening and analysis process.

Inclusion criteria:

a) Year of publication: Only studies published between 2022 and 2025 were included to ensure the recency of the knowledge.

b) Type of study: Quantitative, qualitative, mixed, and systematic reviews related to the topic were accepted.

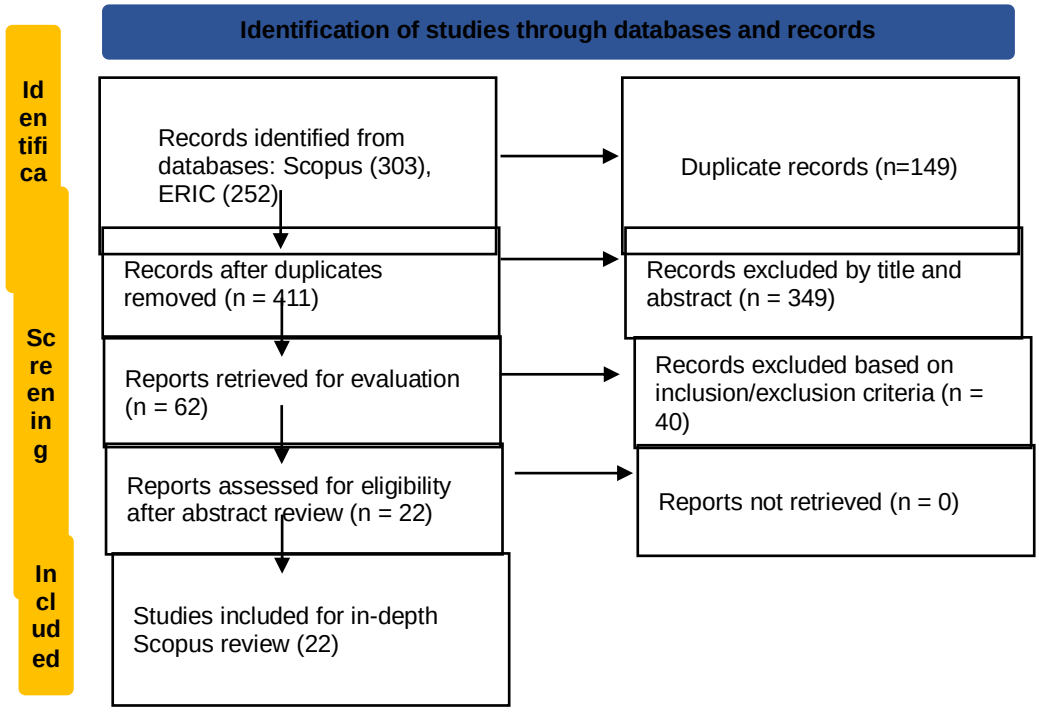
c) Thematic focus: Articles had to directly address transformational leadership, the use of artificial intelligence in educational contexts, or both aspects in an integrated manner.

d) Language and availability: Only articles in Spanish or English with full-text access were considered.

Exclusion criteria:
a) Type of document: Letters to the editor, opinion columns, non-peer-reviewed reports, book chapters, and conference proceedings were excluded.
b) Thematic relevance: Studies that did not directly address the link between leadership or artificial intelligence and educational management were removed.
c) Scientific value: Works without substantial theoretical, methodological, or empirical contributions were discarded.
d) Limited access: Articles that could not be accessed in full were not considered.
Search strings used: Boolean operators AND and OR were used to build the following search strings: "transformational leadership" AND "artificial intelligence" AND "educational management"; "artificial intelligence" OR "school leadership" OR "digital transformation"; "educational AI" AND "school governance"; "educational leadership" AND "emerging technologies."
Study selection process: The selection was carried out in multiple phases. First, an initial search was performed in Scopus using the key terms with filters by year, document type, and discipline. Titles and abstracts were then reviewed for a preliminary screening, followed by full reading of texts that met the inclusion criteria. A total of 22 articles were selected after removing duplicates and those not meeting the required standards.
Data extraction: From each article, the following information was extracted: author, year, country, methodology, objectives, key findings, conclusions, and type of relationship between leadership and artificial intelligence. A comparative matrix was built to identify patterns, theoretical gaps, and recurring methodological approaches. The collected information was organized to facilitate critical and interpretive analysis.
Methodological quality assessment: The quality of the studies was evaluated using the Joanna Briggs Institute (JBI) checklists, considering aspects such as consistency between objectives and methodological design, validity of instruments, analytical robustness, and relevance of conclusions. All included articles reached acceptable or high levels of methodological quality, allowing their inclusion in the final analysis.

