

ARTIFICIAL INTELLIGENCE AND BIG DATA STRATEGIES TO ENHANCE ISLAMIC BANKS' COMPETITIVENESS AND SUSTAINABLE DEVELOPMENT

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ABSTRACT

This study investigates the impact of artificial intelligence and big data strategies on Islamic banks' competitiveness and sustainable development in Jordan, employing an integrated theoretical framework combining the Resource-Based View (RBV) and Dynamic Capabilities Theory (DCT). The research targets 487 managers and department heads from 15 Islamic banks, with a sample size of 214 participants selected through stratified random sampling. It employs a quantitative cross-sectional design, using PLS-SEM for data analysis. The findings reveal that AI implementation, big data analytics capabilities, and data management practices are significantly and positively associated with both bank competitiveness and sustainable development performance. Employee digital competency significantly affects competitiveness but shows no significant impact on sustainable development performance. The results provide valuable implications for banking executives, policymakers, and practitioners in implementing digital transformation strategies. The study contributes to the existing literature by integrating technological capabilities with Islamic banking principles, offering a comprehensive framework for understanding digital transformation in religious-based financial institutions. The originality of this research lies in its examination of the combined effects of AI and big data strategies in Islamic banking, particularly in the Middle Eastern context, while considering both competitive and sustainable development outcomes.

Keywords: Artificial intelligence, Big data analytics, Islamic banking, Bank competitiveness, Sustainable development performance.

JEL classification: L24; C55; G24; G24; Q01.

Article history:

Received : February 11, 2025

Revised : June 24, 2025

Accepted : August 31, 2026

Available online : September 30, 2026

<https://doi.org/10.21098/jimf.v12i3.2651>

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I. INTRODUCTION

The global Islamic banking industry stands at a critical juncture where technological innovation must be balanced with Shariah compliance to ensure long-term competitiveness and ethical sustainability. With assets expected to reach \$4.1 trillion by 2025 (IFSB, 2025), Islamic banks face growing pressure to embrace digital transformation. This growth is fueled by demographic shifts, greater financial inclusion, evolving customer expectations, sustainability priorities, and regulatory reforms. Jordan's Islamic banking sector mirrors this global momentum, growing at an annual rate of 9.2% and projected to surpass \$38.6 billion in assets by 2025 (CBJ, 2024). However, the traditional banking model is increasingly challenged by agile fintech disruptors and digital-first institutions. Three major structural shifts are reshaping Islamic banking in Jordan. First, the rapid adoption of digital technologies is altering customer expectations. A 2024 DinarStandard report shows 72% of Islamic banking customers now demand integrated digital and sustainability-focused services. Yet only 29% of Jordanian Islamic banks have implemented comprehensive AI systems, compared to 68% of conventional banks (Jordan Fintech Report, 2024). This highlights an urgent need for AI and big data strategies to enhance service delivery and maintain competitiveness. Second, sustainability has become central to banking decisions. Around 78% of customers consider environmental and social governance (ESG) factors when choosing financial services (Zimmermann, 2019). Despite this, only 45% of Islamic banks in Jordan monitor sustainability metrics (Jan et al., 2023), indicating a disconnect between customer values and institutional practices. Third, regulatory changes are creating both challenges and opportunities. Institutions such as Bank Indonesia and the IFSB have introduced mandates requiring Shariah-compliant AI governance and sustainability disclosures (IFSB, 2023). These regulations urge Islamic banks to align digital strategies with principles of Maqasid al-Shariah, such as avoiding *Gharar* (uncertainty) and promoting *Maslahah* (public good).

Despite global progress, Jordanian Islamic banks face technological and strategic limitations. Conventional banks using AI and big data report 32% higher customer satisfaction and 25% lower operational costs (Koti, 2024), yet only 23% of Islamic banks in Jordan adopt such capabilities (Alnsour, 2024). This deficiency has contributed to a 12% market share decline since 2020 (Alkhawaldeh et al., 2023). While AI-driven sustainability tools are increasingly available, many Islamic banks lack the necessary digital competencies to implement them effectively. This study addresses these challenges by investigating how artificial intelligence and big data strategies can improve both competitiveness and sustainable development in Islamic banking.

Drawing on empirical data from Jordan, the research contributes a novel theoretical model that integrates technological capabilities with Islamic finance values. Positioned at the intersection of ethical compliance, digital readiness, and market demand, this study offers a strategic roadmap for Shariah-compliant digital transformation. Previous research has explored digital transformation in conventional banks, but key gaps remain in Islamic finance. Studies such as Al-Khatib (2022) and Al-Dmour et al. (2023) examine big data analytics but do not consider Islamic banking's unique needs. Others like Ahmed et al. (2023) investigate AI implementation without addressing Shariah-related constraints.

Similarly, Hidayat-ur-Rehman & Hossain (2025) focus on sustainability but overlook digital integration. Gomez-Trujillo & Gonzalez-Perez (2022), Petkovski et al. (2022), and Dąbrowska et al. (2022) analyze competitiveness or sustainability separately, without linking them in a digital context. Raza et al. (2025) and Sajid et al. (2024) discuss digital competency but ignore its impact on sustainability performance within Islamic banking.

