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Reorienting Educational Management Information Systems for Resilient Digital Learning Ecosystems in Industry 5.0

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Abstract :
The transition toward Industry 5.0 has encouraged educational institutions to reconsider the role of Management Information Systems (MIS) beyond administrative efficiency and technological automation. This study investigates how MIS can be reoriented to support human-centered values and organizational resilience within increasingly complex digital learning environments. A Systematic Literature Review (SLR) was conducted following the PRISMA framework, complemented by bibliometric mapping using VOSviewer. Relevant publications published between 2021 and 2025 were collected from reputable national and international databases and analyzed to identify major research trends, conceptual relationships, and emerging gaps. The findings reveal that existing studies predominantly emphasize technological innovation, while the dimensions of human-centricity and resilience remain insufficiently integrated into educational MIS research. The literature also highlights the growing need for information systems capable of maintaining institutional adaptability, learning continuity, and stakeholder well-being amid rapid technological and social change. In response to these challenges, this study develops the SIM 5.0 conceptual framework, which combines three interrelated dimensions: technological capability, human-centered design, and system resilience. The framework suggests that the effectiveness of educational MIS depends not only on technological advancement but also on its capacity to support educators, students, and administrative personnel while responding flexibly to evolving educational demands. These findings provide practical guidance for developing sustainable, adaptive, and learner-oriented digital management systems in educational institutions.

Keywords: Educational Information Systems; Industry 5.0; Human-Centricity; Resilience; Digital Transformation in Education.

INTRODUCTION

Advances in digital technology have driven significant transformations in Management Information Systems (MIS), particularly in the paradigm shift from Industry 4.0 to Industry 5.0. In the Industry 4.0 era, information systems in educational institutions focused on automation and administrative efficiency through the integration of technologies such as artificial intelligence (AI), the Internet of Things (IoT), and cyber-physical systems. However,

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Industry 5.0 introduces a fundamental shift that emphasizes the integration of humans and technology, aiming not only to enhance institutional productivity but also human well being, sustainability, and system resilience (Xu et al., 2021). Consequently, modern information systems in educational institutions are required to be not only technically efficient but also adaptive, ethical, and human-centered.

In the educational context, this transformation is especially significant. Educational institutions from schools to universities are increasingly dependent on digital systems for learning management, student data processing, and institutional decision-making. Yet the rapid adoption of these technologies has exposed a critical gap: many educational MIS implementations prioritize operational efficiency without adequately addressing the pedagogical, ethical, and resilience dimensions required in the Industry 5.0 era. The emergence of digital disruption accelerated by global connectivity and amplified through digital media platforms further underscores the need for educational information systems that can withstand disruption while maintaining learning continuity (Mursid, Fakhruzein, Jaya, Aziz, Misidawati, & Gunawan, 2026).

In the field of Educational Technology, Management Information Systems (MIS) have evolved beyond administrative tools into strategic infrastructures that support digital learning ecosystems. Contemporary educational MIS are increasingly integrated with Learning Management Systems (LMS), learning analytics, adaptive learning platforms, and digital assessment systems to improve learning quality and institutional effectiveness. Learning analytics, for instance, enables educational institutions to monitor student engagement and provide evidence-based interventions, while LMS platforms facilitate flexible and personalized learning experiences (Ifenthaler & Yau, 2020; Viberg & Gronlund, 2023). Consequently, MIS development in the Industry 5.0 era should not only prioritize operational efficiency but also contribute to meaningful learning experiences, educational quality, and sustainable digital learning environments (Bond et al., 2020).

Research on MIS in educational institutions remains dominated by technical approaches and focuses on technology adoption such as the TAM and UTAUT models which emphasize individual acceptance of technology. These approaches tend to overlook post adoption aspects, including social impacts, ethical considerations, and the long-term sustainability of educational systems. Furthermore, systematic literature reviews that integrate the concepts of human centricity and resilience within the specific context of educational MIS remain limited (D. Pacheco & Iwaszczenko, 2024).

