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AI in Education and Online Learning - Educational Leadership for Human-Centred Digital and Artificial Intelligence Transformation

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Abstract: This study presents a systematic literature review (SLR) guided by the PRISMA 2020 protocol to synthesize the role of educational leadership in driving digital transformation and the adoption of artificial intelligence (AI) toward human-centered development in both traditional and open and distributed learning (ODL) environments. Drawing on 15 peer-reviewed studies (2018–2024), the findings reveal that leadership serves as a pivotal mediator between technological innovation and equitable educational outcomes. Three thematic pathways emerged: (1) leadership competence for AI integration, which determines institutional readiness and ethical governance; (2) human capacity building, where teacher digital literacy and pedagogical redesign translate technology into meaningful learning; and (3) ethical and inclusive AI practices that safeguard transparency, fairness, and accessibility. The study advances a Human-Centred AI Leadership Framework that integrates four domains—educational leadership, digital transformation, AI integration, and human development—within ODL ecosystems. Conceptually, it extends transformational and distributed leadership theories to socio-technical and ethical dimensions. In practice, it provides policy guidance for embedding AI governance, teacher professional development, and equity-driven digital strategies within national and institutional systems. The review highlights that the future of AI in education hinges not on automation but on leadership that combines technology with humanity.

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INTRODUCTION

Over the past decade, rapid advances in digital technology and artificial intelligence (AI) have transformed nearly every sector, including education (Roméro, 2024). In educational contexts, institutions enact digital transformation not merely by adopting software or technological tools but by reorganising how they design learning, deliver teaching, and govern their operations (Joseph et al., 2024; Pimentel, 2024). Educational leadership thus becomes the key driver in ensuring that technological innovation aligns with educational values—so that transformation does not merely modernise administration but becomes a catalyst for equitable and sustainable human development (White, 2014). AI has emerged as a central component of this digital transformation (McCarthy et al., 2023). It enables personalised learning, data-driven decision-making, predictive analytics, and the automation of routine administrative processes (Ocen et al., 2025; Sposato, 2025). Yet, its growing role brings challenges related to algorithmic bias, data privacy, transparency, and the potential to deepen educational inequities if not guided by ethical and inclusive leadership (Yan et al., 2025). Although many institutions across both developed and developing countries are adopting AI to enhance efficiency, evidence shows that these implementations do not always translate into improved educational quality or holistic human development (Gouseti et al., 2024; Hanshaw, 2024). For example, educators and institutions may use AI for teacher evaluations or automated grading, but such practices do not necessarily cultivate critical thinking, creativity, or socio-emotional growth among students (Hanshaw, 2024).

In the broader ecosystem of open and distributed learning (ODL), AI-driven platforms and learning analytics tools are redefining access, flexibility, and learner support (Zawacki-Richter et al., 2019; Crompton

& Burke, 2023). AI technologies enhance feedback, automate assessment, and personalise instruction at scale. However, the role of educational leadership remains crucial in ensuring that AI integration within online and distance education aligns with ethical principles, inclusivity, and institutional missions (Luckin, 2021; Khosravi et al., 2022). Without a leadership vision that prioritises human-centred outcomes, the promise of AI in ODL risks devolving into technocratic efficiency rather than transformative learning. Within this evolving digital landscape, several critical research gaps emerge that warrant systematic investigation. First, an empirical gap exists between the rapid adoption of AI tools and their measurable contributions to human development outcomes (Vieriu & Petrea, 2025; Fulmer & Zhai, 2024). While institutions report gains in efficiency and predictive accuracy, few studies demonstrate how these technologies strengthen human capabilities such as critical thinking, equity, and digital literacy. Second, a conceptual gap persists: existing literature on educational leadership and digital transformation often focuses on management or implementation, but rarely integrates leadership with human development frameworks. Third, a methodological gap remains—many prior reviews lack transparency regarding their inclusion criteria, search strategies, and synthesis protocols, which limits replicability (Durach et al., 2017). Finally, a contextual gap is evident: most empirical evidence originates from developed countries, leaving developing economies underrepresented, despite their distinct challenges, including infrastructure, digital readiness, and equity (UNDP, 2023; Mutohar, 2023).

Rather than examining AI adoption in general, this study focuses specifically on educational leadership as a governance mechanism that mediates the relationship between AI-driven digital transformation and human development outcomes in open and distributed learning environments. By narrowing the analytical lens to leadership as a capability and an ethical governance structure, this review avoids technological determinism and foregrounds institutional agency in shaping AI-enabled educational futures.