Figure 1

Filtering and analysis sequence of scientific articles in the literature review



A total of 22 studies were analyzed after the initial review of more than 80 documents, based on a process of critical reading and thematic categorization. The analysis was structured around four cross-cutting themes: strategic leadership, administrative digitalization, organizational climate, and equity. This approach enabled a holistic and comparative interpretation of educational management models applied in diverse university contexts.

Table 1

Scientific articles selected for the critical analysis of the study

N°	Author	Article Title	Methodology	Country	Year	Database
1	Ke, W., Peng, L., & Wang, L. (2025)	Effects of college students' perceived transformational leadership of physical education teachers on their exercise adherence: Serial-mediated roles of physical self-efficacy and exercise motivation	Cuantitativa	China	2025	Scopus
2	Sharma, R. K., & Kaur, S. (2024)	Analysing the mediating role of organisational citizenship behaviour between transformational leadership and education 4.0 using PLS-SEM approach	Cuantitativa	India	2024	Scopus
3	Carvalho, A. et al. (2022)	What research tells us about leadership styles, digital transformation and performance in state higher education?	Revisión sistemática	Portugal	2022	Scopus
4	Lefteri, A., & Menon, M. E. (2025)	Transformational and transactional school leadership as predictors of teacher self-efficacy	Cuantitativa	Cyprus	2025	Scopus
5	Schmitz, M. et al. (2025b)	Enhancing teacher collaboration for technology integration: the impact of transformational leadership	Cuantitativa	Switzerland	2025	Scopus

6	Tuyen, B. Q. et al. (2025)	Leadership characteristics and digital transformation in an emerging market: The moderating effect of compliance pressure	Cuantitativa	Vietnam	2025	Scopus
7	Hoang, T. N., & Le, P. B. (2024)	The influence of transformational leadership on knowledge sharing of teachers: the roles of knowledge-centered culture and perceived organizational support	Cuantitativa	Vietnam	2025	Scopus
8	Flamand, P. et al. (2025)	Towards program coherence in secondary teacher education: A leadership perspective	Cualitativa	Flanders, Belgium	2025	Scopus
9	Conner, T. et al. (2025)	Leadership competences in undergraduate nurse education: scale development and model testing	Cuantitativa	United Kingdom	2025	Scopus
10	Saif, N. et al. (2024b)	Influence of transformational leadership on innovative work behavior and task performance of individuals: The mediating role of knowledge sharing	Cuantitativa	Pakistan	2024	Scopus
11	Eitan, T., & Gazit, T. (2024)	Explaining transformational leadership in the digital age: The example of Facebook group leaders	Cuantitativa	United States	2024	Scopus
12	Anwar, S., & Saraih, U. N.	Digital leadership in the digital era of	Cuantitativa	Pakistan	2024	Scopus

	(2024)	education: enhancing knowledge sharing and emotional intelligence				
13	Sun, J. et al. (2025)	A catalyst for education? A study on the impact of artificial intelligence assisted learning in painting courses on college students' continuous learning intention	Cuantitativa	China	2025	Scopus
14	Shweta, R., & Panicker, A. (2025)	Measuring the influence of transformational leadership on interplay between artificial intelligence, job meaningfulness and turnover intentions: Observations from Indian IT sector	Cuantitativa	India	2025	Scopus
15	Gong, Y., Wang, S., & Dong, Y. (2025)	Integrating artificial intelligence in entrepreneurship education: Dynamic capabilities and marketing performance among student entrepreneurs	Cuantitativa	China	2025	Scopus
16	Pham, S. T. (2025)	Empirical investigation of the experience of educators and politicians with the emergence of artificial intelligence in education	Cualitativa	United States	2025	Scopus
17	Bagherimajd, K., & Khajedad, K. (2025)	Designing a Model of Sustainable Education based on Artificial	Mixta	Iran	2025	Scopus

