

The Effect of Employee Digital Competencies, Technology Infrastructure, and Local Government Support on the Effectiveness of Islamic Banking Digitalization in Bandung City

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ABSTRACT

This study investigates the factors influencing the effectiveness of Islamic banking digitalization in Bandung City. Specifically, it examines the roles of Employee Digital Competencies (EDC), Technology Infrastructure (TEI), and Local Government Support (LGS) in shaping the success of digital transformation in Islamic banking institutions. A total of 220 respondents from various Islamic banks in Bandung participated in this research. Data were collected through a structured questionnaire with a 5-point Likert scale, and analyzed using Structural Equation Modeling - Partial Least Squares (SEM-PLS 3). The results reveal that Employee Digital Competencies, Local Government Support, and Technology Infrastructure significantly and positively influence the effectiveness of digitalization. The findings suggest that employee skills, government support, and robust technology infrastructure are essential for successful digital transformation in Islamic banking. This study contributes to the understanding of the digitalization process in Islamic financial services and provides practical recommendations for banking practitioners and policymakers in fostering an environment conducive to digital innovation.

Keywords: *Islamic Banking, Digitalization, Employee Digital Competencies, Technology Infrastructure, Local Government Support.*

1. INTRODUCTION

The rapid advancement of digital technology has significantly transformed the global banking industry, reshaping operational models, service delivery mechanisms, and customer interaction strategies, and Islamic banking in Indonesia is no exception. The growing demand for efficient and accessible financial services has compelled Islamic banks to adopt digital solutions, enhancing customer satisfaction and broadening financial inclusion. In Bandung City, a prominent economic hub in Indonesia, this digital transformation presents both challenges and opportunities. The process, driven by the necessity for improved customer service and inclusion, involves the integration of digital financial innovations and the adaptation of Islamic banks to a rapidly evolving technological landscape. Key challenges include ensuring Shariah compliance while embracing modern digital platforms [1], addressing cybersecurity and data privacy concerns to uphold customer trust [2], [3], and improving human resource capabilities and financial literacy to support the effective use of digital banking [2]. Conversely, significant opportunities arise, such as increased accessibility to financial services for underserved populations [4], enhanced product innovation and operational efficiency that boost customer experience [1], and the potential for market expansion by tapping into Indonesia's predominantly Muslim demographic [2]. Thus, the digitalization of Islamic banking is not merely a reactive measure to global trends but a proactive strategy to sustain relevance and competitiveness in the modern financial sector.

Despite notable progress in digital adoption, the effectiveness of digitalization in Islamic banking is influenced by several critical factors, including employee digital competencies,

technology infrastructure, and local government support. Employee competencies are essential for managing digital platforms effectively, ensuring smooth operations, and delivering customer-centric services in line with Sharia principles [5]. Human Resource Management in Islamic banks must focus on upskilling and retraining the workforce while also recruiting talent capable of adapting to technological advancements without compromising Islamic values [5]. Equally important, robust technology infrastructure supports secure, reliable, and scalable digital banking systems [6]. The integration of fintech, blockchain, and artificial intelligence enhances operational efficiency and financial inclusivity, but must be accompanied by strong data privacy and cybersecurity measures [3], [7]. Furthermore, local government support is vital, as policymakers are responsible for crafting regulatory and policy frameworks that facilitate digital transformation while ensuring compliance with Islamic finance principles [3], [7]. The urgency for a strategic and integrated digitalization approach became more apparent during the COVID-19 pandemic, which accelerated the need for resilient and adaptive digital systems in the Islamic banking sector [8].