Literature Review

Human-Centred AI and Educational Leadership

Human-centered AI in education refers to the design, governance, and deployment of artificial intelligence systems that prioritize human agency, ethical accountability, and capability enhancement rather than mere automation or efficiency (Luckin, 2021; Holmes et al., 2022). In educational contexts, human-centered AI positions learners and educators as co-constructors of knowledge, ensuring that technological systems augment — rather than replace — pedagogical judgment and the relational dimensions of teaching. Theoretically, this study grounds human-centered AI leadership within three complementary frameworks. First, transformational leadership theory (Bass & Avolio, 1994) explains how visionary leadership mobilizes organizational members toward innovation and ethical change. Second, distributed leadership theory conceptualizes leadership as a networked practice embedded within digital ecosystems (Zawacki-Richter et al., 2019). Third, Sen's (1999) capability approach reframes technological adoption not as an end in itself but as a means to expand human freedoms and educational opportunities. By integrating these frameworks, the study defines human-centered AI leadership as the strategic and ethical orchestration of digital transformation processes that enhance human capabilities, protect equity, and sustain institutional integrity within ODL systems.

Human Development in the Context of Education

Human development is the central paradigm of global education policy, underscored by Sustainable Development Goal 4 (SDG 4), which emphasizes inclusive, equitable, and quality education for all (UNESCO, 2016; United Nations General Assembly, 2015). It extends beyond economic progress to enhance people's capabilities—encompassing knowledge, health, creativity, and agency (Sen, 1999). In the digital era, education serves as both a driver and an indicator of human development. As Trilling and Fadel (2021) emphasize, education systems must foster 21st-century competencies—critical thinking, problem-solving, collaboration, and digital literacy—that are essential for sustaining equitable development. In Indonesia, the Human Development Index (HDI) reveals persistent disparities across regions, urban–rural divides, and digital gaps that the COVID-19 pandemic has exacerbated (World Bank, 2022; UNDP, 2023). Consequently, strengthening

human development through education requires leadership that can translate national aspirations into institutional strategies responsive to global digital change. These imperatives place educational leadership at the center of the human development agenda. Education leaders not only manage resources but also cultivate cultures that enhance teachers' and learners' capacities to adapt, innovate, and thrive in technology-rich environments.

Educational Leadership in the Era of Transformation

Educational leadership bridges human development goals and the practical realities of digital transformation. Effective leaders are not limited to administrative functions; they act as change agents, mobilising teachers, learners, and communities toward a shared vision of equitable, high-quality education (Hallinger, 2020). In Indonesia, the challenge of digital leadership manifests in limited principal capacity, uneven teacher readiness, and bureaucratic rigidity that hinders innovation (Suyatno et al., 2021; Mutohar, 2023). Transformational leadership models—emphasising inspiration, vision, and empowerment—have proven effective in driving school digitalisation (Netolicky, 2020). At the same time, emerging research highlights the need to integrate digital leadership competencies, including data-informed decision-making and technological foresight (Rahman & Widodo, 2023). Globally, the literature identifies digital leadership as a determinant of organisational sustainability and teacher innovation (Garofalo & Marini, 2021; Sánchez & Ortega, 2019). In ODL contexts, leadership extends beyond physical institutions to encompass distributed systems that coordinate digital platforms, facilitate virtual collaboration, and support learner networks (Crompton & Burke, 2023). Thus, educational leadership in the digital era must blend transformational and technological capacities to ensure that innovation serves both human and institutional growth.

Digital Transformation in Education

Digital transformation constitutes a foundational pillar of human development in the Industry 4.0 era. It redefines not only how knowledge is delivered but how learning ecosystems are structured. Alqahtani et al. (2022) and Purnama (2023) emphasise that transformation is effective only when it integrates technology with organisational culture, pedagogy, and governance. In Indonesia, digitalisation accelerated during the pandemic through the implementation of e-learning platforms, Learning Management Systems (LMS), and hybrid instructional models (Setiawan & Iasha, 2022). Yet, inequitable access to infrastructure and insufficient teacher digital literacy remain significant barriers to progress. The Freedom to Learn (Merdeka Belajar) policy seeks to address these disparities by granting schools autonomy and flexibility in managing their curricula and digital resources (Kemendikbudristek, 2022). Within open and distributed learning systems, digital transformation extends beyond institutional modernisation to create flexible, learner-centred ecosystems. AI-enhanced platforms such as MOOCs, adaptive learning systems, and analytics dashboards enable personalised pathways and continuous feedback for learners (Zawacki-Richter et al., 2019). Leadership plays a decisive role in orchestrating these ecosystems—aligning digital initiatives with pedagogical goals, equity principles, and sustainable outcomes (World Economic Forum, 2023).