In the Indonesian context, the implementation of digital transformation in educational institutions still faces structural challenges such as the digital literacy gap, infrastructure limitations, and a low integration of human centered values into organizational information systems. Many educational institutions still focus on improving technological efficiency without considering the impact on teacher and student well-being and system sustainability. This indicates that MIS development in Indonesian educational institutions is still in a transitional phase toward the Industry 5.0 paradigm.

Previous studies have largely examined Industry 5.0 from the perspectives of manufacturing systems, organizational transformation, and digital innovation (Crnobrnja et al., 2023; Xu et al., 2021). Meanwhile, studies in Educational Technology have often focused on specific technological applications such as LMS, learning analytics, and smart learning environments without integrating the principles of human-centricity and resilience into a comprehensive educational MIS framework (Sharif & Atif, 2024). Therefore, a research gap

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remains regarding how educational management information systems can be redesigned to align with the human-centered and resilient vision of Industry 5.0.

Based on this background, this study addresses the following research question: How can the reorientation of Management Information Systems in educational institutions toward a human-centric and resilient approach be developed based on a literature synthesis in the Industry 5.0 era? The objectives of this study are to (1) identify research trends related to MIS in educational institutions in the context of Industry 5.0, (2) analyze the integration of human centricity and resilience concepts in the educational MIS literature, and (3) propose a SIM 5.0 conceptual framework that can serve as a reference for the development of modern educational information systems.

This study contributes in three main aspects. Theoretically, this study expands understanding of the transformation of Management Information Systems from an Industry 5.0 perspective within the educational sector. Methodologically, this study employs a Systematic Literature Review approach combined with bibliometric analysis to produce a structured and comprehensive synthesis. Practically, this study provides recommendations for educational institutions in designing information systems that are not only technology oriented but also consider human, ethical, and system resilience aspects in the face of educational change.

METHOD

This study employs a Systematic Literature Review (SLR) approach combined with bibliometric analysis to examine the development of Management Information Systems in educational institutions in the context of Industry 5.0, particularly regarding human centricity and resilience. This approach was chosen because it provides a systematic, objective, and visual mapping of research trends, relationships between concepts, and the structure of knowledge within the field under study.

The research process adheres to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines, which include the stages of identification, screening, eligibility assessment, and selection of articles for analysis. Research data were systematically retrieved from four primary sources: Google Scholar, accredited national journals indexed in the Science and Technology Index (Sinta), Scopus, and Web of Science (WoS). Each database was searched using a tailored strategy to optimize retrieval precision. In Google Scholar, the following Boolean query was applied: ("Management Information System" OR "Educational MIS") AND ("Industry 5.0" OR "Human-Centric" OR "Resilience") AND ("Digital Learning" OR "Educational Technology"). In Scopus and Web of Science, advanced field-specific search functions were employed targeting Title, Abstract, and Keywords (TITLE-ABS-KEY), using the string: ("management information system" AND "education") AND ("industry 5.0" OR "human-centric" OR "resilience"). For Sinta-indexed national journals, searches were conducted via the GARUDA portal (Garba Rujukan Digital) employing equivalent Indonesian-language terms, including "Sistem Informasi Manajemen Pendidikan," "Industri 5.0," "Ketahanan Digital," and "Transformasi Digital Pendidikan." All searches were restricted to peer-reviewed publications issued between 2021 and 2025 to ensure the currency and direct relevance of the evidence base.

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The article selection process followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure transparency and rigor in the identification, screening, eligibility assessment, and inclusion of relevant studies (Page, McKenzie, Bossuyt, Boutron, Hoffmann, Mulrow, & others, 2021).