		Intelligence in Higher Education				
18	Dissanayake, H. et al. (2025)	Artificial intelligence and management Education: Bibliometric analysis	Cuantitativa	Sri Lanka	2025	Scopus
19	Alsswey, A. (2025)	Examining students' perspectives on the use of artificial intelligence tools in higher education: A case study on AI tools of graphic design	Cuantitativa	Jordan	2024	Scopus
20	Wang, S. et al. (2025)	Enhancing student acceptance of artificial intelligence-driven hybrid learning in business education: Interaction between self-efficacy, playfulness, emotional engagement, and university support	Mixta	China	2025	Scopus
21	Monzon, N., & Hays, F. A. (2025)	Leveraging Generative AI To Improve Motivation and Retrieval in Higher Education Learners (Preprint)	Revisión sistemática	USA	2025	Scopus
22	Nguyen, L. et al. (2025)	Artificial Intelligence Chatbots as Sources for Patient Education Material on Child Abuse	Cuantitativa	United States	2025	Scopus

RESULTS AND DISCUSSION

Based on the comparative analysis of the 22 selected articles, six recurring thematic axes were identified that link transformational leadership and the use of artificial intelligence in university educational management. These themes reflect both conceptual patterns and the most relevant practical applications found in the reviewed studies, allowing for the observation of convergences, empirical contributions, and

common structural challenges. **Table 2** summarizes these findings, grouping representative authors and highlighting the role played by leadership or AI in each analyzed dimension.

Table 2
Thematic synthesis of the reviewed studies on transformational leadership and artificial intelligence in higher education.

Central Theme	Representative Authors	Common Findings	Role of AI or Leadership
Teacher collaboration and knowledge culture	Schmitz et al. (2025), Hoang y Le (2024), Anwar y Saraih (2024), Saif et al. (2024)	Transformational leadership promotes a collaborative culture and shared knowledge	Leadership as a facilitator of teaching networks and continuous improvement environments
Digital transformation and educational governance	Carvalho et al. (2022), Tuyen et al. (2025), Dissanayake et al. (2025), Eitan y Gazit (2024)	Digitalization requires managerial competencies and adaptive structures	AI as a structuring axis of organizational change
Education 4.0 and technology adoption	Sharma y Kaur (2024), Wang et al. (2025), Bagherimajd y Khajedad (2025), Pham (2025)	AI acceptance depends on leadership, institutional support, and flexible pedagogical design	AI as a tool for personalization, prediction, and educational efficiency
Student motivation and personalized learning	Sun et al. (2025), Alsswey (2025), Gong et al. (2025), Monzon y Hays (2025)	AI stimulates motivation, creativity, and engagement through playful and adaptive experiences	AI as a mediator between motivation and performance
Managerial competencies and innovative leadership	Ke et al. (2025), Lefteri y Menon (2025), Conner et al. (2025), Flamand et al. (2025)	Systematic leadership training is needed from early education, along with mixed leadership models	Leadership as the core of educational change and institutional legitimacy
Organizational impact assessment	Saif et al. (2024), Tuyen et al. (2025), Nguyen et al. (2025), Shweta y Panicker (2025)	The impact of leadership depends on institutional context, regulation, and organizational culture	AI–leadership interaction influences performance, innovation, and talent retention

In line with the specialized literature, transformational leadership is configured as a key approach to addressing the challenges of educational management in complex and

digitalized environments. Various studies concur in identifying fundamental dimensions of transformational leadership—such as idealized influence, inspirational motivation, and intellectual stimulation—that are adapted to the university context through strategic, inclusive, and innovation-oriented leadership practices. **Table 3** presents a systematization of these models, highlighting their application in educational management and listing the main authors who support them theoretically or empirically.

Table 3
Transformational leadership models in university educational management.

