Volume: 10 Issues: 75 Special Issue [August, 2025] pp. 218 - 226
Journal of Islamic, Social, Economics and Development (JISED)
eISSN: 0128-1755
Journal website: www.academicinspired.com/jised
DOI: 10.55573/JISED.107519

DIGITAL TRANSFORMATION IN HIGHER EDUCATION: ISSUES AND CHALLENGES

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Article history
Received date : 20-6-2025
Revised date : 21-6-2025
Accepted date : 30-8-2025
Published date : 14-9-2025

To cite this document:
Kuldip Singh (2025). Digital Transformation in Higher Education: Issues and Challenges: *Journal of Islamic, Social, Economics and Development (JISED),* 10 (75), 218 - 226.

Abstract: *Digital transformation in higher education, particularly through the integration of artificial intelligence (AI), is revolutionizing the educational landscape. AI enables personalized learning experiences, optimizes educational processes, and enhances operational efficiency within academic institutions. The higher education system is currently facing both opportunities and challenges because of digital transformation, or the use of different types of technology by both teachers and students. Benefits that digital transformation brings to higher education systems include the simple distribution of instructional materials, collaborative learning, fostering students' creativity, more effective use of time, and cost savings. Despite its necessity and outstanding opportunities, digital transformation is not an easy task. Many organizations face significant challenges, such as resistance to change, lack of digital skills, and the complexity of integrating new technologies into existing infrastructures. Digital transformation in higher education also poses challenges. These include the resistance to change, the need for upskilling staff, the financial cost of implementing new technologies, and concerns over data privacy and security. This article discusses issues and challenges of digital transformation in Higher education in Malaysia with regards to Artificial Intelligence (AI). Case studies of AI adoption in higher education are discussed. Strategies to overcome issues and challenges are highlighted to enable successful implementation of digital transformation in universities in Malaysia.*

Keywords: *Digital Transformation, Artificial Intelligence, Higher Education.*

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Introduction

The rapid advancement of digital technologies has significantly influenced the landscape of higher education. The digital transformation (DT) of higher education represents a paradigm shift in how learning, teaching, administration, and research are conducted. At the forefront of this transformation is artificial intelligence (AI), which has proven to be a pivotal driver of change. AI-powered tools have facilitated personalized learning, enhanced institutional efficiency, and prepared students for a technology-driven future. However, the integration of AI is not without its challenges. This essay explores the issues and challenges associated with adopting AI in higher education, focusing on infrastructure, policy, ethics, and pedagogy, while also highlighting strategies to overcome these barriers. The integration of digital technologies in higher education has been marked by several notable trends. AI-powered tools, such as those used by platforms like Coursera and Khan Academy, have revolutionized personalized learning by adapting to individual student needs. Virtual learning environments (VLEs) like Moodle and Blackboard have incorporated AI to analyze student engagement and improve educational outcomes. Additionally, blockchain technology is being employed by institutions like MIT to issue tamper-proof digital diplomas. These advancements underscore the transformative potential of digital technologies in education. For instance, AI tutors like Carnegie Learning provide real-time feedback to students, fostering a more tailored and interactive learning experience. Moreover, big data analytics offer insights into learning patterns, enabling proactive interventions to support student success. In contrast, the Malaysian higher education sector is still navigating the complexities of digital transformation. Although national initiatives such as the *Malaysia Education Blueprint (Higher Education) 2015–2025* and the *MyDIGITAL Blueprint* emphasize the importance of digital readiness, the integration of AI and other advanced digital technologies into higher education institutions (HEIs) has been uneven. Some universities, such as Universiti Teknologi Malaysia (UTM), Universiti Kebangsaan Malaysia (UKM), and Universiti Sains Malaysia (USM), have pioneered digital initiatives; however, many institutions continue to face infrastructural, pedagogical, and organizational challenges.

Existing literature highlights the benefits of digital transformation but provides limited insight into how Malaysian universities are adopting AI specifically, and what unique challenges they encounter compared to global counterparts. While studies from developed countries focus on opportunities such as AI-powered learning analytics and intelligent tutoring systems, Malaysian research often underscores issues of readiness, funding, staff competency, and digital equity. This gap indicates the need for a focused study that synthesizes global perspectives while critically examining Malaysia's position, challenges, and strategies for advancing digital transformation in higher education.

Given the post-pandemic acceleration of digital adoption and the Malaysian government's commitment to building a digital economy, this study is both timely and necessary. It not only evaluates the issues and challenges of AI adoption in higher education but also explores how Malaysian universities can leverage global best practices while addressing local constraints.