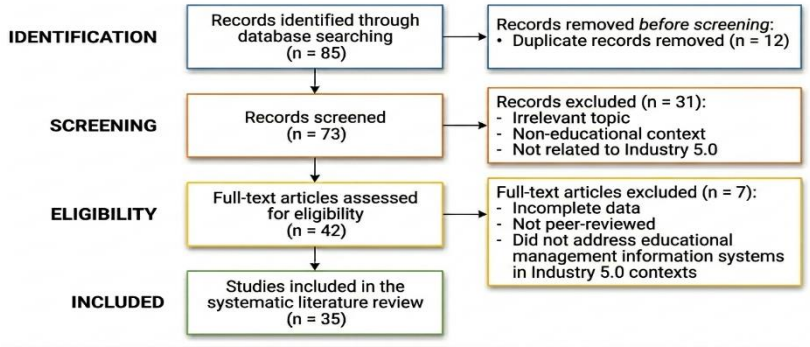

Figure 1. PRISMA Flow Diagram of Article Selection Process

As illustrated in Figure 1, the initial database search identified 85 records. After removing 12 duplicate records, 73 articles were screened based on titles and abstracts. Subsequently, 42 full-text articles were assessed for eligibility, and 7 articles were excluded due to incomplete data, lack of peer-review status, or insufficient relevance to educational management information systems and Industry 5.0. Ultimately, 35 studies met the inclusion criteria and were included in the final review.

During the literature selection process, inclusion criteria required articles to be scientific publications relevant to educational MIS in the context of Industry 5.0, with a clear methodology and available in full text. Articles that were irrelevant, lacked a strong methodological foundation, or were duplicates were excluded. The selection process yielded a final set of 35 articles suitable for in depth analysis.

Data analysis was conducted through thematic synthesis and qualitative content analysis. The selected articles were systematically examined to identify dominant themes, conceptual relationships, and research gaps regarding educational management information systems in the Industry 5.0 era. The synthesis process enabled the identification of recurring patterns related to technological innovation, human-centricity, and resilience within educational contexts.

Following the completion of article selection and thematic synthesis, bibliometric analysis was conducted using VOSviewer version 1.6.20, a specialized software program designed for the construction and visualization of bibliometric networks (van Eck & Waltman, 2010). The bibliometric mapping encompassed two analytical procedures: (1) keyword co-occurrence analysis, aimed at identifying dominant research themes and their conceptual interrelationships across the reviewed corpus; and (2) thematic mapping, utilized to trace the density and relevance of conceptual nodes within the knowledge structure of the field. To ensure analytical validity, a minimum keyword occurrence threshold of two was established, and only terms appearing across a sufficient number of documents were retained for visualization. The resulting network maps were subsequently interpreted in conjunction with the qualitative thematic synthesis to produce an integrated and cross-validated understanding of the current research landscape concerning educational MIS in the Industry 5.0 era.

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RESULTS

The results of the systematic literature review indicate that the development of Management Information Systems (MIS) in educational institutions during the Industry 5.0 era has undergone a significant paradigm shift compared to the Industry 4.0 era. These changes reflect not merely technological advancement but a shift in values from efficiency-oriented systems toward systems focused on people, sustainability, and resilience within educational ecosystems (Crnobrnja et al., 2023; Xu et al., 2021).

Bibliometric Mapping and Knowledge Structure Analysis

The bibliometric analysis conducted using VOSviewer generated visual representations of the keyword co-occurrence network, thematic clusters, and conceptual density patterns within the body of literature pertaining to educational MIS in the Industry 5.0 era. As illustrated in Figure 2, the co-occurrence network derived from the 35 selected publications reveals three primary thematic clusters that reflect the dominant intellectual orientations within the field.

The first cluster, organized around the central nodes "Management Information System," "e-learning," and "learning analytics," represents the technological infrastructure dimension of educational MIS scholarship. This cluster encompasses subthemes such as cloud computing, adaptive learning platforms, and digital assessment systems, indicating that the existing body of research has historically concentrated on the technical architecture and functional deployment of information systems in educational institutions. The second cluster, anchored by "human-centricity," "student engagement," and "well-being," reflects the progressive emergence of people-centered design principles within educational technology discourse. This cluster integrates concepts of digital equity, educator empowerment, and ethical artificial intelligence deployment, suggesting a gradual broadening of the field's analytical focus beyond purely technical concerns. The third cluster, structured around "resilience," "sustainability," and "learning continuity," highlights the increasing scholarly attention directed toward the institutional adaptability and crisis-responsive capacity of educational systems in the face of rapid technological and social disruption.