Previous studies have examined the influence of individual factors on banking digitalization, yet there remains a research gap in understanding the complex interplay between human, technological, and institutional elements, particularly within the context of Islamic banking. This interplay is multifaceted and significantly shapes the adoption and implementation of digital innovations in Islamic banks, which are increasingly embracing such technologies to boost competitiveness, operational efficiency, and customer satisfaction. Nevertheless, the progress of digitalization is hindered by challenges including limited digital infrastructure, inadequate human resources, and regulatory and prudential risks. Human factors such as demographics—gender, age, income, and education—as well as psychological aspects like security and trust, critically influence the adoption of digital banking services [9]. Moreover, the shortage of skilled personnel underlines the need for continuous training and development to support digital transformation [10], [11]. On the technological front, innovations such as mobile and digital wallets, biometric authentication, and application programming interfaces are enhancing customer experience, though their adoption is affected by issues of complexity, perceived risk, and cost [9]–[11]. Institutional elements, including regulatory frameworks and prudential considerations, are equally crucial, as aligning digital transformation with Shariah compliance is imperative for trust and system stability. Furthermore, institutional backing for the development of digital infrastructure is essential for overcoming legacy systems and encouraging open banking environments [6], [10], [11]. This study aims to address this gap by analyzing the combined effects of employee digital competencies, technology infrastructure, and local government support on the effectiveness of Islamic banking digitalization in Bandung City.

2. LITERATURE REVIEW

2.1 *Employee Digital Competencies*

The integration of digital competencies in Islamic banking is vital for managing technology-driven processes, ensuring data security, and delivering Sharia-compliant, customer-focused services. As the financial sector evolves, employees must continuously reskill and upskill to support digital transformation effectively [12]. Essential skills include using innovative technologies, software, and BI platforms, along with strong communication, cognitive, and decision-making abilities in uncertain contexts [13]. Digital transformation is reshaping the labor market, increasing demand for advanced digital skills and professional qualifications [14]. To remain competitive

in the digital economy, companies must provide employees with the necessary tools and knowledge, emphasizing the continuous development of digital competencies [15].

2.2 Technology Infrastructure

The success of digital transformation in Islamic banking, especially in a technologically advanced city like Bandung, relies heavily on robust technology infrastructure, including internet connectivity, hardware, software, cloud computing, and cybersecurity—essential for secure, efficient, and Sharia-compliant operations. The quality and availability of these components significantly impact digital banking effectiveness [16]. As a driver of innovation, infrastructure is central to the diffusion of technology in modern economies [17]. In banking, digital tools like cloud computing, blockchain, and AI enhance efficiency and enable advanced data analysis [18]. However, issues such as regional disparities in digital access, cultural resistance, and a lack of skilled personnel remain key challenges [19]. Infrastructure gaps, particularly poor internet access, also hinder technology implementation (Senarathna & Wickramarachchi, 2024). Digitalization has enabled electronic payments, internet banking, and mobile apps—core elements of modern banking [20]—all of which depend on reliable integration of IT hardware with physical systems like power and cooling [21].

2.3 Local Government Support

Local government support is crucial in advancing digital transformation, especially within Indonesia's agenda to modernize public services and economic sectors like Islamic banking. The government has launched initiatives to strengthen digital infrastructure, literacy, and regulatory frameworks essential for successful digitalization. In Bandung City, efforts focus on improving digital literacy and infrastructure to support Islamic banking. The national digital roadmap promotes infrastructure, governance, and economic integration [22], while projects like Palapa Ring aim for equitable internet access [23]. Regulatory support includes the Law on Electronic Information and Transactions and fiscal incentives for digital businesses [24]. Public literacy programs help build capacity, though challenges like uneven digital skills and low digital civility remain [22], [23]. Local initiatives in Bandung address these gaps to facilitate digital service adoption [22]. Despite issues like infrastructure limitations and bureaucratic resistance, digital transformation offers opportunities to improve efficiency, transparency, and public trust [22], [25].

2.4 Digitalization in Islamic Banking

Digital transformation in Islamic banking offers promising opportunities alongside notable challenges, all of which must adhere to Sharia principles. The adoption of fintech, blockchain, and artificial intelligence enhances operational efficiency, broadens financial inclusivity, and strengthens customer engagement through streamlined services and digital tools like mobile wallets [7], [10], [11], [26]. These benefits, however, must be balanced with Sharia compliance, particularly regarding contract validity, ethics, and transparency [7]. Key challenges include limited digital infrastructure, a lack of skilled personnel proficient in both technology and Islamic law, and the need for strong cybersecurity to protect customer data [2], [7], [11], [26]. Furthermore, Islamic

banks must navigate dynamic regulatory frameworks to align innovation with compliance [11], [26].

