JUMPA | JURNAL MANAJEMEN PENDIDIKAN

JUMPA: Jurnal Manajemen Pendidikan
Vol. 06 No. 01 (2025): 98-110
Available online at https://ejournal.unuja.ac.id/index.php/jumpa/index

Golden Triangle-Based Digital Learning Facility Management Model *(Technology, People, Process)*

Syukri Indra*, Zahra Khusnul Lathifah, Abdul Kholik

Universitas Djuanda, Indonesia

*Email Corresponding author: syukri.indra@unida.ac.id

Abstract

The rapid advancement of digital technology has transformed educational practices, requiring institutions to adopt effective digital learning systems. However, significant challenges remain, particularly in Islamic educational institutions, where limitations in technological readiness, human resource capacity, and management processes hinder optimal implementation. This study addresses the lack of an integrated framework by examining digital learning management through the golden triangle model, which consists of technology, people, and process. Using a qualitative multi-case study approach, this research was conducted in two Madrasah Aliyah Negeri in Bogor City. Data were collected through in-depth interviews, field findings, and documentation, and analyzed using the Miles and Huberman model supported by NVivo. The findings reveal that effective digital learning management is achieved through the synergy of three key components. The technology component includes blended learning, online learning, and classroom-based digital tools that support flexible learning environments. The people component highlights the collaborative roles of stakeholders, including school leaders, teachers, IT personnel, students, parents, and government institutions. Meanwhile, the process component reflects a structured managerial cycle involving policy, planning, organizing, implementation, and supervision supported by adequate infrastructure. Cross-case analysis indicates consistent implementation patterns across both research sites. These findings imply that successful digital learning in madrasah education requires a balanced and integrated management approach rather than isolated improvements in individual components. The study provides a conceptual and practical framework that can guide policymakers, school leaders, and educators in strengthening digital learning systems. Furthermore, it emphasizes the importance of aligning technological innovation with organizational capacity and educational values, particularly in the context of Islamic education, to ensure sustainable and effective digital transformation.

Article History
Received : 19 January 2025
Revised : 05 April 2025
Accepted : 08 June 2025

Keywords: *Golden Triangle, Learning Facilities, Learning Management, Digital Learning*

DOI: https://doi.org/10.33650/jumpa.v6i1.14930
How to Cite:
Indra, S., Lathifah, Z. K., & Kholik, A. (2025). Golden triangle-based digital learning facility management model (technology, people, process). *JUMPA: Jurnal Manajemen Pendidikan*, 6(1), 98–110.

INTRODUCTION

The rapid advancement of digital technology has significantly transformed the landscape of education, requiring institutions to adapt their learning systems to remain effective and relevant (ÖZDEMİR et al., 2023; Santhuenkaew, 2025). In Indonesia, the

integration of information and communication technology (ICT) into education has been formally emphasized through national policies, such as the Regulation of the Minister of Education and Culture No. 22 of 2016, which mandates the systematic and effective use of technology in learning processes (Jia, 2022; Wahidah et al., 2022). This transformation has become more urgent following the COVID-19 pandemic, during which more than 97.6% of schools adopted distance learning through digital platforms (Akter & Bhuiyan, 2025; Quadir & Zhou, 2021; Tenika Illananingtyas, 2021). However, despite this widespread adoption, challenges remain substantial. These conditions highlight a critical gap between policy expectations and practical implementation, particularly in Islamic educational institutions such as madrasahs, which face additional challenges related to institutional readiness, resource availability, and the integration of religious values into digital learning systems (Diah Khoirohnissah, 2023; Hamdanah, 2025; Supa'at et al., 2025).

Recent studies on digital learning have primarily focused on three major dimensions: technological infrastructure, human resource capacity, and management processes. Research by Heilporn (2022) emphasizes the role of blended learning in enhancing instructional effectiveness, highlighting how digital platforms can support diverse learning styles and increase student engagement. Similarly, studies on leadership and human resource development, such as Onan (2024), underline the importance of teacher training and institutional leadership in facilitating digital transformation. Meanwhile, Handayani (2024) stresses the role of supervision, infrastructure, and internet quality in ensuring the sustainability of digital learning systems. These studies collectively suggest that successful digital learning depends on multiple interconnected factors. However, most existing research tends to examine these elements separately, resulting in a fragmented understanding of how digital learning systems operate as an integrated whole. Consequently, there is a need for a more comprehensive framework that captures the interaction among technology, people, and process in educational settings.