Of particular analytical significance is the structural position occupied by the node "Industry 5.0" within the co-occurrence network: it serves as a bridging node connecting all three identified clusters, empirically confirming its function as an overarching integrative framework that synthesizes the otherwise distinct discourses of technology, human-centricity, and resilience. However, the relatively sparse co-occurrence density between "resilience" and "Management Information System," as well as between "human-centricity" and "educational MIS," provides quantitative corroboration of the research gap identified in this study. Despite the growing recognition of these dimensions within broader Industry 5.0 policy and theoretical discourse, their systematic and simultaneous integration within the specialized literature on educational information systems remains empirically limited.

Furthermore, the temporal distribution of publications within the network reveals that A qualitative examination of publication trends suggests that studies published in earlier years were predominantly focused on technological dimensions, whereas more recent publications increasingly emphasize human-centricity and resilience. This temporal pattern suggests a progressive disciplinary reorientation of scholarly attention toward human-centric and resilience-oriented dimensions of educational MIS, a trajectory broadly consistent with the European Commission (2021) policy emphasis on sustainable, human-centric, and resilient industrial systems.

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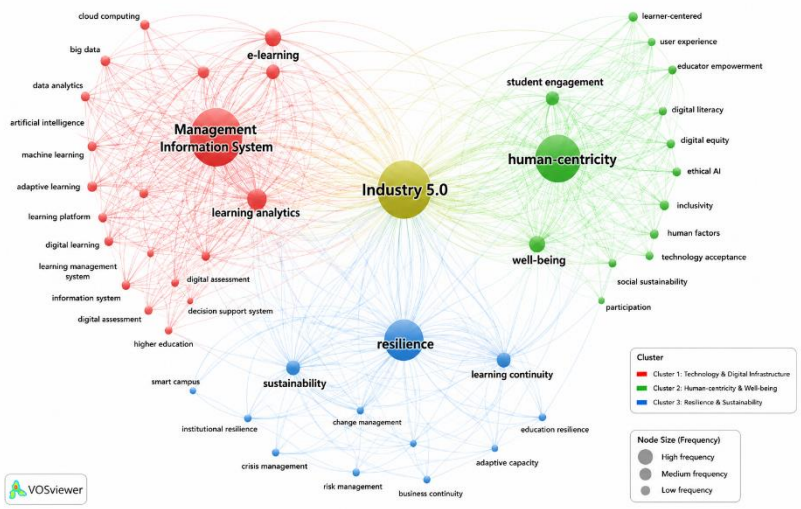

Figure 2. Keyword Co-occurrence Network of Educational MIS Research in the Industry 5.0 Era (VOSviewer analysis of 35 selected studies, 2021–2025)

Paradigm Shift: From MIS 4.0 to MIS 5.0 in Educational Institutions

Table 1 presents a comparison of Industry 4.0 and Industry 5.0 from the perspective of MIS in educational institutions. The shift from Industry 4.0 to Industry 5.0 is not merely a technological advancement, but a fundamental shift in the educational system paradigm. Industry 4.0 focused on process optimization through automation, while Industry 5.0 places educators, students, and administrative staff at the center of a technology supported educational system (European Commission, 2021).

