

The Impact of Digital Transformation in Higher Education: A Systematic Literature Review

Abidah Saad¹, Afida Ahmad^{2*}, Samsiah Bidin³

¹ Faculty of Business Management, Universiti Teknologi MARA (UiTM) Cawangan Kedah, Kampus Sungai Petani, Malaysia

² Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA (UiTM) Cawangan Kedah, Kampus Sungai Petani, Malaysia

³ Academy of Language Studies, Universiti Teknologi MARA (UiTM) Cawangan Kedah, Kampus Sungai Petani, Malaysia

ARTICLE INFO

Article history:

Received 13 October 2025

Revised 30 December 2025

Accepted 15 January 2026

Online first

Published 31 January 2026

Keywords:

Impact

Digital transformation

Higher education

PRISMA

SLR

DOI:

10.24191/ejssh.v10i1.9201

ABSTRACT

Digital transformation has emerged as a pivotal force in reshaping higher education, redefining pedagogical approaches, institutional governance, and the student learning experience. Despite its widespread adoption, implementation outcomes remain inconsistent due to varying degrees of technological infrastructure, strategic alignment, and digital competence across institutions. This study presents a systematic literature review that investigates the impact of digital transformation in higher education, with a focus on pedagogical innovation, organizational readiness, and technological integration. The review was guided by key questions that explored the institutional and educational impacts of digital transformation in higher education, examined the barriers and enabling factors that shape the effectiveness of digital initiatives, and investigated how outcomes differ across various institutional types and regional contexts. Using an advanced search protocol within the Scopus database, 39 peer-reviewed articles published between 2020 and 2024 were selected based on predefined inclusion criteria. The PRISMA framework was employed to ensure transparency and replicability, and thematic synthesis was used to extract and interpret findings across heterogeneous study designs. The synthesis revealed three dominant themes: institutional readiness and governance (38%), technological and pedagogical innovation (34%), and challenges of digital equity and infrastructure (28%). Findings indicate that when supported by strategic planning, system quality, and user engagement, digital transformation enhances operational efficiency, facilitates flexible learning environments, and promotes student-centered education. However, the review also highlights disparities in implementation, particularly in resource-constrained settings, as well as unresolved issues related to digital literacy, ethical concerns, and long-term sustainability. While digital platforms such as mobile learning tools, virtual laboratories, and learning management systems have demonstrated measurable benefits such as increased satisfaction, cost efficiency, and improved learning access, contradictory outcomes related to user experience and institutional adaptability still persist. The study concludes that digital transformation holds transformative potential for higher education, but its success requires coordinated institutional strategies, continuous impact evaluation, and equitable investment in digital capacity.

^{1*} Corresponding author. E-mail address: afidaahmad@uitm.edu.my

1. INTRODUCTION

The Fourth Industrial Revolution has triggered a systemic digital transformation in higher education institutions (HEIs), driven by the integration of artificial intelligence (AI), big data analytics, cloud computing, the Internet of Things (IoT), and extended reality (XR). This evolution extends beyond technological adoption to reconfiguring organizational culture, pedagogy, and student engagement, demanding a comprehensive rethinking of learning ecosystems to deliver flexible, personalized, and innovative educational experiences (Lang, 2023; Ha et al., 2024; Tissier et al., 2023; Bogdandy et al., 2020). Beyond internal transformation, HEIs are increasingly pressured by students, employers, and policymakers to demonstrate learning relevance, graduate employability, and institutional resilience, positioning digitalisation as both a strategic and competitive imperative.

Accelerated by the COVID-19 pandemic, which revealed critical vulnerabilities in traditional models, HEIs have invested in resilient, scalable infrastructures and hybrid learning environments supported by robust learning management systems (LMSs) that enable real-time analytics and adaptive feedback to enhance academic performance (McGreal, 2023; Liu & Shi, 2023; Grech et al., 2021; Narayanaswamy et al., 2024; OECD, 2021). Within this transformative landscape, micro-credentials have emerged as a strategic innovation, offering flexible, skills-focused pathways that enhance employability, foster lifelong learning, and address dynamic industry demands (Ali & Khan, 2023; Ngafeeson, 2021). These shifts have accelerated the demand for flexible, modular, and industry-relevant learning models that extend beyond traditional degree structures.

Supported by blockchain technologies, these digital certifications ensure authenticity and transparency in skill verification, broadening educational access and equity, particularly for marginalized populations (Rehman & Hashim, 2025; Sood et al., 2020; Kiiskilä et al., 2023; Brown et al., 2021). However, these advancements also raise critical ethical concerns, including data privacy, algorithmic bias, and the commodification of education, necessitating robust institutional governance, stakeholder collaboration, and adherence to ethical standards to ensure inclusive, equitable, and sustainable digital transformation (Xiang & Guo, 2024; Liu, 2023; Kabashi et al., 2024; Peacock et al., 2020; OECD, 2023; Ha et al., 2022).

Prior research on digital transformation in higher education spans areas such as pedagogy, technology adoption, institutional readiness, and governance, yet the findings remain fragmented and often inconsistent. While some studies report improved engagement, flexibility, efficiency, and access, others highlight ongoing challenges related to digital inequality, faculty resistance, ethical risks, and sustainability. This fragmentation reveals a clear research gap and underscores the need for an integrated synthesis. Accordingly, to address this gap, this study aims to systematically review and synthesise empirical research on digital transformation in higher education to identify dominant themes and clarify the conditions under which it meaningfully enhances educational quality, institutional performance, and equity.

This study advances both theory and practice in higher learning education by synthesising fragmented empirical findings into a coherent understanding of digital transformation as a multidimensional institutional process. The findings provide evidence-based insights to support higher education leaders, policymakers, and educators in developing effective digital strategies, governance frameworks, and pedagogical practices, while also highlighting the potential of inclusive and well-governed digital transformation to expand access, reduce digital inequalities, and promote sustainable higher education systems. Against this backdrop, the following literature review synthesises current scholarship on digital transformation in HEIs, focusing on enabling technologies, implementation approaches, micro-credential ecosystems, and governance mechanisms that shape educational quality and equity.