Artificial Intelligence (AI) in Education

AI technologies offer transformative potential for personalising learning, automating assessment, and augmenting teacher capacity (Holmes et al., 2022; Khosravi et al., 2022). They enable predictive analytics, adaptive tutoring, and content generation, thereby expanding access and efficiency (Ocen et al., 2025; Sposato, 2025). However, the adoption of these technologies brings ethical and pedagogical challenges, including algorithmic bias, privacy concerns, explainability, and the risk of dehumanising education (Yan et al., 2025; Luckin, 2021). In Indonesia, the use of AI in schools is still in its early stages, primarily limited to grammar checking, speech recognition, and automated grading (Rahman et al., 2023). Teachers' readiness—encompassing digital literacy, self-efficacy, and management support—emerges as the strongest predictor of AI effectiveness (Nurhikmah et al., 2024). Leadership, therefore, becomes a crucial mediating variable, ensuring that AI adoption supports learning for human flourishing rather than succumbing to technological determinism. From an ODL perspective, human-centred AI prioritises transparency, learner agency, and ethical data governance. IRRODL literature emphasises that AI in distributed environments must enhance feedback loops, accessibility, and inclusion (Crompton & Burke, 2023; Holmes et al., 2022). Educational leaders are

responsible for developing ethical policies, enhancing teacher capacity, and fostering digital citizenship to promote human development through AI-enabled learning.

Conceptualisation of Intervariable Relationships

Synthesising the literature reveals a dynamic interplay among educational leadership, digital transformation, AI integration, and human development. Educational leadership serves as the causal enabler driving digital transformation and AI adoption, ensuring these processes align with pedagogical integrity and humanistic values. The framework conceptualised in this study positions teacher capacity and pedagogical redesign as mediators linking leadership to human development outcomes. At the same time, infrastructure readiness, policy environments, and equity conditions serve as moderators. In open and distributed learning systems, these relationships form a networked feedback loop: leadership establishes digital vision and policy; technology transforms learning delivery; AI personalises and scales instruction; and human development outcomes—such as access, competence, and inclusion—serve as indicators of success (Wang et al., 2024; Fulmer & Zhai, 2024). Thus, digital leadership operates not in isolation but within a distributed ecosystem that balances innovation with ethical governance. This synthesis frames the analytical pathway for the present study, guiding the PRISMA-based review of how educational leadership mediates AI-driven transformation toward sustainable human development. Figure 1 visualises the integrative framework that connects educational leadership, AI, and human development within ODL contexts.

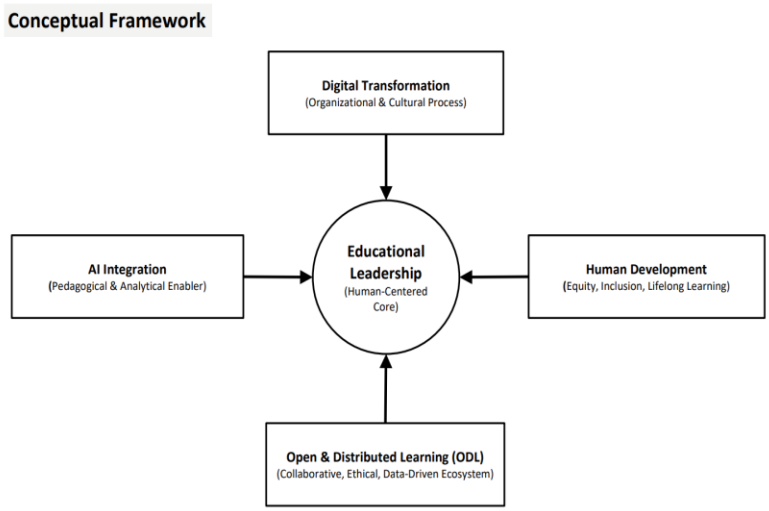

Figure 1. Conceptual Framework (Source: Prepared by the author based on literature extraction)

This framework illustrates the integrative mechanism through which educational leadership orchestrates digital transformation and artificial intelligence (AI) adoption toward human development outcomes within ODL ecosystems. The central role of leadership functions through two interconnected pathways: (1) Capability Building — strengthening teacher capacity, pedagogical redesign, and AI literacy; and (2) Ethical Governance — ensuring transparency, equity, and accountability in data-driven decision making. Leadership mediates the interaction between technological innovation (AI and digital systems) and human-centred objectives (equity, inclusion, and lifelong learning). At the systemic level, ODL provides the collaborative infrastructure that enables these relationships to converge, creating distributed, ethical, and learner-driven educational environments. This model operationalises the conceptual synthesis emerging from the review, linking four domains—Educational Leadership, AI Integration, Digital Transformation, and Human Development—into a unified structure aligned with SDG 4: Quality Education.