This study aims to:

1. Identify the key opportunities offered by digital transformation and AI in higher education.
2. Examine the specific challenges faced by Malaysian HEIs in implementing digital transformation strategies.
3. Compare Malaysia's readiness and implementation gaps with global practices.
4. Recommend strategies to strengthen Malaysia's higher education digital ecosystem.

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Literature Review

Digital Transformation

Digital transformation refers to the integration of digital technology into all organizational areas, changing how operations are conducted and the way value is delivered to customers (Berman, 2012). It is not just a buzzword or about updating the technology within an organization, but about reshaping the organization's culture and operations to embrace continuous change (Bounfour, 2016). Indeed, digital transformation entails a fundamental shift in how businesses operate and deliver value since is driven by a multitude of factors, namely: increasingly pervasive and interconnected digital technology, changes in customer behavior and expectations, and the emergence of innovative business models (Matt et al., 2015). A holistic and strategic approach is critical for a successful transformation, which considers technology, data, process, and organizational change. In this scenario, one of the most comprehensive and balanced interpretations views digital transformations as a progressive process that utilizes digital technologies and abilities to create value-driven business models, enhance business practices and operations, and improve service delivery (Morakanyane et al., 2017). The digital age has created a profound impact on organizations. Those failing to adapt and evolve face the risk of falling behind in the competitive landscape (Kane et al., 2015). Nowadays, organizations need to harness the power of digital transformation to improve business processes, corporate culture, and customer experiences to meet organizational change and market requirements (Westerman et al., 2011). The significance of digital transformation reaches into the sphere of higher education, where it can notably improve the learning experience by making it more accessible, engaging, and efficient. By adopting digital transformation, higher education institutions will be more equipped to cater to the evolving demands of students and the wider academic society. Some also argue that technology is reshaping the dynamics between students and institutions in terms of learning expectations and requirements. This has spurred the growth of competitive and alternative learning methods, fostering more flexible, comprehensive, and personalized learning experiences (Akour & Alenezi, 2022). Therefore, institutions are leveraging technology to enhance learning experiences, streamline administrative tasks, and promote innovative research practices (Daniel, 2015).

Artificial Intelligence

Artificial intelligence (AI) is a branch of study that focuses on artificially imitating human intelligence's cognitive capacities to build computer programs or other devices that can carry out tasks that are traditionally handled by people. According to Norvig and Russell (2013), the phrase "artificial intelligence" is used "when a machine mimics the cognitive functions that humans associate with other human minds, such as learning and problem-solving." Artificial intelligence (AI) can be applied in higher education for individualized learning through the automation of administrative teaching tasks, software that supports the detection of topics that need reinforcement in the classroom, the guidance and support of students outside of the classroom, and the intelligent use of data to teach and support students. AI can be used in education in a variety of ways beyond than personalized instruction, including robotics, augmented reality, adaptive platforms, intelligent tutoring systems, chatbots, adaptive learning, computer aided instruction, direct feedback, and MOOCs (Kuleto et al., 2022). In the context of education, research demonstrates that online courses, MOOCs, augmented and virtual reality, game-based learning, and collaborative work are all quantitatively linked to student learning results. Thus, Augmented Reality (AR), a technological advancement in education that has the capacity to draw students' attention to an engaging and enjoyable learning environment, can be

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used to demonstrate the relevance of AI to higher education (Ngabo et al., 2021). Therefore, studies on the use of AI in higher education focus on management systems and student learning opportunities. Intelligent tutoring systems are a component of the AI story that enables the personalization of education by encouraging interactive learning through the creation of tutoring programs (Wang et al., 2021). Chatbots are a different AI-related technology that is used in higher education. In order to engage students individually, collect candidate data, and construct virtual teaching assistants utilizing this data, higher education institutions have developed chatbots (Kuleto et al., 2021). A chatbot is a piece of software that mimics text- or voice-based conversations with people. It can comprehend spoken language and pick up new vocabulary through usage. Watson Assistant (IBM), Siri (Apple), Alexa (Amazon), and Google Assistant (Google) are a few instances of well-known virtual assistants.