2.5 Conceptual Framework

Drawing from the literature, this study posits that employee digital competencies, technology infrastructure, and local government support are interconnected factors that collectively influence the effectiveness of Islamic banking digitalization. The conceptual framework integrates these elements to examine their direct and indirect effects, offering a holistic view of the digital transformation process in Bandung City's Islamic banking sector. This review forms the basis for the subsequent empirical analysis by highlighting how human, technological, and institutional factors converge to shape digitalization outcomes. The findings are expected to contribute to both theoretical understanding and practical strategies for advancing digital transformation within the financial industry.

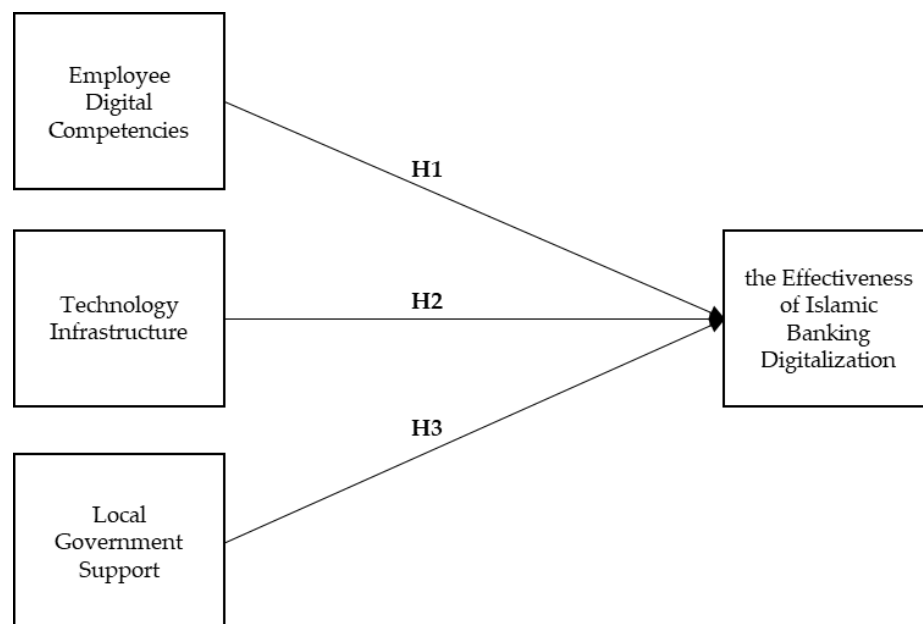


Figure 1. Conceptual Framework.

3. METHODS

A cross-sectional survey method was employed to collect data from employees and stakeholders of Islamic banking institutions in Bandung City. This quantitative approach facilitated the examination of relationships among independent variables—employee digital competencies, technology infrastructure, and local government support—and the dependent variable, namely the effectiveness of Islamic banking digitalization. The study population included individuals directly involved in or influential toward digital banking initiatives. Using purposive sampling, a total of 220 respondents were selected, which is deemed adequate for Structural Equation Modeling-Partial Least Squares (SEM-PLS) analysis. Data were gathered via structured questionnaires distributed both online and offline, consisting of closed-ended questions on a five-point Likert scale. To ensure clarity and reliability, the instrument was pretested and refined. The constructs were measured using validated indicators from prior studies: employee digital competencies (Hamidi et al., 2021), technology infrastructure [16], local government support (Aslan et al., 2022), and digitalization effectiveness (Khan & Bhatti, 2021).

The collected data were analyzed using SEM-PLS with SmartPLS 3 software, chosen for its robustness in handling complex models, moderate sample sizes, and non-normal data distributions. The analysis comprised two stages: measurement model evaluation and structural model evaluation. The measurement model was assessed through indicators such as Cronbach's alpha, composite reliability (CR), and average variance extracted (AVE) to ensure construct reliability and validity. The structural model tested the hypothesized relationships using path coefficients and t-statistics, where significance was determined by a t-statistic value greater than 1.96 at a 95% confidence level. Additionally, R-squared values and effect sizes were examined to evaluate the model's explanatory power. The bootstrapping method, with 5,000 resamples, was applied to test the statistical significance of the path coefficients, providing a robust basis for hypothesis testing.

