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Digital Transformation Maturity Development For Higher Educationin Developing Country

Bisri[1], Achmad Husen[2], Suparno[3]
[1]Universitas Bina Sarana Informatika, Jakarta, Indonesia, bisri.bir@bsi.ac.id
[2]Universitas Negeri Jakarta, Jakarta, Indonesia, ahusen@unj.ac.id
[3]Universitas Negeri Jakarta, Jakarta, Indonesia, suparno@feunj.ac.id

Corresponding Author: bisri.bir@bsi.ac.id[1]

Abstract: This study focuses on developing a digital transformation maturity model tailored to higher education in developing countries, with a specific case study on Indonesia. The purpose of this research is to evaluate and enhance the digital strategies of higher education institutions to improve operational efficiency and educational outcomes. Using a thematic literature review and analysis, this study identifies challenges and proposes a structured model for assessing digital maturity. Major findings include the importance of leadership, institutional readiness, and stakeholder collaboration in driving successful digital transformation. This study highlights actionable insights for policymakers and institutions, emphasizing the need for strategic investments in technology and digital literacy.

Keyword: Digital Transformation, Higher Education, Curriculum Renewal, Operational Efficiency, Digital Maturity.

INTRODUCTION

Digital transformation has garnered significant scholarly attention as a critical driver of innovation in higher education. Emerging technologies such as Artificial Intelligence (AI), big data analytics, and the Internet of Things (IoT) have evolved from supplementary tools to essential resources, reshaping educational processes and fostering new literacies (Shopova, 2014). These technologies enhance teaching methodologies, institutional operations, and student learning outcomes. However, the disparity in adoption rates highlights challenges, particularly in transitioning from traditional to digitalized education, as underscored during the COVID-19 pandemic (Bormann et al., 2021).

In Indonesia, the pandemic accelerated paradigm shifts within the educational sector, compelling institutions to integrate online learning and adopt Learning Management Systems (LMS). These systems enabled interactions through features like discussion forums, assignment submissions, and quizzes, ensuring student engagement in virtual environments (Wulandari et al., 2022). However, barriers such as limited infrastructure, uneven digital literacy, and insufficient funding remain pervasive. Addressing these challenges is vital to ensuring equitable and sustainable digital transformation, particularly in the context of the Industrial Revolution 4.0 (Subroto et al., 2023).

While developed countries have leveraged digital transformation to create personalized, flexible learning experiences, institutions in developing nations like Indonesia struggle with inadequate technological infrastructure and uneven internet access. Nevertheless, the adoption of LMS and similar technologies during the pandemic demonstrates the potential for significant advancements, contingent on institutional preparedness and strategic initiatives (Setiawan et al., 2023).

To achieve meaningful transformation, higher education institutions must redefine business models and curricula to align with digital advancements. This involves incorporating courses on AI, blockchain, and data analytics, which equip students with skills relevant to the tech-driven workforce (Đipa & Turulja, 2023). Collaboration between governments, educational institutions, and private sectors is paramount in addressing existing gaps and driving innovation (Yusuf, 2020).

Existing frameworks of Digital Transformation Frameworks, often fail to address the socio-cultural and infrastructural nuances specific to higher education (Gottschalk & Weise, 2023). Consequently, a tailored Digital Maturity Model (DMM) is essential to evaluate readiness, identify gaps, and prioritize improvements. This research proposes such a framework, addressing technical, cultural, and strategic dimensions to ensure holistic institutional transformation (Haryanti et al., 2024).

METHOD

This research synthesizes previous studies on how higher education institutions adopt digital technology for organizational management and learning delivery. It develops a foundational model from an extensive literature review, highlighting the importance of an evaluation model for digital transformation to provide a comprehensive overview of the digital implementation aspects adopted by higher education institutions. This model serves as a basis for designing strategic changes to achieve better outcomes. The paper also proposes recommendations for future research.

Thematic methods are employed to identify patterns and relationships between concepts, while the Digital Maturity Model framework Haryanti et al., (2024) assesses institutional readiness in technology, data, processes, and strategy. Following Kitchenham et al., (2015) systematic evaluation approach, this article offers a comprehensive understanding of the successes and barriers to digital transformation, presenting strategic recommendations to enhance the effectiveness and efficiency of higher education in Indonesia.

Data Collection

Data was systematically gathered through a literature search in prominent databases, including Google Scholar, Scopus, Elsevier, ProQuest, Springer, and ResearchGate. Keywords such as "digital transformation," "higher education," "effectiveness evaluation," and "digital maturity" were used, as recommended by (Snyder, 2019). The search process involved several steps:

1. Initial Selection: Filtering articles based on titles, abstracts, and relevance.
2. Advanced Screening: Evaluating full-text articles for methodological clarity and alignment with the study’s objectives.
3. Data Consolidation: Compiling selected articles to extract relevant data for analysis.