A systematic review of 183 publications highlighted a growing interest in Digital Transformation (DT) within higher education, identifying key areas such as organizational performance, teaching methodologies, and administrative processes. The review noted that digital technologies enhance operational efficiency and improve educational quality by fostering interactive learning environments and automating administrative tasks. (Ramadania et al., 2024) Another comprehensive analysis involving 3,652 documents categorized research into three main clusters:

- Teaching and Learning: Focused on how DT impacts educational practices and learner experiences.
- Innovation in Management: Examined DT as a catalyst for innovation within institutional management.
- Software Innovations: Investigated digitalization initiatives aimed at enhancing user experience through technology

Despite the recognized benefits, many institutions face challenges in fully realizing the potential of DT. A study indicated that only 25% of higher education institutions have a coherent digital strategy, with many initiatives being isolated rather than part of an integrated plan. This suggests a significant gap in strategic alignment and execution.(Hakan, 2020) Effective leadership is crucial for successful DT implementation. Research indicates that strong executive leadership can help overcome barriers to change, adopt appropriate strategies, and ensure consistent implementation across various departments within educational institutions (Bisri, et al.,2023). The literature suggests a need for further research to explore the holistic application of DT in higher education. Many studies have focused on specific technologies or isolated aspects of transformation, indicating a gap in understanding the comprehensive impact of DT on organizational structures and processes. The findings from these systematic reviews have significant implications for policymakers and educational leaders:

- Strategic Planning: Institutions should develop cohesive digital strategies that align with their overall mission and goals to ensure that digital initiatives are effectively integrated into their operations.
- Capacity Building: There is a need for professional development programs that equip faculty and staff with the necessary skills to leverage digital tools effectively.
- Research Gaps: Future research should focus on longitudinal studies to assess the long-term impact of DT on educational outcomes and institutional effectiveness.

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Opportunities Of Ai In Higher Education

Globally, the integration of artificial intelligence (AI) and digital technologies has reshaped the higher education landscape. Studies highlight several opportunities:

1. Personalized Learning: AI-driven platforms enable adaptive learning, tailoring content to students' individual learning styles and progress (Zawacki-Richter et al., 2019). Intelligent tutoring systems provide real-time feedback, improving student engagement and outcomes.
2. Enhanced Teaching and Assessment: AI tools such as automated grading systems and learning analytics allow lecturers to track student performance, identify at-risk learners, and design targeted interventions (Luckin, 2021).
3. Administrative Efficiency: Universities use AI to streamline admissions, scheduling, and resource allocation, reducing staff workload and improving operational efficiency (Brynjolfsson & McAfee, 2017).
4. Research and Innovation: AI accelerates data analysis in research, enabling quicker insights and supporting interdisciplinary collaborations.
5. Global Competitiveness**:** Universities adopting AI gain reputational advantages, attract international students, and prepare graduates with digital competencies crucial for future labor markets

Readiness And Implementation Gaps in Malaysia

Despite policy initiatives, Malaysia faces multiple challenges in embedding AI into higher education.

- Infrastructure and Funding Gaps: While top universities such as UTM, UKM, and USM have pioneered digital initiatives, many institutions—particularly in rural or resource-constrained contexts—lack sufficient infrastructure, reliable internet connectivity, and sustainable funding models (MOHE, 2022).
- Staff Competency and Training: Academic staff often face difficulties in adopting AI tools due to limited digital literacy, inadequate training, and resistance to change (Yunus & Suliman, 2021).
- Policy-Practice Gap: Although the *Malaysia Education Blueprint (Higher Education) 2015–2025* and *MyDIGITAL Blueprint* emphasize digital transformation, there is a gap between policy aspirations and practical implementation.
- Digital Divide Among Students: Socioeconomic disparities affect students' access to devices, stable internet, and digital learning resources, raising concerns about inclusivity and equity (KPM, 2021).
- Lack of Localized Research**:** Compared to developed countries, there is limited empirical evidence on how Malaysian universities are adopting AI in teaching, learning, and research,
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Methodology

This study adopts a qualitative research design grounded in a literature-based analysis, supported by illustrative case studies of leading Malaysian universities. The literature review was conducted using Scopus, Web of Science, MyCite, and Google Scholar, alongside policy documents from the Ministry of Higher Education (MOHE) and the Malaysia Digital Economy Blueprint (MyDIGITAL**)**. The timeframe for sources was 2018–2024, reflecting the rapid digital adoption post-COVID-19. The study highlights Universiti Teknologi Malaysia (UTM), Universiti Kebangsaan Malaysia (UKM), and Universiti Sains Malaysia (USM) as case studies, given their leadership in digital adoption. Collected literature was thematically analyzed to identify opportunities, challenges, and strategies.

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Issues And Challenges

Despite these advancements, the adoption of AI in higher education is fraught with significant challenges. One of the primary issues is the lack of adequate infrastructure and investment, particularly in developing nations. The disparity in resources hinders equitable AI implementation across the country. Additionally, the high costs associated with AI technologies deter institutions with limited budgets from adopting these tools. Data management poses another critical challenge. In Malaysia, the absence of standardized frameworks complicates the integration of data across systems, as seen in inconsistent student records between different universities. Privacy concerns related to the storage of sensitive student information further exacerbate the issue, especially in light of cybersecurity breaches reported in some Malaysian institutions.