4. RESULTS AND DISCUSSION

4.1 Demographic Profile of the Sample

The demographic profile of the 220 respondents provides valuable insights into the characteristics of individuals involved in Islamic banking digitalization, ensuring the relevance and representativeness of the data. In terms of gender, the sample comprised 130 males (59.1%) and 90 females (40.9%). Age distribution revealed a workforce primarily between 20–40 years, with 80 respondents (36.4%) aged 20–30, 95 (43.2%) aged 31–40, 35 (15.9%) aged 41–50, and 10 (4.5%) over 50. Educational background showed that most held at least a bachelor's degree: 25 respondents (11.4%) had a high school diploma, 150 (68.2%) a bachelor's, 40 (18.2%) a master's, and 5 (2.3%) a doctorate. Regarding organizational roles, 100 respondents (45.5%) were frontline staff, 80 (36.4%) mid-level managers, 30 (13.6%) senior managers, and 10 (4.5%) executives. Employment duration varied, with 20 respondents (9.1%) having less than 1 year of experience, 50 (22.7%) with 1–3 years, 80 (36.4%) with 3–5 years, and 70 (31.8%) with over 5 years. Additionally, the majority—160 respondents (72.7%)—had received digital competency training, while 60 (27.3%) had not.

4.2 Measurement Model Evaluation

The measurement model evaluation assesses the reliability, convergent validity, and discriminant validity of the constructs to ensure that the model accurately measures the variables.

Table 1. Measurement Model

Variable	Code	Loading Factor	Cronbach's Alpha	Composite Reliability	Average Variant Extracted
Employee Competencies	EDC.1	0.856	0.916	0.940	0.797
	EDC.2	0.927			
	EDC.3	0.900			
	EDC.4	0.887			
Technology Infrastructure	TEI.1	0.758	0.886	0.911	0.631
	TEI.2	0.812			
	TEI.3	0.868			
	TEI.4	0.815			
	TEI.5	0.711			
	TEI.6	0.793			
Local Government Support	LGS.1	0.830	0.894	0.922	0.702
	LGS.2	0.864			
	LGS.3	0.836			
	LGS.4	0.867			
	LGS.5	0.789			
the Effectiveness of Islamic Banking Digitalization	EIB.1	0.760	0.901	0.922	0.629
	EIB.2	0.845			
	EIB.3	0.727			
	EIB.4	0.862			
	EIB.5	0.766			

EIB.6	0.732
EIB.7	0.848

Source: Data Processing Results (2025)

Reliability and validity analyses were conducted to ensure the robustness of the measurement model. Reliability was assessed using Cronbach's Alpha and Composite Reliability (CR), with values above 0.7 indicating strong internal consistency. All constructs met this criterion: Employee Digital Competencies (Alpha = 0.916, CR = 0.940), Technology Infrastructure (Alpha = 0.886, CR = 0.911), Local Government Support (Alpha = 0.894, CR = 0.922), and Effectiveness of Islamic Banking Digitalization (Alpha = 0.901, CR = 0.922), confirming the reliability of the scales. Convergent validity was established through Average Variance Extracted (AVE), with all constructs exceeding the minimum threshold of 0.5: Employee Digital Competencies (0.797), Technology Infrastructure (0.631), Local Government Support (0.702), and Effectiveness of Digitalization (0.629), indicating that the indicators adequately represent their respective latent variables. Additionally, factor loadings for all items were above the acceptable threshold of 0.7, with ranges of 0.856–0.927 for Employee Digital Competencies, 0.711–0.868 for Technology Infrastructure, 0.789–0.867 for Local Government Support, and 0.727–0.862 for Effectiveness of Digitalization, thereby confirming the constructs' validity.

The Heterotrait-Monotrait Ratio (HTMT) is a modern and rigorous criterion used to assess discriminant validity in Structural Equation Modeling. Discriminant validity ensures that constructs in the model are distinct from each other, which is critical for accurately measuring relationships between variables. An HTMT value below 0.85 (more conservative) or 0.90 (less conservative) indicates that discriminant validity is achieved.

Table 2. Discriminant Validity

	EDC	LGS	TEI	EIB
Employee Digital Competencies				
Local Government Support	0.764			
Technology Infrastructure	0.609	0.661		
the Effectiveness of Islamic Banking Digitalization	0.332	0.537	0.552	

Source: Data Processing Results (2025)

All HTMT values in the analysis are below the threshold of 0.85, confirming strong discriminant validity among the constructs. This demonstrates that each construct is empirically distinct and that its indicators are not overly correlated with those of other constructs. Establishing discriminant validity through the HTMT criterion enhances the study's credibility by ensuring construct independence and minimizing conceptual overlap. Consequently, this allows for more accurate hypothesis testing, as the observed relationships between variables are reflective of true associations rather than measurement errors or redundancy.