Table 1. Comparison of Industry 4.0 and Industry 5.0 from an Educational MIS Perspective

Aspect	Industry 4.0	Industry 5.0	Implications for MIS in Education
Primary Focus	Efficiency, automation	Human-centricity, sustainability, resilience	Educational MIS shifts from administrative tools to human-centered learning management systems
Human Role	System operator/user	Decision-maker, co-creator, human-in-the-loop	Educators and students become central to system design and pedagogical decisions
Measures of Success	Productivity, speed, accuracy	Well-being, adaptability, sustainability	Educational outcomes, learning quality, and institutional adaptability
System Logic	Data-driven, control-oriented	Value-driven, human-oriented	MIS in education must integrate pedagogical ethics and learning resilience

Source: Adapted from Xu et al. (2021) and European Commission (2021)

The comparison in Table 1 shows that educational MIS must evolve beyond administrative data management to become a strategic system supporting learning quality, institutional adaptability, and the well being of all academic stakeholders. These findings align with the (European Commission, 2021), which emphasizes that Industry 5.0 is oriented toward systems that are human centric, sustainable, and resilient.

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Literature Synthesis and Research Themes

The literature synthesis identified three dominant themes in educational MIS research within the Industry 5.0 context. The first theme concerns technological innovation, including artificial intelligence, learning management systems, learning analytics, and digital transformation in education. The second theme focuses on human-centricity, particularly student engagement, teacher empowerment, digital well-being, and human-machine collaboration in learning environments. The third theme highlights resilience and sustainability, emphasizing learning continuity, institutional adaptability, and educational governance in response to technological and social disruption (Page et al., 2021; Viberg & Gronlund, 2023)

This pattern indicates that while technological approaches remain dominant in educational MIS research, there is an emerging shift toward a more balanced socio technical approach between humans and technology in educational settings. Table 2 synthesizes the key relevant studies.

Table 2. Synthesis of Key Studies on MIS and Industry 5.0 in Educational Contexts

No	Author/Year	Field of Study	Method	Key Findings	Relevance to Educational MIS
1	European Commission (2021)	Industry 5.0 Concept	Policy report	Three pillars: human-centric, sustainable, resilient	Foundation for redesigning educational information systems
2	Crnobrnja et al. (2023)	Digital Transformation toward Industry 5.0	SLR	Integrating technology with a human-centric approach	Context of MIS transformation in educational institutions
3	Mursid et al. (2026)	Digital Age & Economic Multiplier Effects	Descriptive-associative, t-test	Digital media amplifies multiplier effects on institutional and consumer behavior	Digital disruption in education institutions requires resilient MIS
4	Onyemelukwe et al. (2023)	Human-centricity in Industry 5.0	SLR	Focusing on well-being and the human role	Educators' and students' well-being as MIS design center
5	Szara (2025)	Resilience in Industry 5.0	SLR	Resilience remains underdeveloped in current systems	Educational MIS resilience needs systematic development

Source: Compiled from literature review (2021–2026)

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The synthesis in Table 2 shows that most studies still address the three pillars of Industry 5.0 (human centricity, sustainability, and resilience) in isolation and have not yet integrated them into a comprehensive educational MIS framework. Notably, the study by Mursid et al. (2026) on multiplier economic effects in the digital age provides an important contextual backdrop: digital media not only accelerates the spread of information but also amplifies institutional disruption effects, requiring educational MIS to be designed with resilience as a core feature rather than an optional add on.

DISCUSSION

Transformation of MIS in Educational Institutions: 4.0 - 5.0

The development of MIS in educational institutions is inextricably linked to changes in the industrial revolution paradigm. In the Industry 4.0 era, educational MIS evolved into digitally integrated systems leveraging AI, IoT, and big data for student records management, learning analytics, and institutional reporting. These technologies enabled educational organizations to improve administrative efficiency and accelerate data driven decisions. However, an approach overly focused on efficiency also raises critical issues in the educational context: the reduced role of educators in system design, algorithm driven enrollment or assessment decisions that may perpetuate bias, and increased technostress among students and faculty (D. A. D. J. Pacheco & Iwaszczenko, 2024).

In response, the concept of Industry 5.0 brings humans back to the center of the educational system. Technologies such as AI-powered learning management systems continue to be utilized, but explicitly as tools to support not replace human pedagogical judgment. The digital age has also demonstrated that institutional disruption can occur at unprecedented speed and scale.