The inclusion criteria encompassed articles that employed empirical research methods, presented relevant primary or secondary data, and were published in reputable journals to ensure data validity. Exclusion criteria eliminated studies with unclear methodologies or outdated information. Additional validation was conducted through triangulation by comparing

findings from various sources to identify consistencies and discrepancies (Grant & Booth, 2009).

Initial Validation Tests

To validate the developed model, a systematic literature-based validation approach was employed:

1. Cross-Literature Comparison:
   - The proposed model was evaluated against similar frameworks and models from the existing literature.
   - Key components, such as institutional readiness, technological infrastructure, and digital maturity levels, were compared to establish alignment and identify unique contributions.
   - Patterns and trends observed in previous studies were used to corroborate the theoretical foundations of the model.
2. Meta-Synthesis:
   - A meta-synthesis of selected high-quality studies was conducted to aggregate findings and ensure the model's components were consistent with empirical evidence.
   - The synthesis included analyzing how existing frameworks addressed challenges and opportunities in digital transformation across different institutional contexts.
3. Critical Literature Review:
   - A targeted review focused on identifying potential gaps, limitations, and validation insights in the reviewed literature.
   - Specific emphasis was placed on studies evaluating digital maturity and technology adoption in higher education, providing a comparative benchmark for the model.

Data Analysis Methods

Data analysis employed thematic methods to identify patterns, trends, and relationships between concepts. This approach involved:

1. Initial Coding**:** Categorizing key themes and concepts from the collected data.
2. Theme Organization: Structuring the identified themes to uncover interconnections and trends.
3. Data Interpretation: Drawing insights to inform the development of strategic recommendations.

The Digital Maturity Model framework served as the primary analytical tool to assess the digital readiness levels of higher education institutions. It identified institutional strengths and weaknesses in adopting digital technologies, facilitating the formulation of targeted and actionable recommendations.

Validation of Results

The analysis results were validated through a literature-based approach by comparing the findings with existing studies and frameworks. Triangulation was conducted by cross-referencing insights from multiple sources to ensure consistency and reliability. This literature-centric validation ensures that the proposed model aligns with established research and theoretical constructs, providing a robust foundation for its application.

By integrating cross-literature comparison, meta-synthesis, and critical review, this research validates the developed model comprehensively, addressing critical gaps in previous studies and contributing to the broader field of digital transformation in higher education.

RESULTS AND DISCUSSION

The Concept of Digital Transformation in Higher Education

Digital transformation in higher education involves integrating technology to enhance learning experiences, streamline institutional management, and facilitate data-driven decision-making. This process modernizes teaching methodologies, expands access for students—particularly in remote areas—and aligns curricula with industry demands. According to (Robertsone & Lapina, 2022), digital transformation is driven by the need to equip students with market-relevant skills while ensuring institutional competitiveness. Key benefits include flexible learning options, student-centered education, and increased operational efficiency. However, challenges such as reduced face-to-face interaction and delays in teacher feedback remain significant. Similarly, McAfee & Brynjolfsson, (2017) highlight the importance of digital transformation in preparing institutions for the Industrial Revolution 4.0.

Digital transformation emphasizes leveraging technology for societal impact while maximizing opportunities for innovation. Mhlanga, (2024) defines it as the integration of technology across educational components such as teaching, assessment, and administration. Examples include online learning platforms (e.g., LMS and MOOCs), digital assessment tools, and immersive technologies like virtual and augmented reality, which improve understanding of complex concepts. For instance, Binus University has effectively implemented LMS to boost student engagement and learning outcomes. Pahrudin et al., (2024) suggest competency-based curricula focusing on digital literacy to produce graduates with industry-relevant skills.

Strategies for Implementing Digital Transformation

Digital innovation redefines organizational value through technology, reshaping practices to improve customer engagement and operational efficiency Qiao et al., (2024). Successful digital transformation requires a strategic approach that includes infrastructure development, capacity building, and fostering an innovation-driven culture. Peppard & Ward (2016) emphasize the role of organizational readiness in embracing technology and shifting culture. Training programs for faculty and administrative staff to enhance digital literacy and curricular adjustments are critical. Twining et al., (2021) propose that quality curricula in the digital era should equip learners with the skills needed to thrive in a technology-driven world. Collaborative models, such as those in Singapore, demonstrate effective partnerships between universities and industry sectors, offering a roadmap for implementation in Indonesia.

Evaluating the Effectiveness and Efficiency of Educational Outcomes

Frameworks such as the Digital Maturity Model (DMM) assess institutions' digital readiness across technology, processes, people, data, and strategy (Marks & Al-Ali, 2022). Alenezi, (2023) distinguishes between digitalization, which integrates digital data into processes, and digital transformation, which signifies organizational change driven by technology. Agility is crucial for adapting to change, as noted by Harvard University's Chief Digital Officer, who prioritizes agile methodologies over technical expertise (Erceg & Zoranović, 2020). Despite challenges, Universitas Terbuka exemplifies success in Indonesia, leveraging digital tools to expand access. The integration of learning analytics, as highlighted by Mavo Navarro & McGrath, (2021), provides insights into implementation strengths and weaknesses, guiding data-driven improvements.