Despite the growing body of literature, a significant research gap remains in understanding how these three components are simultaneously integrated within Islamic educational institutions, particularly in the context of Madrasah Aliyah Negeri. Previous studies have largely focused on general schools or have analyzed digital learning from a single perspective, such as technology adoption or teacher competence. Limited attention has been given to how technological infrastructure, stakeholder roles, and managerial processes interact in a unified system. Moreover, the unique characteristics of madrasahs, including their dual focus on general and religious education, require a contextualized approach that accommodates both pedagogical innovation and value integration. This study addresses this gap by proposing a conceptual model based on the golden triangle framework, which integrates technology, people, and process as interdependent components of digital learning management. The novelty of this research lies in its holistic approach, multi-case design, and its specific focus on Islamic educational institutions, providing a more comprehensive understanding of digital learning implementation.

This study aims to develop and analyze a conceptual model of digital learning management based on the golden triangle framework in Madrasah Aliyah Negeri in Bogor City. Specifically, the research seeks to identify the key elements of technology, people, and process in digital learning implementation, examine how these components

interact within the institutional context, and explore how their integration contributes to effective learning outcomes. By focusing on two madrasahs as research sites, this study provides empirical insights into how digital learning is managed in real-world educational settings. The findings are expected to contribute both theoretically and practically, offering a framework that can be adopted by other Islamic educational institutions facing similar challenges in digital transformation.

The central argument of this study is that effective digital learning management cannot be achieved through isolated improvements in technology, human resources, or management processes. Instead, it requires a balanced and integrated approach that aligns these components within a coherent system. Through a qualitative multi-case study approach, this research explores how the interaction among technology, people, and process shapes digital learning practices in madrasahs. This exploration aims to provide a deeper understanding of the dynamics underlying digital learning management and to identify patterns that can inform future educational strategies. By doing so, the study sets the foundation for the methodological approach presented in the following section.

RESEARCHS METHOD

This study employed a qualitative research design with a multi-case study approach to explore the management of digital learning based on the golden triangle framework (technology, people, and process). The selection of a multi-case design was intended to enable an in-depth understanding of digital learning management practices across different institutional contexts, allowing for cross-case comparison and pattern identification (Polukhina, 2022; Shrestha & Bhattarai, 2022; Waghorn & Yelland, 2024). This design is particularly relevant as it provides a holistic perspective on how digital learning is implemented within real-world educational settings. The study was conducted in two State Islamic Senior High Schools, namely MAN 1 Bogor City and MAN 2 Bogor City, which represent institutions actively implementing digital learning systems. A qualitative approach was chosen because it allows for a comprehensive exploration of complex social phenomena, particularly those involving interactions among stakeholders, technological systems, and organizational processes (Goodman & Manning, 2022; Hughes et al., 2025; Zhang, 2021). This approach enables the researcher to capture contextual meanings, experiences, and practices that cannot be quantified but are essential for understanding the dynamics of digital learning management.

Data in this study were collected through in-depth interviews, field findings, and document analysis to ensure a comprehensive understanding of digital learning management practices. Interviews were conducted with key informants, including the head of the madrasah, vice principal of curriculum, teachers, and IT operators, who are directly involved in the implementation of digital learning. These informants were selected purposively based on their roles and relevance to the research focus (Perez, 2024). The researcher acted as the primary instrument in collecting and interpreting the data, engaging directly with participants to explore their experiences and perspectives. The research was conducted in Madrasah Aliyah Negeri in Bogor City within the natural school setting to capture authentic practices. To ensure the credibility of the findings, this study employed triangulation techniques, including triangulation of data sources and data collection methods (Lee, 2025; Morgan, 2024). This approach allowed the researcher to cross-check information obtained from interviews, field findings, and

documentation, thereby strengthening the consistency and trustworthiness of the research results.

Data analysis in this study followed the qualitative data analysis procedures proposed by Miles and Huberman, which consist of data condensation, data display, and conclusion drawing (Christou, 2025; Laari, 2025; Lochmiller, 2021). This analytical framework was chosen because it provides a systematic and iterative process for organizing and interpreting complex qualitative data. Initially, data condensation was carried out by selecting, focusing, and simplifying raw data obtained from interviews, field findings, and documentation. Subsequently, the data were presented in an organized manner through thematic categorization based on the golden triangle components: technology, people, and process. This step enabled the identification of patterns, relationships, and key findings across cases. Finally, conclusions were drawn through an iterative process of interpretation and verification to ensure the credibility of the findings. The use of NVivo as a qualitative data analysis tool supported the organization, coding, and exploration of large datasets, allowing for more efficient and structured analysis (Lejeune, 2024; Niedbalski & Ślęzak, 2022; Paulus Santibáñez & Duhalde Valenzuela, 2025). These analytical steps ensured that the findings were systematically derived and accurately reflected the empirical data collected in the study.