Transformational Leadership Dimension	Application in Educational Management	Representative Authors
Idealized influence	The leader acts as an ethical role model and builds institutional trust	Bass (1985); Greimel et al. (2023); Alessa (2021)
Inspirational motivation	Mobilizes the teaching team toward shared educational goals	Eaton et al. (2024); Ystaas et al. (2023)
Intellectual stimulation	Encourages pedagogical innovation and critical thinking	Thomas (2024); Ystaas et al. (2023); Alessa (2021)
Individualized consideration	Promotes personalized professional development and distributed leadership	Greimel et al. (2023); Alessa (2021)
Shared strategic vision	Aligns institutional projects with transformation objectives	Schmitz et al. (2025); Sharma y Kaur (2024)
Culture of innovation and continuous improvement	Establishes conditions for organizational learning and adaptability to change	Hoang y Le (2024); Saif et al. (2024)
Educational digital transformation	Integrates emerging technologies such as AI to modernize processes	Carvalho et al. (2022); Eitan y Gazit (2024)

Based on the systematic analysis of the selected studies, a structured discussion was developed around the main emerging thematic axes that articulate transformational leadership and artificial intelligence in university educational management. This section critically interprets the identified findings, comparing approaches, contexts, and methodologies to clarify how these two elements—leadership and technological innovation—converge in transforming educational governance models. The discussion identifies recurring patterns, theoretical gaps, and institutional challenges, as well as opportunities to strengthen leadership practices in increasingly digitalized, complex, and personalized learning-oriented educational contexts. Furthermore, it highlights the distinctive contributions of each thematic line, considering their impact on decision-making, organizational culture, and the sustainability of pedagogical innovation processes.

Faculty Collaboration and Knowledge Culture

Multiple studies establish a consistent association between transformational leadership and the creation of environments in which faculty collaboration fosters sustained dynamics of continuous improvement (Schmitz et al., 2025). Hoang and Le (2024)

emphasize that such leadership generates conditions for the emergence of cultures centered on peer-shared knowledge, while Saif et al. (2024) demonstrate that these networks gain strategic value when institutional goals are clearly and deliberately communicated. Similarly, Anwar and Saraih (2024) argue that a collaborative culture flourishes when organizational support and digital competencies are aligned with the leader's vision. These findings align with earlier literature reviews, such as that of Greimel et al. (2023), which also concluded that collaboration is more sustainable when leadership practices are embedded in institutional strategies rather than treated as ad hoc initiatives. However, the present review extends these insights by identifying that digital competencies and emotional intelligence—particularly when integrated with digital leadership—serve as amplifiers of collaboration, a dimension that previous reviews addressed only marginally.

Consistent patterns emerge indicating that tacit knowledge consolidates when teachers perceive coherence in the leadership style exercised (Hoang & Le, 2024). Schmitz et al. (2025) similarly report that both formal and informal collaboration depend largely on the clarity of educational innovation goals. This resonates with earlier meta-analyses, such as Ystaas et al. (2023), which highlighted that goal alignment is a determinant of faculty engagement across diverse contexts. In contrast, the present review underscores that collaboration framed merely as operational practice, without strategic support, undermines the transformative potential of leadership (Saif et al., 2024; Schmitz et al., 2025). The literature generally concurs that environments promoting knowledge management provide greater opportunities for organizational learning (Saif et al., 2024). Yet, unlike earlier works that approached this from a purely structural perspective (e.g., Alessa, 2021), the current synthesis incorporates the interplay between leadership vision, institutional culture, and continuous faculty development policies based on participation, continuity, and feedback (Anwar & Saraih, 2024). This integrative view positions collaborative culture not simply as an outcome of leadership, but as a co-constructed process that relies on aligned competencies, strategic intent, and mutual trust.

Digital Transformation in Higher Education

Digital transformation in higher education has increasingly been driven by the imperative to adapt teaching and learning processes to complex, adaptive, and technology-rich environments (Carvalho et al., 2022). In this context, Tuyen et al. (2025) identify leadership traits such as future vision and trust as critical success factors in institutional digitalization. This observation is consistent with earlier syntheses such as that of Alessa (2021), which underscored strategic foresight as a determinant of sustainable innovation in educational institutions. However, the present review advances this perspective by emphasizing that transformation is not limited to the adoption of technological tools, but requires a fundamental reconfiguration of organizational structures and pedagogical processes (Eitan & Gazit, 2024).