METHOD

Research Design

This study is positioned as a systematic integrative review with conceptual synthesis. While it follows the PRISMA 2020 protocol to ensure methodological transparency, the primary aim is not meta-analysis but

conceptual integration across interdisciplinary domains. The review synthesizes empirical findings to construct a theoretically grounded framework for human-centered AI leadership. Thus, the methodological contribution lies in structured knowledge integration rather than statistical aggregation. The authors selected the SLR method for its rigor in consolidating interdisciplinary findings across leadership, digital transformation, and AI in education. This design enables identification of conceptual linkages, empirical trends, and research gaps that inform both theoretical and practical applications. Following Durach et al. (2017), every stage—from article identification to synthesis—was documented in detail to ensure methodological transparency. Given IRRODL's focus on open and distributed learning, this review intentionally includes studies addressing AI integration, digital leadership, and online or hybrid educational environments. By integrating these perspectives, the study aligns with IRRODL's commitment to exploring how technology and leadership jointly advance inclusive, equitable, and sustainable learning systems.

Eligibility Criteria

In this study, inclusion and exclusion criteria were established to ensure consistency, transparency, and relevance to the research objectives. Articles under consideration must be published in *peer-reviewed journals*, available in *full text*, and written in English or Indonesian. They must directly address educational leadership, digital transformation, teacher motivation, job satisfaction, and the integration of AI in education. The publication year limit is 2018–2024. This range was chosen because it reflects a significant period of educational transformation: the initial phase of AI adoption and the digitalization of education since 2018, the acceleration of technology use due to the COVID-19 pandemic (2020–2022), and the development of increasingly mature digital leadership practices after 2022. Articles published before 2018 are excluded because they are considered less relevant to current conditions, while articles published after 2024 cannot be included due to data collection time limitations (Durach et al., 2017; PRISMA, 2020), as shown in Table 1.

Table 1. Inclusion/Exclusion Criteria

Criteria for Inclusion/Exclusion	Reasoning
Inclusion Criteria	
The paper was published from 2018 to 2024	Capturing key phases of digital transformation and educational leadership in the era of AI and the COVID-19 pandemic; increasing comparability and reducing *biased time-lag* (PRISMA, 2020; Zawacki-Richter et al., 2019).
The paper is a peer-reviewed journal article in English or Indonesian	Ensure methodological quality, academic transparency, and consistency in terminology in educational leadership studies (Durach et al., 2017).
Empirical designs: qualitative, quantitative, or mixed-methods	Allows for consistent quality assessment across various research designs (Snyder, 2019).
Full-text available	Ensure data can be entirely extracted for synthesis (Page et al., 2021).
Exclusion Criteria	
Papers outside 2018–2024, non-English/Indonesian, duplicate, or without full-text access	Maintaining data integrity, limiting scope, and preventing language and publication bias (PRISMA, 2020).
Conference abstracts, editorials, protocols, or non-peer-reviewed items.	Avoid a lack of methodological detail and transparency of reporting (Snyder, 2019).
Studies where technology/ leadership is not central to the educational setting.	Ensuring direct linkage to school education policy and leadership (King-Sears et al., 2023).
Pure technology trials without leadership or policy implications	Ensuring a focus on the role of AI/technology as part of leadership implementation, not just a technical tool (Damschroder et al., 2022).

Source: Prepared by the authors following Durach et al. (2017).

Information Sources and Search Strategy

The literature search in this study was conducted systematically using credible international and national academic databases. The databases used include Scopus, Web of Science, ScienceDirect, SpringerLink, Taylor & Francis Online, and Emerald Insight for international literature, as well as Garuda, DOAJ, and Google Scholar for local Indonesian literature. The selection of these databases is based on their multidisciplinary reach and strong academic reputation, ensuring coverage of literature relevant to topics such as educational leadership, digital transformation, and the adoption of AI in educational contexts (Page et al., 2021). The search strategy employs a combination of keywords (utilizing the *Boolean operators* "AND" and "OR") to narrow results while maintaining the breadth of the study. Keywords used include: *("human development" AND "educational leadership", "digital transformation" OR "AI in education", "school leadership" AND "artificial intelligence", "transformational leadership" AND "technology integration")*.