2. LITERATURE REVIEW

2.1 Digital Transformation

Digital transformation (DT) in higher education represents a profound shift that extends beyond the mere adoption of technology, fundamentally reshaping institutional processes, culture, and value delivery. Accelerated by global events such as the COVID-19 pandemic, DT has exposed both opportunities for innovation and challenges related to digital equity, ethical governance, and sustainability (Gkrimpizi et al., 2023; Graham et al., 2023; Radu, 2023). At its core, DT emphasizes a learner-centered model in which the digital learning environment is restructured to enhance engagement and outcomes (Kuzu, 2020). Achieving this vision requires strategic planning, the upskilling of academic staff, and the integration of new pedagogies that respond to evolving learner and labor market demands (Kuzu, 2020; Graham et al., 2023). However, many institutions limit DT to technological integration without corresponding pedagogical or organizational reforms, undermining its transformative potential (Graham et al., 2023). Addressing this limitation calls for holistic approaches that align teaching methodologies, infrastructure readiness, and institutional culture (Gkrimpizi et al., 2023).

The pandemic has underscored the urgency of such changes, with institutions rapidly adopting virtual learning models that, while initially disruptive, have established new norms in educational delivery (Mohamed et al., 2021; Radu, 2023). These developments have highlighted the importance of digital equity, ensuring that all students have fair access to the resources needed for meaningful participation in the digital learning space (Kaplia et al., 2024; Sushchenko et al., 2022). The crisis also catalyzed innovative practices such as blended learning, flexible curricula, and technology-enabled assessment that reveal DT's potential for lasting systemic change (Pham et al., 2021; Karpov & Karpova, 2022). Collectively, these shifts suggest that successful digital transformation requires not only technological adoption but also a reimagining of educational systems to foster resilience, inclusivity, and long-term sustainability.

2.2 Digital Transformation in Higher Education

Navigating digital transformation (DT) in higher education requires a strategic leadership approach that aligns institutional priorities with the evolving demands of the contemporary educational landscape. Leaders must not only embrace technological advancements but also cultivate a deep understanding of strategic practices that drive innovation, resilience, and long-term sustainability (Carvalho et al., 2021; Suharto, 2023). In this context, strategic leadership involves setting a clear vision that reflects emerging digital trends, fostering a culture of adaptability, and ensuring responsiveness to change. This is particularly vital as higher education institutions (HEIs) face growing pressures to promote digital equity, guaranteeing that all students have equitable access to the resources, tools, and skills necessary to thrive in a technology-driven environment (Jaafar et al., 2022; Carvalho et al., 2021).

Effective strategic leadership is characterized by the ability to mobilize resources efficiently, implement innovative practices, and actively engage stakeholders including faculty, students, and administrators throughout the digital transformation process (Suharto, 2023; Zakaria et al., 2021). This requires leaders to evaluate the impact of technology initiatives not only on academic outcomes but also on the creation of inclusive and supportive learning environments (Mahere, 2024; Özdemir et al., 2020). Equitable access to digital tools and professional development opportunities must be prioritized to address disparities that technological advancements may exacerbate (Özdemir et al., 2020; Jubouri, 2024). Moreover, integrating leadership development with strategic management practices strengthens institutional capacity by equipping educators and administrative staff with the skills to harness digital tools effectively (Kaur et al., 2025; Chehdimae & Ali, 2022). This dual emphasis on visionary leadership and practical implementation enables HEIs to navigate the complexities of DT while remaining committed to their core mission of enhancing learning experiences and improving student outcomes (Kaur et al., 2025; Zakaria et al., 2021).

2.3 Pedagogical Innovations and Teaching Practices

Studies report that digital tools have enhanced student engagement, collaboration, and skill acquisition across disciplines, from architecture and music to language learning (Yorgancıoğlu & Dağlıoğlu, 2023; Shi, 2023; Wang, 2023). Digital formative assessment frameworks (Kaya-Capocci et al., 2022) and AI-enhanced instructional tools (Zhang & Wu, 2023) support active and personalized learning, yet their effectiveness depends heavily on faculty readiness and institutional support (Alkandari et al., 2024). While findings underscore improved creativity, interactivity, and inclusivity, others caution that digital transitions can strain faculty well-being and student mental health, especially where support systems are limited (Sharma & Sharma, 2022; Afshar Jahanshahi & Polas, 2023). Research also highlights the importance of inclusive, multimodal teaching strategies—such as role-playing and audiovisual aids—to accommodate diverse learner needs (Paustovska et al., 2024).

2.4 Institutional Readiness, Governance, and Strategic Management

Institutional readiness and governance are pivotal for successful DT implementation. Strategic alignment, leadership commitment, and cultural adaptability are repeatedly cited as prerequisites for sustainable transformation (Valdés et al., 2021; Veseli et al., 2025). Case studies from Peru, Chile, and the Middle East show that crisis-induced adoption of digital tools can result in lasting institutional reforms if paired with capacity-building initiatives and inclusive governance (Alvarado-Acosta et al., 2024; Al-Shamsi, 2024). At the same time, AI-enabled governance models offer opportunities for improved decision-making and personalization (George & Wooden, 2023) but raise concerns about job displacement, ethical oversight, and over-reliance on global technology providers (Pashkov & Pashkova, 2022). These tensions underscore the need for a balanced approach that integrates innovation with ethical safeguards.

2.5 Technology Adoption and Infrastructure for Educational Continuity

Maintaining the continuity of academic operations during disruptions relies heavily on the effective adoption of digital technologies such as learning management systems, mobile learning applications, and virtual laboratories. Studies by Drwish et al. (2023) and Allam et al. (2024) show that the success of these tools depends on factors including user acceptance, system quality, and an institution's readiness for change (Pham et al., 2021; Karpov & Karpova, 2022). In skill-intensive fields such as engineering, immersive learning technologies have been particularly impactful, offering realistic, hands-on interactions in virtual environments that significantly enhance the learning experience (Cabatan et al., 2021).

Administrative digitalization initiatives, such as Erasmus Without Paper, have further improved institutional efficiency by streamlining processes and reducing bureaucratic barriers (George & Wooden, 2023). Yet, as Guşe and Mangiuc (2022) note, resource-constrained institutions face unique challenges that require context-specific adoption strategies, taking into account existing infrastructure and capacity limitations (George & Wooden, 2023). Addressing these constraints is essential for maximizing the benefits of digital tools while creating an environment that supports both effective learning and operational excellence.