The skill gap among educators and students is another obstacle to the effective integration of AI in higher education. Faculty often lack the technical expertise to incorporate AI into their teaching methodologies. For instance, a survey conducted by the Ministry of Higher Education Malaysia revealed that many educators require additional training to effectively utilize AI tools. Similarly, students need AI literacy to fully engage with these technologies. Ethical concerns also loom large in the adoption of AI. Bias in AI algorithms can perpetuate existing inequalities, particularly when systems are trained on datasets that do not reflect Malaysia's diverse ethnic and cultural backgrounds. The opaque nature of AI decision-making processes further undermines trust in these systems. Resistance to change is another barrier, with educators fearing that AI might replace traditional teaching roles. Studies in Malaysia have shown hesitation in adopting automated grading systems, reflecting broader apprehensions about the impersonal nature of AI tools. Finally, the lack of clear policies and regulations governing AI use in education creates uncertainty for institutions. Although Malaysia has introduced the National AI Framework, its implementation in higher education remains inconsistent.

Several case studies illustrate the challenges and opportunities associated with AI in higher education in Malaysia. For example, Universiti Teknologi Malaysia (UTM) has implemented an AI-based administrative system to streamline student services and improve efficiency. This system uses AI algorithms to predict enrolment trends, optimize resource allocation, and enhance the student experience. However, UTM has faced challenges such as high initial implementation costs and the need for continuous system updates to keep pace with technological advancements.

Another case study is Universiti Kebangsaan Malaysia (UKM), which has piloted an AI-driven adaptive learning platform aimed at personalizing education for its students. This platform tailors course content to individual learning styles and progress rates, improving engagement and retention. However, UKM encountered challenges with cultural and linguistic compatibility in the AI tools, as many platforms are designed for Western contexts and require significant customization to suit Malaysian students.

In addition, Universiti Sains Malaysia (USM) has adopted AI-powered research tools to enhance academic output and streamline administrative processes. For example, USM uses AI to analyze research trends and recommend funding opportunities for its faculty. While these tools have significantly boosted research efficiency, USM has faced issues related to data privacy and the integration of disparate data systems.

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Strategies To Overcome Challenges

Addressing these challenges requires a multifaceted approach. Building digital readiness through investments in IT infrastructure and AI technologies is essential. The Malaysian government's initiatives, such as the Malaysia Education Blueprint, aim to reduce digital divides by improving access to technology in rural areas. Collaborations with tech firms like Microsoft and Google can enable institutions to access advanced AI tools at reduced costs. Training and development programs are equally crucial. Universities should offer professional development initiatives focusing on AI for educators, as exemplified by Malaysia's partnership with Coursera to provide upskilling courses. Additionally, AI literacy courses can equip students with the skills needed to thrive in AI-integrated learning environments.

Ethical AI practices must be prioritized to ensure fairness and transparency. Institutions can establish ethics boards to oversee algorithmic fairness and reduce bias in AI systems. For instance, ensuring datasets used for AI in Malaysian universities are inclusive of the country's multicultural demographics can help mitigate biases. Policy reforms are also necessary to create an enabling environment for AI innovation. The Malaysian government should build on the National AI Framework to establish clearer guidelines for AI use in education while fostering collaboration between policymakers, educators, and technology developers.

Conclusion

In conclusion, the digital transformation of higher education, particularly through AI, holds immense potential to revolutionize learning and teaching. However, issues such as infrastructure gaps, ethical concerns, and resistance to change must be addressed to fully realize this potential. By investing in digital readiness, fostering AI literacy, ensuring ethical practices, and implementing policy reforms, stakeholders can create a robust ecosystem for sustainable digital transformation in higher education. Further research and collaboration will be pivotal in ensuring that AI-driven innovations benefit diverse student populations and contribute to the equitable advancement of global education. While digital transformation presents substantial opportunities for enhancing higher education, it also poses challenges that require strategic foresight, strong leadership, and ongoing research to navigate effectively. However, the need for retraining faculty and modernizing educational policies emerges as a recurrent theme to optimize the potential of AI in higher education. This study highlights the dual reality of Malaysia's higher education: significant opportunities for AI-driven innovation alongside persistent barriers that risk widening institutional disparities. To remain competitive, Malaysia must invest in capacity building, digital infrastructure, and policy alignment while ensuring equity in access.

I would like to express my sincere gratitude to Dr Baljinder Singh for proof reading my manuscript and for his valuable suggestions for improving the content of my manuscript. His expertise and insights were invaluable in shaping my final manuscript.

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