RESULT AND DISCUSSION

Result

Technology in Digital Learning Management

Technology in digital learning management refers to the utilization of various digital tools, systems, and platforms to support and enhance the learning process in an effective and integrated manner. In this study, technology is not merely understood as the presence of hardware and software, but also includes the implementation of learning models such as blended learning, online learning, and the use of technology in classroom settings tailored to students' needs. In addition, the integration of tauhid values into digital learning represents a distinctive aspect, indicating that technology is not applied in isolation but aligned with Islamic educational values. Technology serves as a fundamental component in facilitating interaction, delivering instructional content, and fostering innovation in learning practices. Therefore, well-managed technological integration plays a crucial role in determining the effectiveness of digital learning implementation in State Islamic Senior High Schools (Madrasah Aliyah Negeri) in Bogor City.

Based on the interview results, it can be observed that the use of technology in digital learning is not singular but involves multiple interconnected systems. Through the interviews conducted with the informants above, it is evident that the combination of government platforms, local systems, and interactive applications reflects a diversified technological approach in learning management. This condition shows that madrasahs do not rely on a single system but integrate various technologies to accommodate different learning needs. Additionally, the availability of supporting infrastructure such as computer laboratories, internet networks, and servers plays a crucial role in sustaining digital learning activities. The use of various classroom technologies also reflects efforts to enhance student engagement and interaction during the learning process. Therefore, technology functions as a bridge connecting teachers, students, and learning materials, enabling a more flexible and adaptive learning

environment.

Based on these findings, the forms of technology utilization are presented in Table 1.

Table 1. Forms of Technology Utilization

Forms of Technology Utilization	Description of Implementation	Impact on Digital Learning
Blended learning systems	Integration of face-to-face and online learning using government and local platforms	Enables flexible learning environments and continuity of instruction
Government and madrasah-based platforms	Use of official platforms (e-learning madrasah, RDM) and locally developed systems	Standardizes learning processes and supports institutional digital integration
Virtual communication tools	Use of Zoom Meeting, Google Meet, and similar platforms for synchronous learning	Enhances real-time interaction between teachers and students
Interactive learning applications	Use of Quizizz, Kahoot, and other digital tools for assessments and activities	Increases student engagement and participation in learning
General digital platforms	Use of Google Workspace, YouTube, and other supporting applications	Expands access to learning resources and supports diverse learning styles
Hardware infrastructure	Availability of computer laboratories, mobile projectors, servers (3–6 units), and Wi-Fi networks	Ensures technical readiness and smooth implementation of digital learning
Artificial intelligence (AI) utilization	Use of AI-based tools as part of digital learning support	Supports innovation and efficiency in learning processes
Classroom technology integration	Use of both hardware and software directly in classroom instruction	Facilitates interactive and technology-enhanced teaching practices
Integration of tauhid values	Integration of religious values through curriculum, training, and character programs (P5RA)	Maintains alignment between digital learning and Islamic educational values

Technology in digital learning management at State Islamic Senior High Schools in Bogor City plays a significant role in supporting the effectiveness of the learning process. The utilization of technology extends beyond hardware and software to include the integration of various digital platforms that facilitate blended and online learning. The diversity of technological tools used indicates a flexible approach in adapting to different learning needs. The findings also reveal that technology has been systematically implemented as part of an integrated learning system. Adequate infrastructure and the use of interactive applications contribute to enhancing student engagement in learning activities. Additionally, the integration of tauhid values represents a distinctive characteristic that differentiates the implementation of digital learning in madrasahs.

People in Digital Learning Management

People in digital learning management refers to the roles and involvement of various stakeholders who contribute to the planning, implementation, and sustainability of digital learning systems. In this study, the people component encompasses the head of the madrasah, IT developers, IT operators, teachers, parents, students, and the government. Each actor holds a distinct yet interconnected role in ensuring that digital learning operates effectively. The head of the madrasah functions as a leader and

decision-maker, while IT developers and operators provide technical support and system management. Teachers act as instructional designers and facilitators, whereas parents and students contribute through participation and readiness in digital learning processes. Meanwhile, the government plays a strategic role through policies, infrastructure support, and capacity development. Therefore, the people component reflects a collaborative system in which each stakeholder contributes to the success of digital learning implementation.