The main difference between educational MIS 4.0 and MIS 5.0 lies in the system's orientation: MIS 4.0 focuses on efficiency driven systems emphasizing administrative productivity, whereas MIS 5.0 is oriented toward value-driven systems that consider not only efficiency but also human, pedagogical, and environmental values (Nuryana et al., 2024). This transformation involves a shift in the objectives and perspective regarding information systems in educational institutions.

Human-Centric Design in Educational MIS

In the educational context, human centric design means placing educators, students, and administrative staff at the center of MIS architecture. The study findings indicate that while human-centricity is recognized as a key theme, its implementation in educational MIS remains superficial often limited to user interface improvements without addressing more fundamental aspects such as algorithmic transparency in student assessment systems, educator control over data, and student involvement in system design (Sigfrids et al., 2023).

This situation gives rise to what may be termed "false human-centricity" in educational MIS systems that appear student centered through personalized interfaces but are actually controlled by opaque algorithmic logic. In the digital age, where social media platforms can rapidly disseminate information about institutional practices (Mursid, Fakhruzein, Jaya, Aziz, Misidawati, Gunawan, et al., 2026) educational institutions that fail to genuinely integrate human centric principles risk significant reputational consequences, paralleling the boycott dynamics observed in the business sector but manifesting as student protest, regulatory scrutiny, or enrollment decline.

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Furthermore, well being remains an under-integrated component in the development of educational information systems. The implementation of AI-based grading, automated attendance monitoring, and predictive analytics in student performance can lead to work-related stress for educators and anxiety among students if not designed with explicit attention to human well-being (Ardelia, 2023; Dwivedi et al., 2021). Therefore, a human centric approach in educational MIS must encompass psychological, social, and ethical aspects beyond mere usability improvement.

Ethics Integration in Educational MIS

The paradigm shift in educational MIS underscores that systems cannot be focused solely on administrative efficiency; they must also prioritize educational values, sustainability, and social responsibility. The use of AI in student admission systems, learning analytics platforms, and automated assessment tools raises critical ethical concerns such as algorithmic bias, data privacy for minors, and accountability for system based educational decisions (Floridi, 2024; Stahl, 2021).

Key ethical principles for modern educational management information systems include: (1) Transparency the system must be able to explain how academic decisions are derived, particularly when AI is involved; (2) Fairness educational MIS must be designed to minimize bias in student assessment and institutional resource allocation; (3) Data Privacy student data, being particularly sensitive, requires rigorous protection; (4) Educator Autonomy final pedagogical decisions must remain with qualified educators; and (5) Student Well being the system must support healthy learning environments rather than amplifying academic anxiety or technostress.

System Resilience in Educational Contexts

In the educational context, system resilience takes on particular importance given the disruptions that educational institutions have faced in recent years. The COVID-19 pandemic demonstrated that educational institutions with robust, adaptive digital information systems were better positioned to maintain learning continuity through emergency remote teaching transitions. This experience highlights that resilience in educational MIS encompasses both technical robustness and social organizational adaptability (Alves et al., 2023).

The findings of Mursid et al. (2026) on multiplier economic effects in the digital age provide a useful analytical lens for understanding resilience challenges in educational institutions. Just as digital media amplifies economic multiplier effects transforming localized boycotts into global movements with measurable institutional impacts digital channels can similarly amplify reputational, administrative, and pedagogical disruptions in educational institutions. An educational MIS designed with resilience as a core feature must therefore incorporate mechanisms for crisis communication, continuity planning, and adaptive learning delivery.

Furthermore, adaptation to disruption in educational MIS encompasses proactive anticipation of future disruptions and reactive management of those that have already occurred. This is achieved through flexible, modular system design that allows institutions to dynamically adapt to changing educational requirements whether government policy changes, curriculum reforms, or emergent pedagogical needs (Sariisik & Demir, 2025).