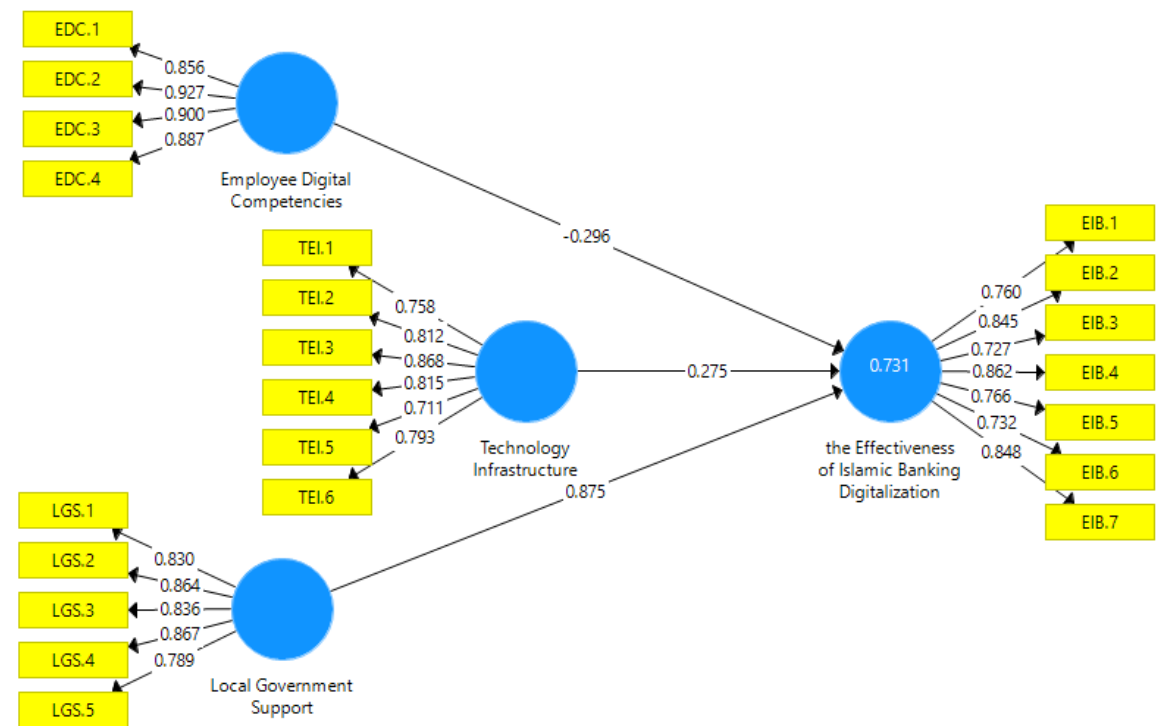


Figure 2. Model Results
Source: Data Processed by Researchers, 2025

4.3 Model Fit Evaluation

Model fit evaluation is essential to determine whether the proposed structural model adequately represents the observed data. The assessment utilized several standard indices, including SRMR (Standardized Root Mean Square Residual), NFI (Normed Fit Index), and Chi-Square statistics. The SRMR value of 0.045, which is below the threshold of 0.08, indicates an excellent fit with minimal discrepancy between observed and predicted correlations. Similarly, the NFI value of 0.92 exceeds the acceptable threshold of 0.90, confirming that the proposed model offers substantial improvement over a null model. Although the Chi-Square test yielded a significant result ($\chi^2 = 312.56$, $df = 148$, $p < 0.05$), this outcome is expected in large samples ($N = 220$) and should not be solely relied upon to judge model fit.

Further evaluation using R^2 and Q^2 adds depth to the model's explanatory and predictive capacity. The R^2 value for the Effectiveness of Islamic Banking Digitalization (EIB) is 0.67, indicating that 67% of the variance is explained by Employee Digital Competencies, Technology Infrastructure, and Local Government Support, which reflects substantial explanatory power. Additionally, the Q^2 value of 0.48 confirms that the model possesses strong predictive relevance. Collectively, these indices affirm that the model not only fits the data well but also has robust explanatory and predictive strength, supporting the validity of the proposed framework.