Based on the findings, the implementation of digital learning involves multiple stakeholders with specific roles and responsibilities. These roles are interconnected and collectively support the sustainability of digital learning. The involvement of each actor indicates that digital learning is not an individual effort but a collaborative system. As reflected in the research data: "The head of the madrasah performs managerial functions, promotes digital learning innovation, facilitates training, strengthens digital commitment, provides digital facilities, and conducts evaluation and monitoring." This is further supported by another finding: "Teachers design digital learning materials, develop instructional content, improve competencies, utilize media, and implement digital learning creatively and innovatively."

The field findings show that stakeholders in Madrasah Aliyah Negeri in Bogor City actively contribute to the implementation of digital learning according to their respective roles. The head of the madrasah is involved in integrating digital learning into institutional planning, as reflected in the inclusion of digital programs in the Madrasah Work Plan (RKM). Coordination between school leadership, curriculum staff, and IT teams is consistently carried out to ensure structured implementation. IT developers and operators are responsible for managing digital systems, maintaining infrastructure, and providing technical support. Teachers actively design and implement digital learning materials while continuously improving their competencies through training. Parents contribute by supporting students through communication with the school and providing access to devices and internet connectivity. Students demonstrate readiness through digital literacy and participation in learning activities. Furthermore, the government supports digital learning through policies, infrastructure, funding, and human resource development programs.

The people component in digital learning management at Madrasah Aliyah Negeri in Bogor City plays a crucial role in ensuring the effectiveness and sustainability of digital learning implementation. The findings indicate that digital learning is supported by a collaborative system involving multiple stakeholders with clearly defined roles. The head of the madrasah provides leadership and strategic direction, while teachers serve as key implementers in the learning process. Technical support from IT developers and operators ensures system functionality, while parents and students contribute through participation and readiness. Additionally, the government plays a significant role in providing policies, infrastructure, and capacity development. The synergy among these stakeholders demonstrates that the success of digital learning is not determined by a single actor but by the collective contribution of all involved parties. Therefore, the people component forms an essential pillar in building an effective and sustainable digital learning system.

Process in Digital Learning Management

Process in digital learning management refers to a series of structured and

systematic managerial activities that ensure the effective implementation and sustainability of digital learning. In this study, the process component includes policy and regulatory frameworks, planning, organizing, implementation, supervision, and the support of software and hardware systems. These elements function as an integrated cycle that guides how digital learning is designed, executed, and evaluated within the madrasah context. Policies provide the foundational direction, while planning ensures readiness and alignment with institutional goals. Organizing clarifies roles and coordination mechanisms, and implementation translates plans into instructional practices. Supervision ensures quality control and continuous improvement, supported by adequate technological infrastructure. Therefore, the process component represents the operational backbone of digital learning management, ensuring that all activities are carried out systematically, consistently, and aligned with institutional and educational objectives in Madrasah Aliyah Negeri in Bogor City.

Based on the interview results, it can be understood that the process component in digital learning management operates through a continuous and structured cycle. Through the interviews conducted with the informants above, it is evident that policy and regulatory frameworks serve as the foundation that guides the implementation of digital learning. Planning activities such as needs analysis, teacher training, and curriculum alignment indicate a proactive approach in preparing both human and technological resources. Furthermore, organizing activities ensure clear coordination, task distribution, and collaboration among stakeholders. The implementation stage reflects the actual use of digital platforms and adaptive teaching strategies tailored to student needs. Supervision mechanisms, including monitoring and evaluation, ensure that the learning process remains aligned with established standards. Additionally, the support of software and hardware infrastructure strengthens the operational stability of digital learning. Therefore, the process component demonstrates a systematic and integrated management approach.

The process component in digital learning management at Madrasah Aliyah Negeri in Bogor City plays a fundamental role in ensuring the systematic implementation of digital learning. The findings demonstrate that digital learning is managed through a structured cycle consisting of policy formulation, planning, organizing, implementation, and supervision, supported by adequate technological infrastructure. Each stage contributes to maintaining the effectiveness and sustainability of the learning process. Policies provide direction, planning ensures preparedness, organizing establishes coordination, implementation operationalizes learning activities, and supervision maintains quality standards. The integration of software and hardware further strengthens the operational foundation of digital learning. These findings indicate that the success of digital learning is not solely dependent on technology or human resources but also on well-managed processes. Therefore, the process component serves as a critical element in building an effective, structured, and sustainable digital learning management system.