Digital Transformation Framework

The QS Digital Maturity Framework evaluates institutional digital preparedness across five stages: Nascent, Emerging, Connected, Engaged, and Mature (Đurek, 2019). Institutions at the "Mature" stage benefit from advanced analytics, integrated systems, and innovative learning environments (Rossmann, 2018). In Indonesia, most higher education institutions are

at the "Emerging" or "Connected" stages due to infrastructure limitations, low technological literacy, and insufficient strategic policies. Universitas Terbuka demonstrates a model for overcoming these barriers by utilizing cloud technology and LMS to reach students in remote areas (Wulandari et al., 2022).

Impact of Digital Transformation on Learning Effectiveness

Digital transformation enhances learning through accessibility, flexibility, and personalization. E-learning platforms improve student engagement and foster independent learning (Sarnoto et al., 2023). Innovations such as virtual simulations and AR enable practical, immersive learning experiences, especially in fields like medicine and engineering (Tene et al., 2024). However, traditional methods still dominate in some contexts, such as cadaver-based medical education in Indonesia (Agastya, 2024).

Improving Educational Outcomes Through Digitalization

Efficiency in higher education is assessed from both value-based and resource-oriented perspectives (Alvarez-Sández et al., 2023). Automation and data analytics streamline administrative processes, enhancing operational efficiency (TOMA, 2023). Blockchain technology, which ensures secure academic certifications, is gaining traction globally but faces technical and infrastructural hurdles in Indonesia (Harika, 2024).

To enhance the depth of this discussion, the inclusion of tables summarizing key findings from previous research provides a structured and concise overview. These tables highlight critical insights, facilitating a clearer understanding of the proposed model's effectiveness. By presenting comparative analyses, strategies, outcomes, and the current position of technological adoption in developing countries, the tables serve as visual aids to reinforce claims and demonstrate the practical implications of digital transformation in higher education. This approach bridges theoretical arguments with empirical evidence, ensuring a comprehensive and informed discussion.

Insights from Related Studies

Technological Tool	Adoption Rate	Impact on Learning	Current Position in Developing Countries	Relevance to the Model	References
LMS (e.g., Moodle, Canvas)	High in developed countries, moderate in Indonesia and other developing nations.	Facilitates personalized learning and efficient content delivery.	Limited integration due to infrastructure gaps and lack of digital literacy among educators.	Strengthens digital maturity by improving 'Processes' and 'People'; supports leadership with decision-making tools for governance.	(Sarnoto et al., 2023); (Pahrudin et al., 2024); (Marks & Al-Ali, 2022); (Mhlanga, 2024)
Virtual Simulations	High in engineering and medical fields globally; limited use in developing countries.	Improves understanding of complex concepts in safe environments.	Mostly used in niche pilot programs, constrained by lack of resources and expertise.	Advances digital maturity in 'Technology' and 'People'; aligns with leadership promoting innovation and governance improvement.	(Tene et al., 2024); (Agastya, 2024); (McCarthy et al., 2023); (Twining et al., 2021); (Graham et al., 2023)

Learning Analytics	Emerging in Indonesia; limited access and application in most developing nations.	Enables data-driven insights to improve educational outcomes.	Still at a nascent stage; efforts are underway to build capacity for broader adoption.	Improves governance through actionable insights; enhances digital maturity in 'Data' and 'Strategy' dimensions.	(Mavo Navarro & McGrath, 2021); (Marks & Al-Ali, 2022); (Wulandari et al., 2022); (Đurek, 2019); (Amankwah-Amoah et al., 2021)
Blockchain	Low adoption in Indonesia; early experimentation in other developing nations.	Enhances transparency and security in academic certifications.	Minimal presence; significant barriers include lack of infrastructure and regulatory frameworks.	Supports governance by building trust; enables leadership to advance digital maturity and transparency.	(Harika, 2024); (Suryawijaya, 2023); (TOMA, 2023); (Alvarez-Sández et al., 2023); (Rossmann, 2018).

CONCLUSION

Addressing the challenges of digital transformation in higher education has become increasingly critical, especially in developing countries. The Digital Transformation Maturity Model provides a comprehensive framework for evaluating institutional digital capabilities and identifying key areas for development. Findings underscore the essential role of technology integration, curriculum innovation, and strong institutional backing in ensuring the success of digital transformation initiatives. This study contributes by linking digital transformation maturity with improved educational outcomes and operational efficiency. It suggests practical applications, such as using the model to design interventions for closing digital gaps, enhancing student readiness for the digital workforce, and promoting institutional resilience.

To overcome barriers and achieve sustainable transformation, higher education institutions should adopt inclusive policies, invest in digital literacy programs, and foster collaboration among stakeholders. Future research directions include examining long-term impacts on governance, scalability of technologies, and the relationship between digital maturity and leadership effectiveness. These areas could deepen academic discussions and address gaps in understanding digital transformation in higher education.

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