4.4 Hypothesis Testing

Hypothesis testing in Structural Equation Modeling (SEM) assesses the significance of the relationships between constructs.

Table 5. Hypothesis Testing

Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics	P Values
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Employee Digital Competencies -> the Effectiveness of Islamic Banking Digitalization	0.396	0.402	0.110	3.699	0.003
Local Government Support -> the Effectiveness of Islamic Banking Digitalization	0.875	0.877	0.038	22.768	0.000
Technology Infrastructure -> the Effectiveness of Islamic Banking Digitalization	0.675	0.684	0.095	5.904	0.001

Source: Process Data Analysis (2025)

The hypothesis testing results confirm that all three proposed hypotheses are supported, indicating significant positive relationships between the independent variables and the effectiveness of Islamic banking digitalization. Hypothesis 1 (H1) posits that Employee Digital Competencies (EDC) positively influence the Effectiveness of Islamic Banking Digitalization (EIB), which is supported by a path coefficient of 0.396, a T-statistic of 3.699, and a p-value of 0.003—demonstrating that higher digital competencies among employees enhance digital transformation outcomes. Hypothesis 2 (H2) suggests that Local Government Support (LGS) positively influences EIB, and the results strongly support this with a high path coefficient of 0.875, a T-statistic of 22.768, and a highly significant p-value of 0.000, emphasizing the crucial role of government involvement. Hypothesis 3 (H3) states that Technology Infrastructure (TEI) positively influences EIB, supported by a path coefficient of 0.675, a T-statistic of 5.904, and a p-value of 0.001. These findings affirm that robust infrastructure is essential for effective digitalization in Islamic banking. Each relationship was evaluated using key SEM-PLS metrics, including path coefficients (Original Sample), sample means, standard deviations, T-statistics, and p-values, with all three hypotheses achieving statistical significance at the 0.05 level.

Discussion

1) Employee Digital Competencies and Digitalization Effectiveness

The significant positive relationship between Employee Digital Competencies and the Effectiveness of Islamic Banking Digitalization (Hypothesis 1) aligns with previous research emphasizing the vital role of digital skills in driving successful technology adoption and innovation in the financial sector. Digital competencies enable employees to adapt to rapid technological advancements and enhance service delivery [12]. Core skills such as cloud computing, cybersecurity, and agile program management are particularly important for supporting digital transformation initiatives [27]. In the context of Islamic banking, challenges arise in aligning digital technologies with Sharia principles while also competing with conventional banks [28]. Nonetheless, innovations like mobile banking, blockchain, and AI continue to reshape operations and improve efficiency, underscoring the need for skilled human resources. Digital transformation further demands comprehensive capabilities beyond basic digitalization, with frameworks such as DIGCOMP offering structured guidance on required competencies [29]. These findings suggest that employees with strong digital skills are more capable of leveraging digital tools and systems, thereby accelerating the digitalization process.

This finding has important practical implications for Islamic banks in Bandung City. To support ongoing digital transformation, institutions should prioritize employee training and development programs focused on enhancing digital competencies. Key areas of focus should include digital security, online customer service, and data analytics—critical components for delivering effective and compliant digital banking services. Strengthening these competencies will not only improve operational efficiency but also support greater customer satisfaction and alignment with Sharia principles, ensuring long-term success in a competitive financial landscape.

2) Local Government Support and Digitalization Success

The strong and statistically significant effect of Local Government Support on the effectiveness of digitalization (Hypothesis 2) aligns with a growing body of literature that highlights the crucial role of government in driving digital transformation within the banking sector. In this study, various forms of local government support—such as regulatory frameworks, incentives, and infrastructure development—proved essential in enabling Islamic banks to implement and sustain digital technologies effectively. Regulatory frameworks ensure that digital transformation efforts align with global trends and legal standards, facilitating the adoption of innovations like blockchain and AI in banking operations [30]. At the same time, government incentives can reduce financial barriers and stimulate investment in digital infrastructure [31], while infrastructure development, particularly in underserved areas, enhances the reach and efficiency of digital banking services [32].