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Proposed SIM 5.0 Framework for Educational Institutions

This study proposes a Management Information System conceptual model for educational institutions in the Industry 5.0 era that integrates three main elements: technology, human-centricity, and system resilience. This framework was developed to overcome the limitations of previous research that examined these dimensions separately without integrating them into a comprehensive educational framework.

The first layer the Technology Layer includes digital technologies such as AI-powered learning management systems, IoT for campus management, cloud based student information systems, and data analytics for learning quality monitoring. These technologies enable real-time data processing, data-driven institutional decision-making, and improved educational service delivery. However, technological implementation without considering the human element risks creating dependency and reducing educators' pedagogical autonomy (Dwivedi et al., 2021).

The second layer the Human Centric Layer places educators, students, and administrative staff at the center of the educational system. Key elements include trust in digital learning systems, positive user experience for all academic stakeholders, transparency in AI-driven academic decisions, and the well being of the educational community. This layer is aligned with the Human Cyber Physical System (HCPS) concept, emphasizing that educational digital systems must enhance rather than diminish human (Lou et al., 2025; Nasir et al., 2025).

The third layer the Resilience Layer emphasizes the system's ability to withstand educational disruptions through adaptive, flexible, and recoverable characteristics. In the context of the digital age, where disruption can spread rapidly through online channels as demonstrated by Mursid et al. (2026), educational MIS must incorporate predictive analytics for early warning, modular architecture for quick adaptation, and robust governance for maintaining institutional continuity.

SIM 5.0 and Educational Technology Development

The proposed SIM 5.0 framework has important implications for educational technology development. In contemporary educational institutions, management information systems increasingly function as the backbone of digital learning ecosystems through the integration of Learning Management Systems (LMS), student information systems, digital assessment platforms, and learning analytics technologies. Previous studies have demonstrated that learning analytics and digital learning systems contribute to improved learning design, communication, and educational effectiveness in higher education institutions (Drugova et al., 2024). Evidence from Indonesian higher education also indicates that institutional e-learning platforms can effectively support independent learning and enhance students' learning flexibility when integrated into broader digital learning ecosystems (Hakim & Rahmadini, 2025). These systems support evidence-based decision making while improving educational effectiveness and learner engagement (Ifenthaler & Yau, 2020).

From a human-centric perspective, educational technologies should be designed to support meaningful learning experiences rather than merely automate administrative tasks. Adaptive learning platforms, AI-assisted feedback systems, and personalized learning environments can enhance student engagement while preserving educators' pedagogical autonomy and professional judgment (Crompton & Burke, 2023). The integration of multimedia-based learning resources and blended learning environments has also been shown

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to improve learning effectiveness and learner engagement in digital educational settings (Swara & Pratiwi, 2020). Such an approach is consistent with the Industry 5.0 vision that positions technology as a tool for empowering humans rather than replacing them.

The resilience dimension is equally important in educational technology. Learning management systems and digital learning platforms should support learning continuity during disruptions through cloud-based infrastructure, flexible access, and adaptive instructional delivery. The experiences of educational institutions during periods of crisis demonstrate that resilient educational technologies contribute significantly to institutional sustainability and learning continuity (Bond et al., 2020).

Therefore, the implementation of SIM 5.0 can contribute to the development of sustainable digital learning ecosystems that are adaptive, inclusive, and aligned with the principles of Educational Technology in the Industry 5.0 era.

To further demonstrate the relevance of the proposed SIM 5.0 framework to the field of Educational Technology, Table 3 synthesizes the implications of human-centricity, resilience, sustainability, and AI integration for digital learning ecosystems based on previous studies (Bond et al., 2020; Innovation & European Commission, 2021; Onyemelukwe et al., 2023; Viberg & Gronlund, 2023b).