The role of artificial intelligence (AI) as a central driver of this transformation is increasingly evident, as highlighted by Dissanayake et al. (2025), whose bibliometric findings reveal a steady growth of AI-focused research in educational management. Earlier reviews, such as those by Pham and Sampson (2022), documented similar trends but focused primarily on pedagogical impacts; in contrast, the current synthesis integrates these pedagogical considerations with the structural and governance

dimensions of higher education. This integration reveals that transformational leadership facilitates adaptation to digital environments when oriented toward the enhancement of academic performance (Carvalho et al., 2022), though its effectiveness is constrained when regulatory frameworks fail to align with technological objectives (Tuyen et al., 2025). A recurrent theme in prior literature (e.g., Greimel et al., 2023) is the necessity of coherence between technological innovation and long-term organizational change. This review confirms that principle but extends it by illustrating how excessive regulatory pressure can diminish innovative capacity in institutional contexts (Tuyen et al., 2025), mirroring concerns raised in earlier comparative analyses of policy-driven educational reforms. Furthermore, the present synthesis underscores that digital literacy among leadership teams is not merely a desirable trait but a decisive factor in sustaining innovation in virtual interaction spaces (Eitan & Gazit, 2024).

Ultimately, while previous works have acknowledged the structural challenges of digital transformation, the findings consolidated here highlight a critical interaction between regulatory environments, leadership competencies, and institutional flexibility. This triad determines not only the success of digital initiatives but also their capacity to evolve in response to shifting educational demands.

Adoption of AI and Education 4.0

The adoption of artificial intelligence (AI) in higher education is increasingly consolidating as a strategic pillar in the transition toward Education 4.0 models (Sharma & Kaur, 2024). This trend aligns with earlier reviews such as Pham and Sampson (2022), which identified AI as a catalyst for pedagogical transformation, though their focus was predominantly on instructional technologies rather than governance. The present synthesis advances this discussion by underscoring the combined influence of self-efficacy, institutional support, and emotional commitment in fostering acceptance of AI-driven hybrid environments (Wang et al., 2025). This multi-dimensional view highlights a complexity that earlier studies addressed only partially, particularly in contexts where perceptual and pedagogical barriers persist and hinder full integration (Bagherimajd&Khajedad, 2025). Furthermore, Pham (2025) draws attention to the structural gap between the rapid evolution of AI and the comparatively slower capacity of educational systems to integrate it meaningfully—a discrepancy echoed in the current review's cross-institutional comparisons.

From a systemic standpoint, institutions that achieve successful AI adoption tend to align innovation policies with flexible pedagogical strategies (Wang et al., 2025). This observation resonates with the findings of Greimel et al. (2023), who emphasized that flexibility in design and governance enhances the sustainability of technological change. However, the present review extends this by demonstrating how transformational leadership reinforces such alignment through the cultivation of organizational citizenship behaviors and a culture of experimentation (Sharma & Kaur, 2024). This synergy becomes particularly critical when scaling AI adoption to the curricular level without concurrently adapting institutional frameworks (Pham, 2025). Bagherimajd and Khajedad (2025) further note that sustainable AI integration necessitates governance models tailored to the specific demands and contexts of higher education—an aspect largely absent in earlier reviews focused on K-12 settings. The analysis reveals that AI adoption continues to be shaped by tensions between technological acceleration and pedagogical legitimacy (Pham, 2025). Earlier works, such as Lin and Yu (2024),

identified similar tensions but placed less emphasis on their governance implications. The current synthesis addresses this gap by stressing that effective program design must balance benefits with ethical and formative risks, integrating social, institutional, and cultural variables alongside technological infrastructure (Wang et al., 2025). Ultimately, as Sharma and Kaur (2024) contend, the success of Education 4.0 hinges on leaders capable of managing complexity, anticipating the transformative effects of AI, and navigating the interplay between innovation and institutional stability.

Student Motivation and AI-Assisted Learning

AI-assisted learning has increasingly been recognized as a pedagogical environment that fosters sustained interest and intrinsic motivation among students at multiple educational levels (Sun et al., 2025). This finding aligns with earlier works such as Benvenuti et al. (2023), which identified adaptive technologies as key drivers of learner engagement, though those studies tended to focus on skill acquisition rather than the broader motivational spectrum. The present review expands this understanding by incorporating evidence that AI tools applied in creative domains—such as graphic design—enhance engagement through playful, simple, and emotionally resonant experiences (Alsswey, 2025). This combination of perceived usefulness and dynamism is presented as an effective mechanism for reshaping the link between motivation and academic performance (Gong et al., 2025). Furthermore, Monzon and Hays (2025) highlight that generative AI fosters personalized learning pathways, thereby promoting both autonomy and efficient information retrieval—an aspect only marginally addressed in earlier meta-analyses of digital learning tools.