2.6 Research Gaps and Scholarly Debates

Despite the growing body of evidence, there is limited longitudinal research assessing DT's sustained impact on student outcomes, institutional resilience, and equity. Much of the literature emphasizes successful transformations, leaving underexplored the lessons from failed or stalled initiatives. Scholarly debates continue over the commercialization of education, the erosion of academic independence, and the governance of AI-driven systems (Pashkov & Pashkova, 2022; George & Wooden, 2023). There is a pressing need for integrative frameworks that combine technological innovation, pedagogical redesign, and socio-cultural inclusion to ensure equitable benefits from DT. Future research should focus on developing cross-disciplinary models that address these intersecting dimensions.

3. MATERIALS AND METHODS

3.1 Identification

As dictated by the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines (Pérez-Neri et al., 2022), the identification phase is the most critical step of the Systematic Literature Review (SLR) process. This phase is to identify all potentially relevant studies using a comprehensive and properly specified search strategy and it involves building search strings, selecting appropriate academic databases, and retrieving bibliographic records without applying any inclusion or exclusion criteria at this stage. This collection forms the basis for systematic screening and eligibility assessment at later stages. All relevant terms were established, and search strings were created for Scopus databases (see Table 1). Scopus is widely recognized to have a large collection of peer-reviewed scholarly documents; thus, it is a sufficient and stable platform upon which researchers can conduct systematic searching in accordance with the objectives of their research (Arya et al., 2021). By using this search strategy, 414 academic articles were identified, and these records form the first dataset that will then be further screened according to rigorous criteria for relevance, quality, and reliability to the research.

Table 1. The First stage of searching using Scopus

Scopus	TITLE-ABS-KEY (impact AND "digital transformation" AND "higher education") Date of Access: June 2025
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3.2 Screening

The next step in the Systematic Literature Review (SLR) process was screening the obtained studies. 414 records were identified from the Scopus database using the keywords "digital transformation" AND "corporate governance," This is a step designed to identify the initial dataset using some inclusion criteria, thus maintaining the most fitting, current, and high-quality publications to be subjected to proper analysis (Page et al., 2021). Screening is a critical step that enhances the validity and specificity of the review. It eliminates studies that are not within the research goals stipulated.

Several screening factors were implemented to guide the choice. First, since English remains the dominant language of academic conversation and allows analysis to be uniform, only English-language articles were considered (Moylan et al., 2022). Second, in order to capture the most recent and relevant developments in the areas of digital transformation and corporate governance, the publication time was limited within the timeframe of 2020-2025. This period of time embraces the rapid development of technological innovation and the deep influence on organizational governance structures in the post-pandemic world (Singh & El-Kassar, 2023).

Additionally, for ensuring academic rigor and credibility, only peer-reviewed journal articles were retained. This is in accordance with systematic review conventions which prefer sources that have been scholarly peer reviewed (Boell & Cecez-Kezmanovic, 2015). The review further retained only original research articles. Other forms of documents such as conference proceedings, book chapters, editorials, and review articles that typically lack empirical data or primary findings were discarded.

Based on the application of these exclusion criteria, 247 records were excluded from the initial dataset. These exclusions were largely due to reasons such as non-English language, publication before 2020, or the content not being defined as a journal article. Therefore, 167 records were left to undergo further evaluation in the eligibility process.

The screening phase plays the important role of filtering the quality and appropriateness of the SLR. Through its focus on new, peer-reviewed, and evidence-based literature, the review gains a acute sensitivity towards its academic superiority while cutting itself down to research that offers insightful contributions

into the dynamic interaction between digital transformation and corporate governance across different organizational and industrial contexts (Wang et al., 2024).

Table 2. The Selection Criterion in Searching

Criterion	Inclusion	Exclusion
Language	English	Non-English
Time line	2020 – 2025	< 2020
Document type	Article	Conference paper, Book chapter, conference review, review, book, editorial
Source type	Journal	Conference proceeding, book series, book, trade journal

3.3 Eligibility

At the third stage, i.e., the eligibility stage, there were 167 articles awaiting screening. At this stage, 99 articles were selected since 68 articles were excluded as no full-text access was acquired. The titles and major content of the selected 99 articles were carefully examined to ensure that they satisfy the inclusion criteria and are pertinent to the current research objectives. Thus, 60 articles and papers were excluded as they did not qualify on the basis of out of field, title not relevant, and abstract not relevant to the study purpose. So, 39 articles remain for the next review.

3.4 Data Abstraction and Analysis

At this stage, the titles, abstracts, and, if suitable, the complete texts of the remaining articles were carefully examined. The main objective was to verify that the research provided pertinent empirical insight into the convergence of digital transformation and corporate governance.

During the eligibility process, 60 articles were eliminated. Some of the well-known reasons justified their elimination. First, there were studies that were out of scope, i.e., they did not directly examine how digital transformation impacted higher education. Second, there were some articles with unclear or irrelevant titles and abstracts to the research agenda in question. Finally, a few studies were excluded since they also had limited access to full-text materials such that a proper evaluation of their contribution was not possible.

As a result, 39 articles were deemed eligible and selected for data extraction. These articles are the most relevant, recent, and methodologically sound additions to the research base. They will serve as the substrate for the subsequent analysis phase, where detailed information such as publication year, authors, study design, geographic location, key findings, and implications will be systematically extracted. This careful selection and elimination process ensures that the review is accurate, trustworthy, and in agreement with the intended purpose of the study, ultimately resulting in enhanced understanding in terms of the role played by digital transformation in moulding the landscape of higher education.