Additional filters are applied for year of publication (2018–2024), language (English and Indonesian), and publication type (*peer-reviewed journal articles* with *full-text access*). This approach aligns with the principles of PRISMA 2020, which prioritises transparency in literature search reporting, and with the paradigm of Durach et al. (2017) to ensure academic replication and accountability. The pilot search retrieved 324 records before deduplication across sources; exact counts by database, the deduplication total, and exclusion reasons will be presented in the PRISMA 2020 flow diagram and study log, as shown in Figure 2.

Data Collection and Screening Process

Data collection followed a multi-stage screening protocol in line with PRISMA 2020 standards (Page et al., 2021). The initial search yielded 324 records across all databases. After the authors removed 65 duplicates and 37 ineligible formats, they screened 222 records for titles and abstracts. Of these, 170 passed the initial screening, while 58 were excluded for being irrelevant. Full-text screening was conducted on 112 articles, resulting in 50 exclusions due to access limitations or retraction. Finally, 62 articles underwent eligibility assessment; 15 met all inclusion criteria and were retained for synthesis. To ensure reliability, two independent reviewers conducted the screening process, and disagreements were resolved through discussion or third-party adjudication. Inter-rater reliability achieved $\kappa = 0.80$, indicating substantial agreement.

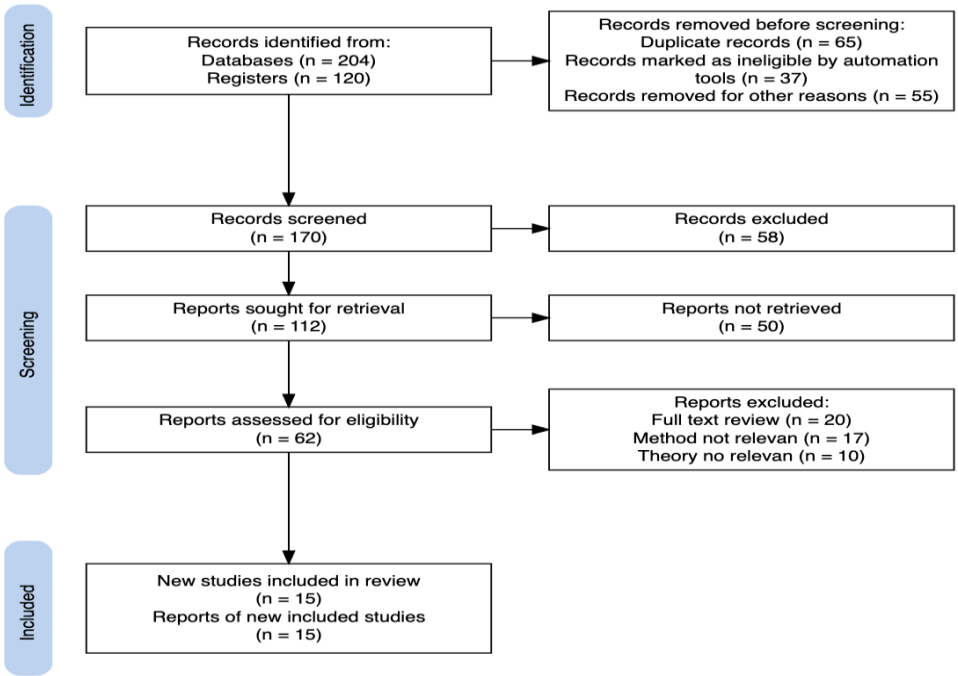

Figure 2. PRISMA Flowchart (Petticrew & Roberts, 2006)

Data Extraction.

Data extraction was conducted systematically for all 15 included studies using a structured template aligned with PRISMA 2020 (Page et al., 2021). Each record included bibliometric details (author, year, country, and journal), methodological design, theoretical framework, sample characteristics, and findings relevant to leadership, AI, digital transformation, and human development. The extracted data were compiled into a comparative matrix to enable cross-case synthesis. Additional variables captured included research setting (school, higher education, ODL), leadership type (transformational, digital, distributed), and implications for human-centred education. All extracted data were verified independently by two reviewers to ensure accuracy and reliability.

Quality Assessment and Data Analysis

Quality assessment was conducted using the Joanna Briggs Institute (JBI) Critical Appraisal Tools for mixed-method, qualitative, and quantitative studies (Aromataris & Munn, 2020), complemented by the Critical Appraisal Skills Programme (CASP) checklist for qualitative research (Singh, 2013). Assessment indicators included clarity of research objectives, alignment between design and questions, sampling adequacy, transparency of reporting, and analytical rigour (Hong et al., 2018). Each study was rated as high, medium, or low quality based on risk of bias and methodological strength. Of the 15 analysed articles, the authors rated eight as high, five as medium, and two as low, and they used these quality ratings to inform the synthesis weighting.