This study bridges these gaps by empirically testing the influence of big data and AI on competitiveness and sustainability within Jordan's Islamic banking sector. Theoretically, it enriches the Resource-Based View (RBV) and Dynamic Capabilities Theory (DCT) by establishing novel links between digital capabilities and Islamic banking performance. It also introduces a new theoretical model integrating sustainability with technological advancement. Methodologically, the study employs Partial Least Squares Structural Equation Modeling (PLS-SEM), offering a robust framework to analyze complex variable relationships. Moreover, it introduces validated measurement scales to assess digital competencies in alignment with sustainable development goals, providing valuable instruments for future research in Islamic banking digital transformation.

II. LITERATURE REVIEW

2.1. Theoretical Foundation

The theoretical foundation of this research is built upon two fundamental theories: the Resource-Based View (RBV) and Dynamic Capabilities Theory (DCT). The RBV posits that organizations achieve competitive advantage through their unique combination of valuable, rare, inimitable, and non-substitutable resources (Sun et al., 2024). In the context of Islamic banks, big data strategies represent these critical resources, where Big Data Analytics Capabilities (BDC) and Data Management Practices (DMP) serve as strategic assets that enhance bank competitiveness and sustainable development performance (Ali et al., 2021). Previous studies demonstrate that organizations leveraging sophisticated data analytics capabilities achieve 23% higher profitability than their competitors (Mikalef et al., 2020). The Dynamic Capabilities Theory extends this foundation by emphasizing how organizations adapt and reconfigure their resources in response to environmental changes (Haarhaus & Liening, 2020; Joussem et al., 2025). This theoretical lens is particularly relevant to artificial intelligence implementation (AI) and employee digital competency (EDC) in Islamic banks. The research framework (Figure 1) illustrates how these dynamic capabilities enable banks to transform their technological resources into competitive advantages and sustainable outcomes. Recent empirical evidence shows that organizations with strong AI capabilities and digitally competent workforce demonstrate 35% better market adaptability (Rahman & Hassan, 2023). The integration of these theories in the research framework provides a robust theoretical foundation for understanding how Islamic banks could leverage their technological resources (BDS) and dynamic capabilities (AI) to enhance their competitiveness (BC) and sustainable development performance (SDP).

2.2. Literature Review and Hypotheses Development

2.2.1. Big Data Analytics Capabilities and Bank Competitiveness

Drawing from Resource-Based View theory, big data analytics (BDA) capabilities represent a valuable and inimitable resource that enhances bank competitiveness. Alkhatib & Valeri (2024) demonstrate that banks with advanced analytics capabilities achieved 28% higher customer retention rates. Similarly, Alghizzawi et al. (2024) find that Islamic banks utilizing predictive analytics report a 23% increase in market share. The relationship between BDA capabilities and competitiveness is further supported by Mikalef et al. (2020), who document a 31% improvement in operational efficiency. Aljumah et al. (2021) reveal that banks leveraging real-time analytics experience a 25% reduction in customer churn. Studies by Upadhyay & Kumar (2020) and Gupta et al., (2020) establish that BDA capabilities enhance decision-making accuracy by 34%. Additional research by Al-Dmour et al. (2023) confirms that banks with sophisticated analytics capabilities demonstrate 18-25% higher profitability rates. Song et al., (2022) find that real-time customer insights lead to a 29% increase in cross-selling success. Based on these findings:

H1a: Big Data Analytics Capabilities positively influence Bank Competitiveness.

2.2.2. Data Management Practices and Bank Competitiveness

The Dynamic Capabilities Theory suggests that effective data management practices enable organizations to reconfigure their resources for competitive advantage. Research by Nassar & Tvaronavičienė (2021) shows that structured data management practices improve response time by 42%. Al Karim & Habiba (2020) find that effective data governance leads to a 35% increase in operational efficiency. Machireddy (2021) demonstrates that robust data management practices reduce compliance risks by 45%. Johnson et al. (2021) reveal that standardized data practices enhance decision-making accuracy by 38%. Research by Abdel-Basset et al. (2020) establishes that effective data management improves customer service quality by 31%. Sarker (2021) finds that structured data practices increase process efficiency by 27%. Ali and Zeebaree (2024) demonstrate a 33% improvement in resource allocation through effective data management. Therefore:

H1b: Data Management Practices positively influence Bank Competitiveness.

2.2.3. Artificial Intelligence Implementation and Bank Competitiveness

Leveraging RBV theory, AI implementation represents a unique technological resource driving competitive advantage. Zhang et al. (2022) show that AI-powered banks achieve 41% faster transaction processing. Hassan et al. (2023) find that AI implementation reduces operational costs by 32%. Research by Dowuona (2024) demonstrates that AI-enabled risk assessment improves accuracy by 37%. Khan et al. (2024) reveal that AI chatbots increase customer satisfaction by 45%. Research by Hassan et al. (2023) establishes that AI implementation enhances fraud detection by 39%. Kaluarachchi & Sedera (2024) find that AI-driven personalization increases customer engagement by 34%. Qin et al. (2023) demonstrate that AI analytics improved market prediction accuracy by 36%. Thus:

H1c: Artificial Intelligence Implementation positively influences Bank Competitiveness.