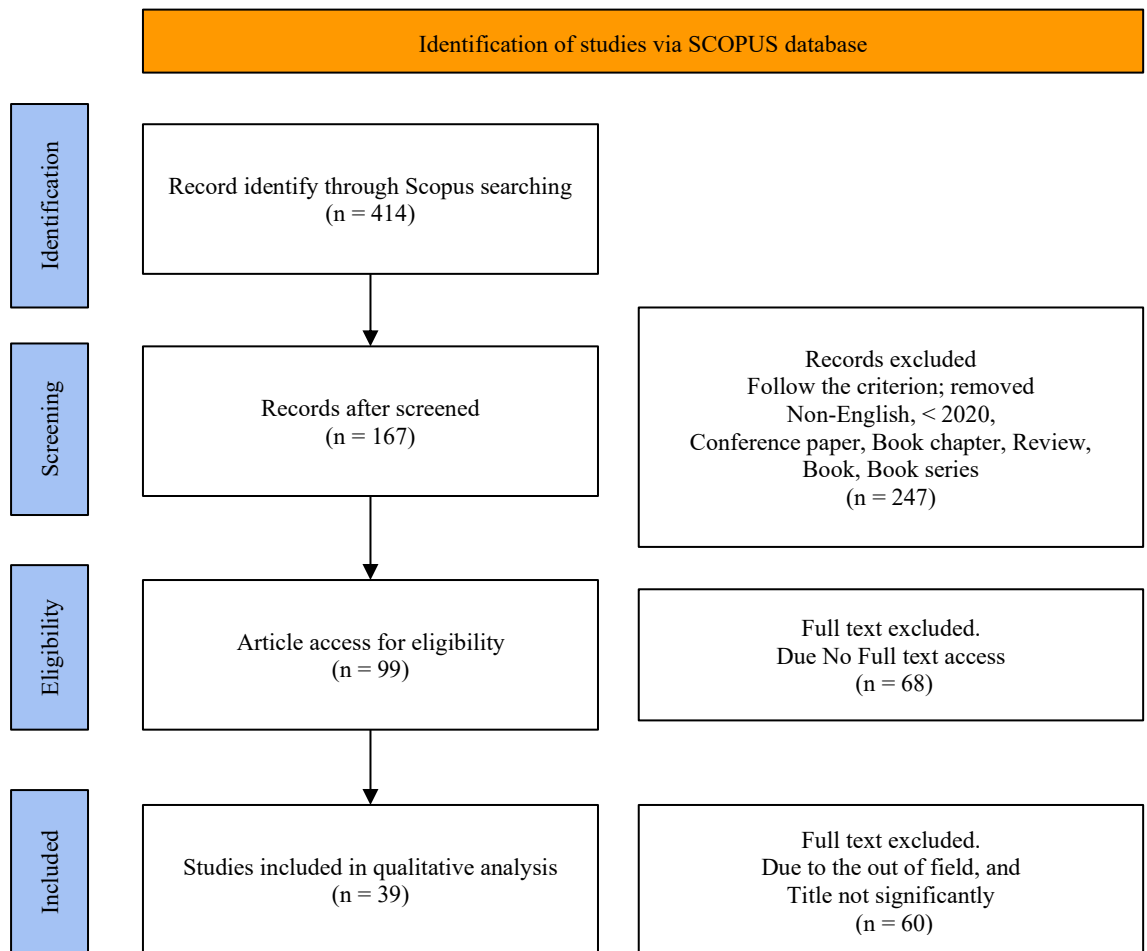


Fig. 1. Flow diagram of the proposed searching study

Table 3. Number and details of Primary Studies (PS) using SCOPUS Database

No	Authors	Title	Year	Source title
1	Acuna J.M.M.; Hernandez-Perlines F.; Cisneros M.A.I.	Digital transformation model for universities: A preliminary proposal	2024	International Journal of Education and Practice
2	Yorgancıoğlu D.; Dağlıoğlu E.K.	The Digitalization of Studio Practices and Its Impact on the Development of Design Literacy of First-Year Architecture Students	2023	FormAkademisk
3	Ramírez-Montoya M.S.; McGreal R.; Agbu J.-F.O.	Complex Digital Horizons in the Future of Education 4.0: Insights from UNESCO	2022	RIED-Revista Iberoamericana de Educacion a Distancia
4	Zhang J.; Wu Y.	Impact of university teachers' digital teaching skills on teaching quality in higher education	2025	Cogent Education
5	Wang Y.	Artificial Intelligence Technologies in College English Translation Teaching	2023	Journal of Psycholinguistic Research
6	Liu Q.	Digital Transformation of Higher Education in China: Ways to Improve Academic Performance	2024	Croatian Journal of Education
7	Tri N.M.; Hoang P.D.	The Impact of Digital Transformation in Higher Education: The Case Study from Vietnam	2023	Journal of Higher Education Theory and Practice