The reviewed literature consistently shows that when students perceive AI as responsive to their individual interests and cognitive styles, their sustained engagement increases significantly (Alsswey, 2025). Gong et al. (2025) further emphasize that these technologies enhance not only domain-specific skills but also adaptability and opportunity recognition in complex contexts. This insight complements prior syntheses such as Lin and Yu (2024), which acknowledged adaptability as a benefit of AI but did not explicitly link it to institutional and pedagogical flexibility. In contrast, the current review underscores that such impacts are amplified in organizational environments that actively support innovative pedagogical applications of AI (Monzon & Hays, 2025). The experiential "flow" generated by AI, as identified by Sun et al. (2025), reinforces the desire for continued autonomous learning—mirroring patterns observed in gamification research but now framed within AI-driven contexts. The evidence suggests that curriculum design centered on AI must account for both motivational and structural determinants of its effectiveness (Gong et al., 2025). Earlier reviews (e.g., Pham & Sampson, 2022) acknowledged structural factors but often treated motivation as a secondary effect, whereas the present synthesis positions it as a primary driver of educational value perception. Sun et al. (2025) show that accommodating diverse learning styles and ensuring the practical applicability of AI elevate students' perceived value of education, which in turn sustains engagement, particularly in creative disciplines (Alsswey, 2025). Finally, Monzon and Hays (2025) argue that when active methodologies such as gamification are integrated, AI functions as a potent mediator between motivation and academic achievement—offering a convergence point between emerging technology and well-established motivational frameworks.

Leadership Competencies and Innovation Management

Leadership competencies associated with transformational leadership have been consistently linked to strengthening teachers' self-confidence in demanding educational contexts (Ke et al., 2025). This finding aligns with earlier reviews such as Ystaas et al. (2023), which identified self-efficacy as a mediator between leadership style and teacher performance, although their analysis centered primarily on healthcare and K-12 environments. The present synthesis advances this discussion by focusing specifically on higher education and by highlighting the benefits of integrating transformational and transactional leadership styles. Lefteri and Menon (2025) demonstrate that such integration generates a cumulative effect on the perception of professional efficacy, expanding the capacity of leaders to address complex pedagogical demands across diverse school contexts (Conner et al., 2025). Moreover, Flamand et al. (2025) show that leadership practices emphasizing curricular coherence significantly enhance legitimacy within teacher education programs—a dimension less developed in earlier meta-analyses of leadership in academic settings.

Across the reviewed studies, there is strong agreement that developing strategic leadership competencies requires systematic validation and institutionalization processes beginning at the stage of initial teacher education (Conner et al., 2025). This perspective echoes recommendations in Greimel et al. (2023), yet the present review strengthens the argument by linking competency development directly to the motivational role of leadership. Ke et al. (2025) find that adherence to educational practices increases when leadership is perceived as both a motivational driver and a source of self-efficacy. However, Flamand et al. (2025) caution that this potential is constrained in the absence of operational frameworks that connect leadership decisions with sustained collaborative processes. Another significant contribution of this review is its emphasis on hybrid leadership structures. While earlier syntheses (e.g., Alessa, 2021) discussed the balance between authority and guidance, Lefteri and Menon (2025) add that integrating strategic vision into these structures enhances adaptability in dynamic educational environments. This point is reinforced by Conner et al. (2025), who argue that competency assessment should be grounded in training models that combine both clinical and organizational criteria. Such an approach enables institutional decision-making to transcend operational management and focus on processes of continuous transformation (Lefteri& Menon, 2025). Finally, Ke et al. (2025) conclude that sustained teacher motivation is closely tied to the presence of leadership figures capable of cultivating climates of professional trust—a finding that positions leadership not merely as an administrative function but as a core driver of institutional innovation.