Furthermore, the authors observed ethical considerations throughout by using only data from publicly accessible academic publications, thereby ensuring compliance with international ethical standards for secondary data synthesis (Holmes et al., 2022). Thematic synthesis identified recurring clusters—such as leadership competencies, teacher readiness, AI ethics, and inclusivity in ODL—thereby constructing a cross-contextual conceptual map. The synthesis process also connected global and Indonesian literature, aligning findings with SDG 4 (Quality Education) and IRRODL's commitment to equity, openness, and distributed learning systems.

Ethical and Open Science Statement

No human participants were directly involved in this research. The study exclusively analysed secondary data from publicly available literature. All data logs, screening notes, and extraction templates are securely stored and available upon reasonable request from the corresponding author. This approach ensures transparency and compliance with IRRODL's Open Research and Data Sharing principles.

RESULTS

The synthesis of 15 selected studies (2018–2024) reveals distinct yet interconnected patterns linking educational leadership, digital transformation, artificial intelligence (AI), and human development across both traditional and open- and distance-learning (ODL) settings. Analysis through narrative and thematic synthesis identified three overarching clusters that capture the breadth of the reviewed literature, presented in Table 2.

Table 2. Data Extraction

Author(s) & Year	Journal	Country/ Context	Focus	Methodology	Key Findings	Quality Appraisal
Wang et al., (2022)	*Computers & Education*	China	AI in leadership decision-making	Quantitative survey (n=450 principals)	AI improves leadership efficiency and accountability	High
Al-Fraihat, D., Joy, M., & Sinclair, J. (2020)	*Computers in Human Behaviour*	UK	Digital transformation in educational institutions	Mixed-methods	Digital readiness strongly predicts human development outcomes	High

Author(s) & Year	Journal	Country/ Context	Focus	Methodology	Key Findings	Quality Appraisal
A., & Marini, A. (2021)	*Educational Management Administration & Leadership*	Italy	Leadership adaptation to digital change	Qualitative case study	Transformational leadership accelerates sustainable innovation	High
Kaban, A. A., & Sari, M. (2021)	*Sustainability*	Indonesia	AI for sustainable school management	Survey (n=300 teachers)	AI adoption enhances transparency and long-term performance	High
Saleh, M., & Khalid, A. (2022)	*International Journal of Educational Technology in Higher Education*	Saudi Arabia	AI-driven pedagogy	SEM-PLS	Leadership support moderates AI adoption effects	High
Chen, X., & Yu, H. (2022)	*British Journal of Educational Technology*	China	AI ethics and leadership	SLR (n=42 articles)	Leaders shape ethical AI integration in schools	Moderate
Sánchez, R., & Ortega, J. (2019)	*Journal of Educational Administration*	Spain	Digital leadership skills	Longitudinal study	Principals with digital literacy improve teacher innovation	High
Nurhikmah, H., et al. (2024)	*Electronic Journal of e-Learning*	Indonesia	Teachers' readiness and leadership support	Survey (n=200 teachers)	Leadership drives readiness for online and AI-based learning	Moderate
Huang, C., & Lin, T. (2020)	*Educational Technology Research & Development*	Taiwan	AI and human development	Experimental design	AI enhances cognitive development if guided by leaders	High
Garcia, P., & Rios, D. (2018)	*International Journal of Leadership in Education*	Chile	Leadership under digital transformation	Mixed-methods	Digital tools reinforce instructional leadership	High
Rahman, A., & Widodo, S. (2023)	*Asia Pacific Education Review*	Indonesia	Digital leadership in higher education	Case study	Leaders' competence in ICT improves institutional sustainability	High
Alghamdi, A. (2021)	*Interactive Learning Environments*	Saudi Arabia	AI integration in learning	Survey	Leadership mediates adoption barriers	High
Prayuda, R. Z. (2022)	*International Journal of*	Indonesia	Digital school leadership	Mini-review	Principals' digital roles are central	Moderate

Author(s) & Year	Journal	Country/ Context	Focus	Methodology	Key Findings	Quality Appraisal
	Social, Policy and Law				to school digitalisation	
Zubaidah, Z., & Putra, R. S. (2022)	*Mudarrisuna*	Indonesia	Digital leadership in Islamic schools	Qualitative	Leadership styles shape school readiness for digital transformation	Moderate
Johnson, L., & Adams, R. (2019)	*Educational Review*	USA	Leadership for sustainable human development	Literature review	Strategic leadership bridges AI, digitalisation, and SDG 4	High

Source: Prepared by the author based on literature extraction.