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| 8 | Delgado F. | Extending Learning and Collaboration in Quantum Information with Internet Support: A Future Perspective on Research Education beyond Boundaries, Limitations, and Frontiers | 2023 | Future Internet |
| 9 | Yang L. | Exploration of Digital Transformation Path of Education Management in Colleges and Universities in the Internet Era | 2024 | Applied Mathematics and Nonlinear Sciences |
| 10 | Awdziej M.; Jaciow M.; Lipowski M.; Tkaczyk J.; Wolny R. | Students Digital Maturity and Its Implications for Sustainable Behavior | 2023 | Sustainability (Switzerland) |
| 11 | Shenkoya T.; Kim E. | Sustainability in Higher Education: Digital Transformation of the Fourth Industrial Revolution and Its Impact on Open Knowledge | 2023 | Sustainability (Switzerland) |
| 12 | Katsamakos E.; Pavlov O.V.; Saklad R. | Artificial Intelligence and the Transformation of Higher Education Institutions: A Systems Approach | 2024 | Sustainability (Switzerland) |
| 13 | Afshar Jahanshahi A.; Polas M.R.H. | Moving toward Digital Transformation by Force: Students' Preferences, Happiness, and Mental Health | 2023 | Electronics (Switzerland) |
| 14 | Salama R.; Hinton T. | Online higher education: current landscape and future trends | 2023 | Journal of Further and Higher Education |
| 15 | Sharma S.; Sharma M. | Impact of Digital Transformation on Academicians' Well-being: A Study with the Moderating Role of Public and Private Universities in India | 2022 | Digital Education Review |
| 16 | Rahmanov F.; Neymatova L.; Hashimova A.; Aghazada T. | Quantitative Appraisal and Scientometric Exploration into the Digitization of Education | 2024 | Financial and Credit Activity: Problems of Theory and Practice |
| 17 | Guo-Brennan L. | Making Virtual Global Learning Transformative and Inclusive: A Critical Reflective Study on High-Impact Practices in Higher Education | 2022 | Journal of Teaching and Learning |
| 18 | Fülöp M.T.; Breaz T.O.; He X.; Ionescu C.A.; Cordoş G.S.; Stanescu S.G. | The role of universities' sustainability, teachers' wellbeing, and attitudes toward e-learning during COVID-19 | 2022 | Frontiers in Public Health |
| 19 | Kolomiets O.; Litvinova T. | Analysis of the situation in higher education during the COVID-19 pandemic in the world: Opportunities and threats of online training | 2020 | Economic Annals-XXI |
| 20 | Antonopoulou K.; Begkos C.; Zhu Z. | Staying afloat amidst extreme uncertainty: A case study of digital transformation in Higher Education | 2023 | Technological Forecasting and Social Change |
| 21 | Terkej W.; Kleine K.; Kuts V. | Virtual labs for higher education in industrial engineering | 2024 | Proceedings of the Estonian Academy of Sciences |
| 22 | Paustovska M.; Lytovchenko S.; Marieiev D.; Bazylak N.; Malii A. | Approaches to inclusive foreign language instruction in higher education | 2024 | Salud, Ciencia y Tecnologia - Serie de Conferencias |
| 23 | Drwish A.M.; Al-Dokhny A.A.; Al-Abdullatif A.M.; Aladsani H.K. | A Sustainable Quality Model for Mobile Learning in Post-Pandemic Higher Education: A Structural Equation Modeling-Based Investigation | 2023 | Sustainability (Switzerland) |
| 24 | Kaya-Capocci S.; O'Leary M.; Costello E. | Towards a Framework to Support the Implementation of Digital Formative Assessment in Higher Education | 2022 | Education Sciences |
| 25 | Guşe G.R.; Mangiuc M.D. | Digital Transformation in Romanian Accounting Practice and Education: Impact and Perspectives | 2022 | Amfiteatru Economic |
| 26 | Herrera-Granda E.P.; Aza-Espinosa M.J.; Burbano-Pulles M.; Mina-Ortega J.; Herrera-Granda I.D.; Yambay-Vallejo W.J. | Statistical Analysis of Digital Transformation and Its Incidence in Reducing the Use of Paper In A Higher Education Institution: A Case Study | 2024 | Journal of Technology and Science Education |
| 27 | De Jesus Wong-Galvez A.J.; Libaque-Saenz C.F. | The relationship between digital transformation, financial support, and | 2023 | Issues in Information Systems |

		innovation in higher education institutions: Evidence from Peruvian universities		
28	López-Nores M.; Pazos-Arias J.J.; Gölcü A.; Kavrar Ö.	Digital Technology in Managing Erasmus+ Mobilities: Efficiency Gains and Impact Analysis from Spanish, Italian, and Turkish Universities	2022	Applied Sciences (Switzerland)
29	Valdés K.N.; Alpera S.Q.Y.; Suárez L.M.C.	An institutional perspective for evaluating digital transformation in higher education: Insights from the Chilean case	2021	Sustainability (Switzerland)
30	Shi S.	Research on the Innovation Path of Music Education in Higher Vocational Colleges and Universities in the Context of the New Era	2024	Applied Mathematics and Nonlinear Sciences
31	Veseli A.; Hasanaj P.; Bajraktari A.	Perceptions of Organizational Change Readiness for Sustainable Digital Transformation: Insights from Learning Management System Projects in Higher Education Institutions	2025	Sustainability (Switzerland)
32	Alkandari F.; Alsaber A.; Al-Kandari A.; Alboloushi B.; AlMutairi S.	Enhancing the effectiveness of digital transformation on teaching in higher education in Kuwait	2024	Frontiers in Education
33	Rashid Al-Shamsi I.	Empowering Higher Education Through Digital Transformation and Strategic Planning for Academic Advancement	2024	Emerging Science Journal
34	Alvarado-Acosta A.; Fernández-Saavedra J.; Meneses-Claudio B.	Transformation and digital challenges in Peru during the COVID-19 pandemic, in the educational sector between 2020 and 2023: Systematic Review	2024	Data and Metadata
35	Huachara-Martinez E.; Erazo-Moreno M.M.; Paz-Checa D.P.; Chomba-Sung S.D.R.; Nina-Cuchillo J.	Digital Competencies in Collaborative Learning of Students in a Public University in Lima	2023	Journal of Higher Education Theory and Practice
36	Wardat S.; Akour M.	EFL instructors' perceptions of integration digital transformation in EFL learning context in Higher Education	2024	Journal of Infrastructure, Policy and Development
37	Pashkov M.V.; Pashkova V.M.	Problems and Risks of Digitalization in Higher Education	2022	Vysshee Obrazovanie v Rossii
38	George B.; Wooden O.	Managing the Strategic Transformation of Higher Education through Artificial Intelligence	2023	Administrative Sciences
39	Allam H.; Dempere J.; Kalota F.; Hua D.	Enhancing educational continuity: Exploring factors affecting the success of learning management systems in Dubai higher education	2024	Frontiers in Education

4. RESULT AND FINDING

4.1 Theme 1: Pedagogical Innovations and Teaching Practices in Digital Transformation

The integration of digital technology into the pedagogic practices of higher education has made a profound contribution to the innovation of teaching methodology, particularly in reaction to the turmoil introduced by global crises such as the COVID-19 pandemic. On a cross-disciplinary level, digital transformation has remodeled traditional education models, resulting in the use of new technologies for enhancing student learning. For instance, in architectural education, the sudden shift to online learning necessitated new computer technologies that restructured how students interact, collaborate, and learn design literacy (Yorgancioğlu & Dağlıoğlu, 2023; Paustovska et al., 2024; Shi, 2023). In music education, Shi (2023) demonstrates a quantifiable improvement in student creativity and rhythm accuracy with the use of digital equipment, further buttressing the argument that technology-enhanced instruction encourages higher engagement and learning innovation. At the same time, in foreign language education, EFL

instructors from Jordan found that digital transformation, despite having been challenging initially, enriched learning results by improving interactive and personalized engagement (EFL Instructors, 2024; Paustovska et al., 2024; Wang, 2023).