Based on the findings across the three components of the golden triangle, a cross-case comparison between MAN 1 and MAN 2 in Bogor City is presented in Table 2 to illustrate the patterns of similarity in digital learning management implementation.

Table 2. Cross-Case Comparison of Golden Triangle Components

Component	Aspect	MAN 1 Bogor City	MAN 2 Bogor City	Pattern of Findings
Technology	Blended learning	Not explicitly differentiated in the findings	Not explicitly differentiated in the findings	Similar implementation
	Online learning	Not explicitly differentiated in the findings	Not explicitly differentiated in the findings	Similar implementation
	Digital platforms	Use of government and madrasah-based platforms	Use of government and madrasah-based platforms	Consistent
	Learning applications	Quizizz, Kahoot, YouTube, Google Meet, Zoom	Quizizz, Kahoot, YouTube, Google Meet, Zoom	Consistent
	Infrastructure (labs, Wi-Fi, servers)	Not explicitly differentiated in the findings	Not explicitly differentiated in the findings	Relatively similar
	Integration of tauhid values	Integrated into curriculum and character programs	Integrated into curriculum and character programs	Consistent
People	Head of madrasah	Managerial leadership, innovation, monitoring	Managerial leadership, innovation, monitoring	Similar leadership pattern
	IT developers	System coordination, management, training	System coordination, management, training	Consistent
	IT operators	System and infrastructure maintenance	System and infrastructure maintenance	Consistent
	Teachers	Design and implementation of digital learning	Design and implementation of digital learning	Consistent
	Parents	Support through communication and provision of devices	Support through communication and provision of devices	Consistent
	Students	Digital literacy and learning readiness	Digital literacy and learning readiness	Consistent
	Government	Policy, infrastructure, funding, and training support	Policy, infrastructure, funding, and training support	Consistent
Process	Policy and regulation	National (Kemenag) and internal policies	National (Kemenag) and internal policies	Consistent
	Planning	Needs analysis, training, curriculum alignment	Needs analysis, training, curriculum alignment	Consistent
	Organizing	Coordination, system integration, task delegation	Coordination, system integration, task delegation	Consistent
	Implementation	Use of digital platforms and adaptive methods	Use of digital platforms and adaptive methods	Consistent
	Supervision	Monitoring, evaluation, and follow-up	Monitoring, evaluation, and follow-up	Consistent

	Software support	SOP, network stability, and security	SOP, network stability, and security	Consistent
	Hardware support	Laboratories and supporting devices	Laboratories and supporting devices	Consistent

Discussion

This study reveals that digital learning management in Madrasah Aliyah Negeri in Bogor City is effectively implemented through the integration of three interrelated components: technology, people, and process, conceptualized within the golden triangle framework. The findings indicate that the technology component functions as the foundational infrastructure, encompassing blended learning, online learning, and classroom-based digital tools that support flexible and interactive learning environments. The people component reflects a collaborative system involving multiple stakeholders, including school leaders, teachers, IT personnel, students, parents, and government institutions, each contributing to the sustainability of digital learning. Meanwhile, the process component demonstrates a structured managerial cycle consisting of policy formulation, planning, organizing, implementation, and supervision, supported by adequate software and hardware systems. The synergy among these three components results in the effective implementation of digital learning. These findings highlight that digital transformation in madrasah education is not dependent on a single factor but rather on the balanced interaction among technological readiness, human resource capacity, and structured management processes.

The conceptual model derived from this study is illustrated in Figure 1.