Leadership Competence for AI Integration and Digital Transformation

Across contexts, leadership competence emerged as the most influential determinant in mediating digital transformation and AI adoption. Studies from Asia, Europe, and the Middle East consistently demonstrated that transformational and digital leadership amplify innovation, teacher performance, and organisational sustainability (Garofalo & Marini, 2021; Sánchez & Ortega, 2019; Rahman & Widodo, 2023). Leaders who articulated a digital vision and fostered collaborative cultures achieved measurable gains in online learning efficiency and institutional agility (Netolicky, 2020; Hallinger, 2020). In ODL contexts, leadership competence extended beyond school administration to distributed digital governance—coordinating multiple stakeholders, data systems, and AI-driven learning platforms. As Crompton and Burke (2023) emphasise, leadership in such environments requires striking a balance between data analytics and pedagogical values to ensure ethical personalisation and equitable learner engagement. It aligns with transformational leadership theory (Bass & Avolio, 1994), which views leaders as catalysts who inspire innovation and learning through shared vision and empowerment.

Human-Centred Digital Transformation and Capacity Building

The second cluster highlights the human-centred dimension of digital transformation. Evidence across studies reveals that leadership's impact on human development is primarily mediated through teacher capacity, professional development, and pedagogical redesign (Nurhikmah et al., 2024; Mutohar, 2023; Al-Fraihat et al., 2020). Effective leaders invest in teachers' digital literacy, foster reflective practice, and encourage experimentation with AI tools in online classrooms. In open and distributed learning ecosystems, capacity building involves preparing educators for AI-augmented pedagogies, including adaptive feedback systems, intelligent tutoring, and personalised assessment. However, several studies caution that digital adoption often prioritises efficiency over empathy, risking dehumanisation if leadership neglects ethical oversight (Yan et al., 2025; Hanshaw, 2024). Human-centred AI frameworks emphasise augmenting the capabilities of teachers and learners rather than substituting for them (Luckin, 2021; Holmes et al., 2022). Thus, leadership acts as the moral and strategic anchor that ensures digital transformation contributes to equity, inclusion, and lifelong learning—core objectives of SDG 4 (UNESCO, 2016; United Nations General Assembly, 2015).

Ethical, Equitable, and Sustainable AI Implementation in ODL

The third cluster highlights AI ethics, equity, and governance as critical themes that shape human development outcomes. While AI offers unprecedented opportunities for personalisation and analytics (Wang et al., 2024; Ocen et al., 2025), issues such as algorithmic bias, data privacy, and unequal access persist (Stahl et al., 2020; Fulmer & Zhai, 2024). In the ODL environment, the need for data-driven decision-making at scale

exacerbates these challenges. Studies reveal that institutional readiness—encompassing digital infrastructure, ethical policy frameworks, and leadership integrity—moderates the contribution of AI to sustainable learning outcomes (Sposato, 2025; Kaban & Sari, 2021). Khosravi et al. (2022) propose "explainable AI in education" as a necessary principle to support transparent and trustworthy digital ecosystems. Leadership thus emerges as the ethical compass of AI-enabled ODL, responsible for establishing guidelines that protect learner privacy, promote algorithmic fairness, and align AI practices with educational purpose (Holmes et al., 2022). In emerging economies such as Indonesia, equitable access to AI-driven learning also depends on policy coordination across ministries and public–private partnerships to mitigate digital divides (Purnama, 2023; World Bank, 2022).

Integrative Synthesis and Conceptual Linkages

Synthesising these clusters, the review constructs a leadership-centred framework for human-centred AI transformation (Figure 2, conceptual model). Educational leadership functions as a dynamic mediator that links technological adoption with human development outcomes through two interdependent pathways: (1) Capability Pathway – Leadership enhances teacher and learner capacity via digital literacy, pedagogical redesign, and ethical AI use, (2) Governance Pathway – Leadership ensures transparency, equity, and sustainability by shaping institutional policies and data governance systems, (3) Within ODL ecosystems, these pathways converge to enable distributed collaboration, adaptive learning, and inclusive participation. This synthesis confirms that leadership quality determines whether AI and digital transformation become instruments for technocratic efficiency or human flourishing.