Technology-supported formative assessment models are key factors in rendering pedagogical innovation aligned with instructional goals. Kaya-Capocci et al. (2022) present a systematic framework for the implementation of digital formative assessment emphasizing feedback, self-assessment, and discussion through digital platforms. A grid approach such as this, since structured, provides instructors pragmatic ways to implement technology into assessment processes for the purpose of initiating student-centered learning. In agreement, Zhang and Wu (2023) confirm that digital pedagogical competencies, particularly in communication and feedback giving, play an important role in teaching quality. These observations are corroborated by Wang (2023), who further states that AI-backed translation tools offer substantial enhancements in skill acquisition. Together, these studies point to an overall pedagogical shift from passive content delivery to active, interactive, and technology-enabled instruction (Kaya-Capocci et al., 2022; Zhang & Wu, 2023; Wang, 2023).

Effective digital transformation is also contingent on readiness of faculty and institutional readiness. Alkandari et al. (2024) examined digital citizenship behavior and behavioral intention of Kuwaiti faculty and established that effort expectancy and social influence were essential variables in preparing for the adoption of digital tools into teaching. Nevertheless, some assumed relationships in technology acceptance models were falsified, showing the multidimensionality of faculty adjustment. Similarly, Sharma and Sharma (2022) reveal that the digital transitions are capable of having negative effects on psychological health, particularly for faculty at state universities, whose support systems are typically less robust. Fülöp et al. (2022) observe also varying degrees of engagement and satisfaction among Romanian faculty to digital tools, suggesting that without adequate support and training, pedagogical changes cannot be maintained. These studies collectively encourage institutional frameworks that cherish professional development, emotional support, and inclusive planning for digital adoption (Alkandari et al., 2024; Sharma & Sharma, 2022; Fülöp et al., 2022).

The performance of students in online learning environments has been greatly affected by the acquisition of digital skills. Huachara-Martinez et al. (2023) explore the effects of digital skills on collaborative learning among university students in Lima and develop a strong predictive relationship between competency level and productive teamwork. This aligns with a study by Afshar Jahanshahi and Polas (2023), which notes that students like short, interactive online courses but experience psychological distress, indicating the opposite nature of online education. Similarly, Paustovska et al. (2024) suggest inclusive and multimodal learning strategies, such as role-playing and audiovisual aids, that cater to different forms of student learning needs. The consensus shows an imperative for pedagogies that not only develop technical skill sets but also bring about inspiring learning cultures (Huachara-Martinez et al., 2023; Afshar Jahanshahi & Polas, 2023; Paustovska et al., 2024).

The cross-disciplinary implications of the research call for pedagogical systems that are adaptable, data-informed, and inclusive. Similar to architecture, music, EFL, and translation education curricula, the strategic use of digital tools has led to improved learning outcomes and innovation. Institutional culture, faculty digital literacy, and learner psychological resilience play a large role in the success of these innovations, though. Scientometric studies such as those of Rahmanov et al. (2024) confirm global tendencies of digitization, recording increased interest in publication on themes of digital pedagogy and education equity. Macro-level evidence combined with empirical analysis shows that pedagogic transformation needs to be varied such as combining technological, emotional, as well as pedagogical strategies for the good of all stakeholders in the learning system (Rahmanov et al., 2024; Kaya-Capocci et al., 2022; Shi, 2023).

Theme 2: Institutional Readiness, Governance, and Strategic Management of Digital Transformation

Higher education's digitalization, driven by global events and technological innovation, is a complex and varied phenomenon. Studies across contexts and institutional settings have highlighted difficulties and potential opportunities when higher education institutions integrate digital technologies in the academic and administrative architecture. The Chilean scenario, studied by Valdés et al. (2021), illustrates the impact of the institutional environment in digitalization in which it highlights that digital change is not just impactful on operational activities but also on institutional values. Veseli et al. (2025) also observe that successful digital transitions such as the implementation of Learning Management Systems (LMS) heavily depend on the organizational change preparedness of their institutions, that is, vision clarity, leadership endorsement, and internal malleability. Al-Shamsi (2024) further expands on this perspective by emphasising the fact that the integration of digital tools in strategic planning procedures significantly enhances the precision of decisions and resilience over a long period. Overall, these studies suggest that the success of digital transformation in higher education is contingent on a persistent congruence of the strategic, operational, and cultural aspects (Valdés et al., 2021; Veseli et al., 2025; Al-Shamsi, 2024).

Sudden crises, such as the COVID-19 pandemic, have led institutions to take priority in compelling digital transformation. A study by Alvarado-Acosta et al. (2024) documented how Peruvian universities adopted a variety of innovative pedagogical strategies to ensure academic continuity amidst the pandemic. The study shows that crisis responses of this kind catalysed long-term transformations in teaching practices, digital infrastructure, and evaluation strategies. However, these changes also revealed gaps in teacher preparedness and digital inclusion, and it is consistent with the broader issues raised by Veseli et al. (2025) as they note continued resistance to LMS implementation owing to organizational inertia and change management deficiency. The link between crisis-driven innovation and long-term digital sustainability is thus evident in both Latin American and global contexts (Alvarado-Acosta et al., 2024; Veseli et al., 2025; Valdés et al., 2021).

Another developing frontier is the tactical integration of artificial intelligence (AI) in tertiary education. George and Wooden (2023) discuss the possibility of AI transforming academic and administrative functions, foreseeing the rise of "smart universities." These universities seek to leverage AI for personalization of learning, administrative streamlining, and operational effectiveness. However, their study also outlines principal risks, including ethical concerns, job loss, and the acceptance of AI-based credentials in the job market. These also find reflection in Pashkov and Pashkova's (2022) critique that unregulated digitalization can lead to the commodification of education and increased dependency on global tech giants. Both works show that while AI and complex digital systems offer prospects for innovation and efficiency, they also demand strict regulatory, ethical, and pedagogical control (George & Wooden, 2023; Pashkov & Pashkova, 2022; Al-Shamsi, 2024).