Evaluation of the Organizational Impact of Leadership

Empirical evidence consistently shows that transformational leadership can positively influence the innovative behavior of academic staff, particularly when mediated by a culture of shared knowledge (Saif et al., 2024). This observation aligns with the conclusions of Greimel et al. (2023), who documented similar effects in organizational contexts outside academia. However, the present review adds to this understanding by situating shared knowledge not only as a mediator but also as a strategic mechanism for enhancing innovation in digitally transforming higher education institutions. Tuyen et al. (2025) further demonstrate that the impact of leadership on organizational digital transformation is contingent on regulatory pressure, which can either inhibit or amplify the anticipated outcomes. This insight parallels findings from Alessa (2021), yet the current synthesis extends the discussion by explicitly connecting regulatory constraints with the capacity for digital adoption. The interaction between leadership effectiveness

and external structures reinforces the idea that personal leadership skills alone are insufficient to guarantee organizational change (Nguyen et al., 2025). Shweta and Panicker (2025) complement this by showing that leadership exerts a stronger influence in highly automated environments when it enhances employees' perceived work meaning and reduces turnover intentions—a relationship less developed in earlier meta-analyses of AI adoption in educational management.

Organizational impacts of leadership are neither linear nor homogeneous, varying according to institutional type and the degree of technological integration achieved (Tuyen et al., 2025). Saif et al. (2024) argue that shared knowledge amplifies leadership's effect on performance, but this tendency diminishes in rigid environments that do not foster sustained collaborative processes (Shweta & Panicker, 2025). This finding echoes earlier conclusions by Ystaas et al. (2023), though the present review sharpens the focus on higher education and digital governance. Moreover, Nguyen et al. (2025) highlight that AI-based educational resources often require substantial adaptation to realize their full organizational potential—an operational nuance frequently overlooked in broader discussions of digital transformation.

The reviewed studies converge on the notion that leadership's ability to drive organizational change depends on a dynamic interplay between institutional, technological, and human factors (Nguyen et al., 2025). As Saif et al. (2024) emphasize, optimal outcomes emerge when leadership aligns with a structured culture of innovation, a point that reinforces and expands upon earlier cross-sector analyses of innovation ecosystems. However, as Tuyen et al. (2025) note, this alignment becomes increasingly challenging in contexts where regulatory pressure restricts managerial flexibility and proactive decision-making. Finally, Shweta and Panicker (2025) underscore that robust talent management practices—integrated with leadership vision—significantly improve both staff retention and organizational commitment, further solidifying leadership's role as a central driver of institutional sustainability in technologically evolving educational environments.

CONCLUSIONS

The reviewed findings confirm that transformational and digital leadership functions as a key axis linking collaborative processes, organizational innovation, and technological adoption in higher education. Leadership effectiveness increases when aligned with institutional cultures centered on knowledge-sharing and active faculty participation. At the same time, the organizational impact is reinforced by structural conditions such as strategic clarity, perceived legitimacy, and institutional support—factors that mediate between leadership vision and educational outcomes.

Moreover, the integration of artificial intelligence in educational contexts not only transforms teaching practices but also redefines the student experience by enhancing motivation, autonomy, and sense of belonging. This technological shift is more effective when articulated through leadership models that promote curricular coherence, pedagogical flexibility, and digital literacy. Leaders capable of managing the tension between innovation and institutional regulation achieve more sustained impacts on both performance and teacher-student engagement.

The examined studies also reveal that adopting Education 4.0 and AI-based tools requires strategic governance that transcends instrumental implementation. Leadership evaluation must consider not only organizational outcomes but also the leader's

capacity to generate inclusive, collaborative, and adaptive environments. Among the limitations of this review is the methodological heterogeneity of the analyzed studies, which hinders the comparability of results and the generalization of conclusions. Furthermore, the scarcity of longitudinal research limits the ability to assess the sustainability of transformational and digital leadership effects over the medium and long term in real educational contexts.
Future research should explore how the impact of leadership varies according to institutional type, cultural context, and level of technological maturity. It is also recommended to incorporate experimental studies and longitudinal designs that enable the identification of causal relationships and evolutionary trajectories in AI adoption and leadership-linked collaborative practices.

DECLARATION OF CONFLICT OF INTEREST

The authors declare no conflict of interest related to this research.

DECLARATION OF AI USAGE

The authors declare that artificial intelligence tools were used solely as a support resource during the development of this article, without replacing the human intellectual or reflective process at any point. After conducting an exhaustive review through various specialized platforms, the content was verified to show no signs of plagiarism, which is duly documented. Likewise, the authors affirm that this work is the result of an original and autonomous intellectual effort and has not been previously published or generated by automated systems or digital writing platforms.

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