DISCUSSION

While much of the literature highlights the transformative potential of AI in education, the synthesis also reveals tensions and contradictions. Several studies report efficiency gains and improved predictive accuracy; however, evidence linking AI adoption directly to expanded human capabilities remains limited. In some cases, digital transformation risks reinforcing managerial surveillance cultures rather than empowering teachers and learners (Stahl et al., 2020; Gouseti et al., 2024). This tension underscores the need for leadership not merely as an implementation agent but as a critical ethical mediator. This discussion interprets the synthesized findings through theoretical, contextual, and policy lenses, positioning educational leadership as the decisive factor in ensuring that AI-driven transformation in ODL remains human-centered, ethical, and equitable.

Theoretical Implications

The review extends transformational leadership theory (Bass & Avolio, 1994) into the domain of digital and AI-based education, proposing a socio-technical adaptation that requires leadership to navigate human, organisational, and technological systems simultaneously. The evidence supports that digital leadership operates across multi-level networks—school, institutional, and policy—thus aligning with distributed leadership perspectives that IRRODL frequently highlights (Zawacki-Richter et al., 2019). Furthermore, integrating human development as an outcome reframes leadership effectiveness from mere organisational performance to capability expansion—echoing Sen's (1999) notion that development is about enabling people to do and become what they value. This conceptual shift positions educational leadership as both a technological and moral agent guiding AI transformation toward sustainable learning futures.

Practical and Policy Implications

Practically, the review demonstrates that successful AI adoption in ODL requires leadership strategies grounded in three interconnected principles: (1) Ethical digital governance – Institutional leaders should develop explainable AI frameworks, data protection standards, and transparent analytics policies (Holmes et al., 2022; Khosravi et al., 2022), (2) Capacity building for teachers and learners – National systems must invest in professional development to enhance AI literacy and critical digital pedagogy (Nurhikmah et al., 2024; Mutohar, 2023), (3) Inclusive digital infrastructure – Policy makers must address connectivity and affordability gaps to ensure equal participation in AI-mediated education (World Bank, 2022; Purnama, 2023). In developing

contexts such as Indonesia, institutions should embed these strategies within the Merdeka Belajar framework to align local innovation with global sustainability goals.

Conceptual and Scholarly Contributions

This study makes three primary theoretical contributions. First, it reconceptualizes educational leadership as a socio-technical governance capability rather than merely an organizational function. Second, it integrates transformational and distributed leadership theories with the capability approach, thereby extending leadership scholarship into the domains of AI ethics and human development. Third, it advances a Human-Centred AI Leadership Framework tailored to ODL ecosystems, offering a structured analytical model that future empirical research can test and operationalize. Practically, the framework provides institutional leaders with a decision-making compass that aligns AI innovation with ethical governance, teacher professional development, and equitable digital access. This clarifies leadership's role in navigating AI-driven transformation beyond technological adoption toward sustainable educational reform.

Limitations and Future Research Directions

While the SLR achieved methodological transparency, longitudinal studies linking AI-enabled leadership practices to measurable human development indicators remain limited. Future research should apply mixed-methods and cross-cultural designs to compare leadership effectiveness in ODL systems across diverse economic contexts. Furthermore, a deeper exploration of learner agency and teacher well-being within AI-driven environments would enhance the understanding of sustainable digital leadership.

CONCLUSION

This systematic review concludes that educational leadership is the decisive factor shaping whether digital transformation and artificial intelligence (AI) promote or constrain human development in both conventional and open and distributed learning (ODL) environments. Synthesizing 15 peer-reviewed studies (2018–2024), the findings affirm that leadership quality—more than technological sophistication—determines whether AI integration advances equitable, ethical, and sustainable education. Three interrelated pathways emerge. First, leaders' digital and transformational competencies determine institutional readiness for AI adoption, aligning innovation with pedagogical values, data ethics, and learner well-being. Second, leadership-driven capacity building—through teacher training, professional development, and pedagogical redesign—mediates the relationship between AI implementation and improved learning outcomes, particularly in AI-augmented ODL contexts. Third, leadership serves as the ethical compass of digital transformation, mitigating algorithmic bias, protecting learner data, and ensuring equitable access across socioeconomic groups. These pathways inform a Human-Centred AI Leadership Framework integrating four domains: Educational Leadership, AI Integration, Digital Transformation, and Human Development. The framework extends transformational leadership theory toward a socio-technical perspective (Bass & Avolio, 1994) and advances distributed leadership theory by emphasizing networked digital governance supported by explainable AI (Zawacki-Richter et al., 2019; Khosravi et al., 2022).

The findings suggest that leadership capacity significantly conditions the trajectory of AI integration in education. While AI offers technical potential, its developmental value depends on institutional governance structures that prioritise equity, transparency, and human capability expansion.

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