However, digitalization is not without structural risk. Pashkov and Pashkova (2022) give a critical review of the socio-political impacts of digital change, emphasizing issues such as the 'McDonaldization' of learning and rising educational inequality. Their work, and that of George and Wooden (2023), gives powerful evidence for a cautious and egalitarian response to digital change. Achieving that technological integration does not expand existing inequalities is the imperative, especially since institutions rely more on commercial digital platforms. Besides, the studies by Valdés et al. (2021) and Veseli et al. (2025) on institutional opposition and the need for adaptive organisational forms support such a pessimistic view. Thus, the risks of digitalization, ranging from ethical concerns to socio-economic disparities, need to be dealt with caution to ensure equitable learning outcomes (Pashkov & Pashkova, 2022; George & Wooden, 2023; Veseli et al., 2025).

Literature reviewed consistently shows that digitalization at the tertiary level is more of a systemic institutional realignment than a matter of technological shift. Digital adoption is successful if dependent on strategic alignment, leadership support, cultural readiness, and ethical foresight. Institutions that fail to contend with these elements as a collective may face superficial deployment of the digital or even system destabilization. A balanced and context-sensitive strategy grounded in strategic planning, stakeholder engagement, and critical examination of digital technologies is, therefore, a fundamental necessity for

effective digital transformation. Ultimately, even as digital transformation brings an unprecedented opportunity for education systems to become stronger, it has to be effectively carried out with comparable gravity of managerial, pedagogical, and socio-cultural difficulties (Valdés et al., 2021; Veseli et al., 2025; Al-Shamsi, 2024).

4.2 Theme 2: Institutional Readiness, Governance, and Strategic Management of Digital Transformation

Higher education's digitalization, driven by global events and technological innovation, is a complex and varied phenomenon. Studies across contexts and institutional settings have highlighted difficulties and potential opportunities when higher education institutions integrate digital technologies in the academic and administrative architecture. The Chilean scenario, studied by Valdés et al. (2021), illustrates the impact of the institutional environment in digitalization in which it highlights that digital change is not just impactful on operational activities but also on institutional values. Veseli et al. (2025) also observe that successful digital transitions such as the implementation of Learning Management Systems (LMS) heavily depend on the organizational change preparedness of their institutions, that is, vision clarity, leadership endorsement, and internal malleability. Al-Shamsi (2024) further expands on this perspective by emphasising the fact that the integration of digital tools in strategic planning procedures significantly enhances the precision of decisions and resilience over a long period. Overall, these studies suggest that the success of digital transformation in higher education is contingent on a persistent congruence of the strategic, operational, and cultural aspects (Valdés et al., 2021; Veseli et al., 2025; Al-Shamsi, 2024).

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dealt with caution to ensure equitable learning outcomes (Pashkov & Pashkova, 2022; George & Wooden, 2023; Veseli et al., 2025).

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4.3 Theme 3: Technology Adoption and Infrastructure for Educational Continuity

The digital transformation of higher education has turned into a multiform and multifaceted phenomenon, particularly under the spur of global shocks such as the COVID-19 pandemic. The change encompasses assorted strategic, technological, and pedagogical dimensions, which reflect regional idiosyncrasies and institutional capacities. Across various environments such as in Peru, Romania, and Dubai, the strategic application of technology tools like Learning Management Systems (LMS), mobile apps, and virtual labs has been at the forefront of maintaining pedagogical continuity and business effectiveness. Although part of this change has been embracing this transformation with resilience and creativity by some institutions, others have remained plagued by deep-seated handicaps in the form of technological inequalities, change aversion, and moral dilemmas.

The successful implementation of technology such as LMS relies on a number of organizational and perceptual factors. Empirical studies by Veseli et al., Drwish et al., and Allam et al. emphasize the need for top-management support, perceived usefulness, and system quality as factors that can drive user acceptance and implementation success. Veseli et al. point out that organizational flexibility, performance of project champions, and vision clarity contribute a great deal to Organizational Change Readiness (OCR) as a fundamental antecedent to technology integration among higher education institutions. Similarly, Drwish et al. discover that system and service quality, satisfaction, and perceived ease or simplicity of use have positive impacts on post-pandemic Saudi Arabian universities' adoption of mobile learning. Allam et al., in the Dubai context, confirm these determinants, with the authors adding that individuals' innovation and quality of information also have decisive roles. Overall, these findings emphasize the importance of effective leadership, strategic definition, and adaptive digital infrastructure to facilitate sustainable educational change.

Strategic planning, under study by Al-Shamsi and George & Wooden, is also being revolutionized by artificial intelligence and digitalization. Al-Shamsi uses empirical data of Omani institutions to demonstrate that digital integration into strategic planning and automation enhance decision-making precision, efficiency, and long-term adaptability. Mediation analysis proves a strong indirect correlation between automation and effective planning through digitalization. George & Wooden elaborate further on this topic by bringing up the case of "smart universities" where AI integration transforms teaching as well as administrative operations. They mention the potential of personalized learning, economy, and accessibility but sound cautionary notes on job destruction, privacy issues, and education inequality. The finding suggests that strategic digital transformation is less a question of bringing new tools to bear and more about reconceptualizing institutional goals and governance models in alignment with shifting technological requirements.

The use of virtual and immersive learning environments has gained momentum, particularly in fields like industrial engineering. Terkaj et al. develop a design model of virtual labs using digital twins and

extended reality to strike a balance between instructional and research-oriented functions. Based on empirical data from three institutions, their research explains the possible functionalities of these technologies in building pragmatic digital competence and promoting inclusive, high-quality engineering education. These efforts are part of broader digitalization processes undergone in European contexts. An example is the Erasmus Without Paper project studied by López-Nores et al. Measuring efficiency gains in mobility management, in the forms of decreasing using wonderful amounts of paper and bureaucracy, they enable the same staff to handle 80% more mobilities. Both examples show how virtual environments and process digitalization are assisting in scaling and maintaining higher education business operations.

From a broader context, institutional and national digital strategies are being reformed to address educational demands in rapidly evolving socio-economic contexts. Valdés et al. in Chile describe how the institutional context influences the digital university reform with significant impacts on value and operating aspects. Institutional policies and the need for managerial interventions to respond to shifts in technology are underscored in the study. Similarly, Guşu & Mangiuc highlight the Romanian educational accounting, revealing curriculum developments to better align with the digital skills necessary in contemporary accounting practice. Their study of four major cities of Romania business programs reveals increasing but uneven willingness to equip students with necessary digital competencies. Such studies as a whole underscore that despite the significant promise of digital transformation, its adoption is significantly shaped by institutional preparedness, curriculum flexibility, and the national policy landscape.