Tabel 3. Educational Technology Implications of SIM 5.0

SIM 5.0 Component	Educational Technology Application
Human-Centricity	Personalized Learning and Student Engagement
AI Integration	Learning Analytics and Adaptive Learning
Resilience	Learning Continuity and Flexible Learning
Sustainability	Digital Learning Ecosystem Development
Governance	Ethical AI and Educational Data Protection

Source: Compiled from the reviewed literature (2021–2025)

As shown in Table 3, the proposed SIM 5.0 framework extends beyond administrative information management and contributes directly to educational technology development. Human-centricity supports personalized learning and student engagement, while AI integration facilitates learning analytics and adaptive learning environments. Furthermore, resilience and sustainability strengthen learning continuity and the development of digital learning ecosystems. These implications reinforce the role of educational MIS as a strategic component of educational technology in the Industry 5.0 era.

Furthermore, smart learning environments supported by learning analytics and immersive educational technologies can facilitate adaptive, collaborative, and data-driven learning experiences that align with the principles of Industry 5.0 (Sakr & Abdullah, 2024).

Implications for Indonesian Educational Institutions

Digital transformation in educational management requires not only technological infrastructure but also organizational readiness, institutional leadership, cross-organizational collaboration, and continuous professional development for educators (Márquez et al., 2023).

The transformation of educational MIS toward the Industry 5.0 paradigm carries specific implications for Indonesian educational institutions. Implementation of Industry 5.0-based MIS still faces challenges including the digital literacy gap among educators and students, infrastructure limitations particularly in non-urban areas, and an organizational

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culture that does not yet fully support human-centric approaches (Dharma, 2024; Nugroho & Wulandhari, 2025).

In the Indonesian educational context, the digital transformation of MIS must be adapted to local conditions. Many educational institutions currently use information systems primarily as administrative tools rather than as strategic systems supporting learning quality and institutional resilience. The transformation toward value driven educational systems requires capacity building for educators in digital literacy and data driven pedagogy, development of adaptive AI governance frameworks ensuring transparency and accountability in educational decision-making, and strengthening of digital infrastructure to ensure equitable access across institutional types and geographic regions.

CONCLUSION

This study concludes that the transformation of Management Information Systems in educational institutions from the Industry 4.0 era toward Industry 5.0 represents a fundamental paradigm shift. Educational MIS must evolve beyond administrative data management to become a strategic, value-driven system placing educators, students, and institutional well being at the center.

The findings indicate that while the concepts of human centricity, sustainability, and resilience have been recognized as the main pillars of Industry 5.0, their integration in educational information systems remains incomplete. Research tends to be dominated by technological approaches, leaving the ethical, human, and resilience dimensions underaddressed. The insights from Mursid et al. (2026) regarding the amplifying effects of digital media on institutional disruption further demonstrate that, in the digital age, educational institutions must design their MIS with resilience as a foundational feature, given that disruption originating in digital channels can propagate institutional challenges at unprecedented speed and scale.

As its main contribution, this study proposes an educational SIM 5.0 framework comprising three integrated layers: technology, human centricity, and resilience, specifically adapted for educational institution contexts. This framework emphasizes that the success of educational MIS is determined not only by technological sophistication but also by the system's ability to accommodate the diverse needs of the educational community while adapting to educational transformation.

Furthermore, the proposed SIM 5.0 framework may serve as a conceptual foundation for developing Learning Management Systems, learning analytics platforms, adaptive learning environments, and digital learning ecosystems that align with the principles of Educational Technology in the Industry 5.0 era. By integrating technological innovation with human-centered values and institutional resilience, educational institutions can better respond to future challenges while maintaining educational quality and learner well-being (Viberg et al., 2023).

In the Indonesian context, strategic efforts are needed in human resource capacity building for digital literacy, development of contextually appropriate AI governance frameworks, and strengthening of digital infrastructure. Future research should empirically test the proposed SIM 5.0 framework in diverse Indonesian educational institution contexts, examine the long term impact of human centric educational MIS on learning outcomes and institutional resilience, and develop evidence based implementation guidelines.

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