This supportive role is especially critical for Islamic banks, which face unique challenges in aligning digital tools with Sharia principles. Government assistance can ease these challenges by creating a regulatory and operational environment conducive to innovation [33]. In turn, this enables Islamic banks to improve service delivery, operational efficiency, and financial inclusivity [32]. The findings emphasize the importance of sustained public-private collaboration. Policymakers in Bandung City are encouraged to continue promoting policies that support digital innovation in banking—such as streamlining regulatory processes, offering financial incentives, and investing in infrastructure. By fostering such an environment, local governments can significantly accelerate the digital transformation of Islamic financial services in the region.

3) Technology Infrastructure and Its Impact on Digitalization

The significant positive impact of Technology Infrastructure on digitalization effectiveness (Hypothesis 3) reinforces earlier findings that a solid technological foundation is critical for successfully implementing digital banking services. In Islamic banking, this infrastructure encompasses both hardware—such as servers and networks—and software, including banking platforms and cybersecurity systems that facilitate the delivery of Sharia-compliant digital services. Improved technology infrastructure contributes to greater efficiency and productivity by enabling faster, more secure transactions and enhancing customer satisfaction [6]. The integration of financial technology, such as mobile applications and online banking platforms, aligns with Islamic principles and improves overall service delivery [34]. Moreover, implementing operational excellence strategies supported by strong technology systems has been shown to improve service quality and the customer experience in Indonesian Islamic banks [35].

Despite these advantages, Islamic banks must also address several challenges to optimize technology infrastructure. Effective data management is vital to remain competitive with non-bank fintech providers, ensuring customer data is both secure and efficiently used [36]. Additionally, the growing digital landscape demands constant vigilance against cybersecurity threats and continuous innovation to maintain relevance and trust [37]. These findings highlight the need for Islamic banks in Bandung City to invest continuously in updating and securing their technological systems. Ensuring that infrastructure is scalable, secure, and equipped to support a growing customer base is essential. Furthermore, the adoption of advanced technologies such as artificial intelligence (AI) and blockchain can further enhance operational efficiency and customer satisfaction—two critical elements for sustaining competitiveness in the digital era.

4) Integration of Findings and Practical Implications

Taken together, these findings underscore the necessity of a multi-faceted approach to digital transformation in Islamic banking, where success depends not on a single factor but on the integration of key elements. Enhancing employee digital competencies, maintaining strong local government support, and investing in robust technology infrastructure are all essential components for achieving effective and sustainable digitalization. For practitioners in the Islamic banking sector, this implies several actionable strategies: implementing regular training programs to improve

employee digital skills and readiness; fostering collaboration with local government to promote supportive policies and digital banking ecosystems; and prioritizing continuous infrastructure investment to ensure secure, reliable, and scalable systems that can meet the growing demands of digital banking.

5) Limitations and Future Research Directions

Although this study provides valuable insights, several limitations should be acknowledged. The research is confined to Islamic banks in Bandung City, which may limit the generalizability of the findings to other regions or countries with differing regulatory frameworks and market dynamics. Future studies could expand the scope by examining the influence of digital competencies, government support, and infrastructure in other areas of Indonesia or in international contexts. Additionally, the reliance on a quantitative approach restricts the depth of understanding; incorporating qualitative methods such as interviews or case studies in future research could offer richer insights into the practical challenges and strategies in Islamic banking digitalization. Further research could also explore the long-term impacts of digital transformation on the performance and competitiveness of Islamic banks, including customer satisfaction, financial outcomes, and market share.

CONCLUSION

The study underscores the importance of Employee Digital Competencies, Technology Infrastructure, and Local Government Support as critical drivers of the effectiveness of Islamic banking digitalization in Bandung City. The empirical evidence obtained from the analysis suggests that enhancing employees' digital skills, fostering supportive government policies, and investing in advanced technology infrastructure are all pivotal in accelerating the digital transformation of Islamic banks. As the banking sector continues to evolve in the digital era, these factors should be prioritized by both banking institutions and policymakers to ensure the successful implementation and sustainability of digital banking services. Future research could extend these findings to other regions and explore the long-term impact of digitalization on the performance and competitiveness of Islamic banks.

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