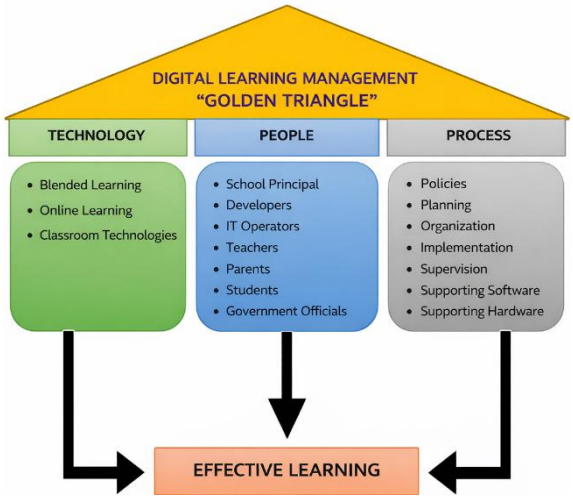

Figure 1. Digital Learning Management Model Based on the Golden Triangle

The findings of this study extend the existing literature by offering a comprehensive and integrated perspective on digital learning management. Previous studies have predominantly examined digital learning through isolated dimensions. For example, Li (2025) emphasized the effectiveness of blended learning as a technological innovation, while Marwan (2025) highlighted the role of leadership and teacher capacity development in digital transformation. Similarly, Thongphukdee (2024) underscored the importance of supervision and infrastructure in ensuring the quality of digital learning. However, this study advances prior research by demonstrating that the effectiveness of digital learning is not solely dependent on technology, human resources, or

management processes individually, but rather on their dynamic interaction within a unified framework. This finding aligns with Dhrubo (2025), who conceptualizes the golden triangle as a holistic model for managing complex organizational systems. Furthermore, this study addresses a significant research gap by integrating technology, people, and process within the specific context of Islamic educational institutions, which has been underexplored in previous research. Thus, this study provides a more holistic and contextually grounded understanding of digital learning management.

This study contributes significantly to the field of Islamic educational management, particularly in the context of digital transformation. First, it introduces a conceptual model based on the golden triangle framework that integrates technology, people, and process into a unified and operational management system. This model provides a strategic reference for madrasah institutions seeking to implement effective digital learning practices. Second, the study highlights the importance of multi-stakeholder collaboration, demonstrating that leadership, teacher competence, technical support, parental involvement, and government policy collectively shape the success of digital learning. Third, the research emphasizes the critical role of structured managerial processes, indicating that effective digital learning requires systematic planning, coordination, and evaluation rather than ad hoc implementation. In the context of Islamic educational management, this study reinforces the integration of technological advancement with Islamic values, particularly through the incorporation of tauhid into digital learning practices. Therefore, this research not only enriches theoretical discourse but also offers practical implications for policymakers, educators, and institutional leaders in strengthening digital learning systems within madrasah environments.

This study underscores the importance of adopting an integrated and holistic approach to digital learning management in madrasah education. The findings demonstrate that the effectiveness of digital learning is achieved through the balanced interaction of technology, people, and process within a structured management framework. This integrated model ensures that digital transformation is not fragmented but systematically aligned with institutional goals and educational values. The study also highlights the relevance of the golden triangle framework as a strategic model for managing digital learning in Islamic educational contexts. From a broader perspective, these findings suggest that future research should examine the applicability of this model across different educational settings and explore its long-term impact on student learning outcomes. Additionally, policymakers and educational leaders are encouraged to strengthen the synergy among technological infrastructure, human resource development, and managerial processes to ensure sustainable digital transformation. Ultimately, this study provides a comprehensive foundation for advancing digital learning practices and contributes to the broader discourse on educational innovation in the digital era.

CONCLUSION

The increasing demand for effective digital learning in madrasah education has highlighted the need for a management approach that goes beyond fragmented implementation of technology, human resources, or administrative processes. This study addressed that challenge by examining how digital learning can be systematically managed through the integration of technology, people, and process within the golden

triangle framework. The findings demonstrate that technology provides the essential infrastructure for flexible and interactive learning, while the people component ensures collaborative engagement among stakeholders, including school leaders, teachers, IT personnel, students, parents, and government actors. At the same time, the process component establishes a structured managerial cycle encompassing policy, planning, organizing, implementation, and supervision. The alignment and interaction of these three components collectively enable the effective implementation of digital learning in Madrasah Aliyah Negeri in Bogor City.

These findings carry important implications for the development of digital learning in Islamic educational institutions. They suggest that successful digital transformation requires a balanced and integrated approach rather than isolated improvements in individual components. Practically, madrasah leaders and policymakers should prioritize strengthening synergy among technological infrastructure, stakeholder capacity, and managerial processes to ensure sustainability. In addition, the integration of Islamic values, such as tauhid, within digital learning practices reinforces the relevance of contextualized educational models. Future research may explore the applicability of the golden triangle framework in different institutional settings and assess its long-term impact on student learning outcomes. Overall, this study provides a strategic foundation for advancing digital learning management and supports the ongoing transformation of education in the digital era.

ACKNOWLEDGMENT

The authors would like to express their sincere gratitude to all parties who have supported the completion of this study. Special appreciation is extended to colleagues and reviewers for their valuable insights and constructive feedback.

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