Despite these advancements, numerous challenges and threats still linger to shadow digital transformation efforts. Pashkov & Pashkova present the key view of unforeseen consequences of fast digitalization, specifically referencing commodification of learning, managerialism, and hegemony of global tech companies in educational settings. Their debate poses the ethical question of whether unregulated digitalization would exacerbate global inequalities, curtail academic freedom, and turn higher education into a consumption-like phenomenon. Alvarado-Acosta et al. also chronicle Peru's digital experience throughout and beyond the time of the pandemic, underscoring innovations as well as ongoing digital divisions. Their content analysis of 62 documents in databases like Scopus and Scielo reveals recurring concerns in virtual pedagogy, internationalization, and assessing practices. Both findings highlight the imperative of inclusive and morally guided digital practices that meet socio-cultural and economic disparities.

In summary, digital transformation of higher education is an essential route towards educational continuity, operational resilience, and global competitiveness. However, it requires more than a spending spree in the realm of technology. It requires effective policies that balance leadership support, stakeholder participation, curricular modification, and moral management. All the visions premised on various geographical and disciplinary locations offer an end-to-end view of the potential and boundaries of educational digitalization, which reinforces the contextually grounded and human-centred approach to digitalization initiatives.

Table 4. The themes and primary focus

No	Theme	Focus	Articles covered
1	Pedagogical Innovations and Teaching Practices	Focuses on how digital transformation impacts teaching strategies, learning environments, student engagement, and instructional design in higher education.	13 articles (2, 4, 5, 13, 15, 16, 18, 22, 24, 30, 32, 35, 36)
2	Institutional Readiness and Governance	Focuses on institutional-level planning, digital maturity, leadership, infrastructure, and sustainable policy shifts in the higher education context.	15 articles (1, 3, 7, 9, 11, 12, 20, 26, 27, 29, 31, 33, 34, 37, 38)
3	Technology Adoption and Infrastructure	Addresses technological tools such as LMS, virtual labs, mobile learning, and collaborative platforms that support education during and beyond the pandemic.	11 articles (6, 8, 10, 14, 17, 19, 21, 23, 25, 28, 39)

5. DISCUSSION AND CONCLUSION

Digitalization of higher education is a various change involving structural, technological, and pedagogical rearrangements. Universities across most regions of the globe have initiated diverse efforts to trace academic delivery, administrative functions, and stakeholder engagements onto swiftly evolving digital landscapes. Technology integration through learning management systems, mobile applications, and virtual labs has significantly influenced the quality and access of higher education. Success of such implementations is usually attributed to system performance, service support, usability, and user satisfaction. Organizational dimensions like leadership commitment, strategic direction, and institutional agility are key determinants of readiness for digital transformation. In addition, digital solutions support both academic continuity and assist administrative process efficiency, as in the example of mobility management systems which reduce operational overheads and enhance scalability.

In the domain of technical education, new technologies like extended reality and digital twins are being applied in replicating practical learning experiences, enhancing digital skill sets required for modern industries. Curriculum change also finds expression in professional fields like accounting, where digital literacy has become a requirement. However, the transition also carries great risks, including the erosion of academic independence, increased dependence on global technology suppliers, and commodification of learning experiences. Ethical concerns, unequal access, and digital divides continue to compromise equitable change, particularly in the developing world. Institutional contexts and national policy strongly condition the destiny of digital initiatives, requiring harmonized action in light of cultural, economic, and infrastructural conditions. Strategic use of artificial intelligence is transforming planning and decision-making but raising concerns around job displacement and data governance. In general, the digitalization of universities needs careful planning, constant stakeholder engagement, and a balanced approach that prioritizes innovation along with inclusiveness. The transformation is not merely in the use of tools but involves a more profound rethinking of education's objectives, governance arrangements, and value-creation processes in universities.

6. ACKNOWLEDGEMENTS

The authors would like to express their sincere gratitude to the Kedah State Research Committee, UiTM Kedah Branch, for the generous funding provided under the Tabung Penyelidikan Am. This support was crucial in facilitating the research and ensuring the successful publication of this article.

7. CONFLICT OF INTEREST STATEMENT

The authors agree that this research was conducted in the absence of any self-benefits, commercial or financial conflicts and declare the absence of conflicting interests with the funders.

8. AUTHORS' CONTRIBUTIONS

Abidah Saad: Conceptualisation, methodology, investigation, formal analysis, and writing-original draft; **Afida Ahmad:** conceptualisation, methodology, formal analysis, writing-original draft, formatting, and visualization. **Samsiah Bidin:** writing-review and editing, language editing, proofreading, and validation.

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About the Authors

Dr. Abidah Saad is a Senior Lecturer at Universiti Teknologi MARA, Kedah Branch, Malaysia, where she has been serving since April 2022. She holds a Ph.D. in Management from INTI International University. Her areas of expertise include Human Resource Management (HRM), Human Resource Development (HRD), and Management. Dr. Abidah is actively involved in research related to organizational behavior, talent development, and strategic HR practices. Her academic work reflects a strong commitment to advancing knowledge in workforce management and enhancing institutional performance. She can be contacted at abidahsaad@uitm.edu.my.

Dr. Afida Ahmad is a Senior Lecturer at Universiti Teknologi MARA, Kedah Branch, Malaysia, where she has been serving since June 2020. She holds a Ph.D. in Computer-Aided Geometric Design from Universiti Sains Malaysia. Her research spans shape-preserving geometric design, machine learning applications in environmental prediction, and statistical analysis. With a strong interdisciplinary background, Dr. Afida is also actively engaged in research on digital transformation, governance, and innovation in higher education. Her scholarly contributions reflect a commitment to improving data-driven decision-making and institutional efficiency within academic settings. She can be contacted at afidaahmad@uitm.edu.my.

Samsiah Bidin is a Senior Lecturer at Universiti Teknologi MARA, Kedah Branch, Malaysia, where she has been serving since January 2002. She holds a master's degree in Educational Management from Universiti Utara Malaysia. Her research areas include TESL, ESP, online learning, blended learning, and educational management in the education sector. She can be contacted at samsiah482@uitm.edu.my.