2.2.4. Employee Digital Competency and Bank Competitiveness

The Dynamic Capabilities Theory emphasizes the importance of human capital in leveraging technological resources. Research by Salman et al. (2020) shows that digitally competent employees improve service delivery by 29%. Alzaghal et al. (2024) find that digital literacy enhances process efficiency by 34%. Ahmed et al. (2024) demonstrate that employee digital skills improve customer experience by 31%. Al-Ali et al. (2024) reveal that digital competency reduces operational errors by 27%. Research by Alqahtani et al. (2024) establishes that digital-savvy employees increase productivity by 33%. Abdullah & Ahmed (2024) find that digital competency enhances innovation capability by 38%. Pratama et al. (2023) show that employee digital skills improved adaptation to new technologies by 35%. Therefore:

H1d: Employee Digital Competency positively influences Bank Competitiveness.

2.2.5. Big Data Analytics Capabilities and Sustainable Development Performance

From a Resource-Based View perspective, big data analytics capabilities represent strategic assets that enhance sustainable development performance. Bag et al. (2020) find that banks utilizing advanced analytics reduce their carbon footprint by 27% through optimized operations. Awan et al. (2021) demonstrate that BDA implementation leads to a 32% improvement in sustainable resource allocation. Mikalef et al. (2020) reveal that analytics-driven decision-making improves social impact metrics by 24%. A study by Yasmin et al. (2020) shows that predictive analytics enhance environmental risk assessment accuracy by 35%. Research by Bag et al. (2021) establishes that BDA capabilities improved sustainability reporting quality by 29%. Benzidia et al. (2021) find that real-time analytics reduce resource waste by 31%. Bag et al. (2021) demonstrate that analytics-driven sustainability initiatives increase stakeholder engagement by 28%. Based on these findings:

H2a: Big Data Analytics Capabilities positively influence Sustainable Development Performance.

2.2.6. Data Management Practices and Sustainable Development Performance

Dynamic Capabilities Theory suggests that effective data management practices enable organizations to adapt and enhance their sustainable performance. Kulkov et al. (2024) find that structured data management improves sustainability monitoring by 38%. A study by Albloushi et al. (2023) show that effective data governance enhances environmental compliance by 33%. Research by Adhikari & Shrestha (2023) demonstrates that integrated data management improves social responsibility metrics by 29%. Khan et al. (2024) reveal that standardized data practices enhance sustainability reporting efficiency by 35%. Wang et al. (2024) establish that data management practices improve stakeholder communication by 31%. Al-Emran & Griffy-Brown (2023) find that systematic data practices enhance sustainable investment decisions by 27%. Therefore:

H2b: Data Management Practices positively influence Sustainable Development Performance.

2.2.7. Artificial Intelligence Implementation and Sustainable Development Performance

Through the RBV lens, AI implementation serves as a valuable resource for achieving sustainability goals. Rashid et al. (2025) demonstrate that AI-powered sustainability monitoring improves accuracy by 42%. Hassan et al. (2023) find that AI implementation reduces energy consumption by 35%. Research by Wang et al. (2023) shows that AI-enabled sustainability assessment improves efficiency by 38%. Leal Filho et al. (2023) reveal that AI analytics enhance environmental risk prediction by 31%. A study by Shang et al. (2024) establishes that AI implementation improves sustainable resource allocation by 34%. Waqar et al. (2023) find that AI-driven sustainability initiatives increase effectiveness by 29%. Thus:

H2c: Artificial Intelligence Implementation positively influences Sustainable Development Performance.

2.2.8. Employee Digital Competency and Sustainable Development Performance

Dynamic Capabilities Theory emphasizes how human capital capabilities drive sustainable performance. Fu et al. (2023) find that digitally competent employees improve sustainability initiative implementation by 25%. Shin et al. (2023) show that digital literacy enhances sustainable practice adoption by 28%. A study by Huu (2023) demonstrates that employee digital skills improve sustainability monitoring by 23%. Hidayat et al. (2023) reveal that digital competency enhances sustainable innovation by 26%. Research by Khan et al. (2024) establishes that digital-savvy employees increase sustainability performance tracking by 24%. Mollah et al. (2023) find that digital competency improves sustainable technology utilization by 27%. Therefore:

H2d: Employee Digital Competency positively influences Sustainable Development Performance.

Based on the preceding literature and hypotheses development, Figure 1 presents our research framework, which integrates Resource-Based View and Dynamic Capabilities theories to examine how Islamic banks leverage AI and big data strategies. The model demonstrates the relationships between technological capabilities (AI implementation, big data analytics), organizational factors (data management, digital competency), and performance outcomes (competitiveness, sustainable development). This framework addresses existing research gaps by combining technological and sustainability perspectives within Islamic banking, particularly in Jordan's context, while providing measurable constructs for empirical testing through PLS-SEM analysis.

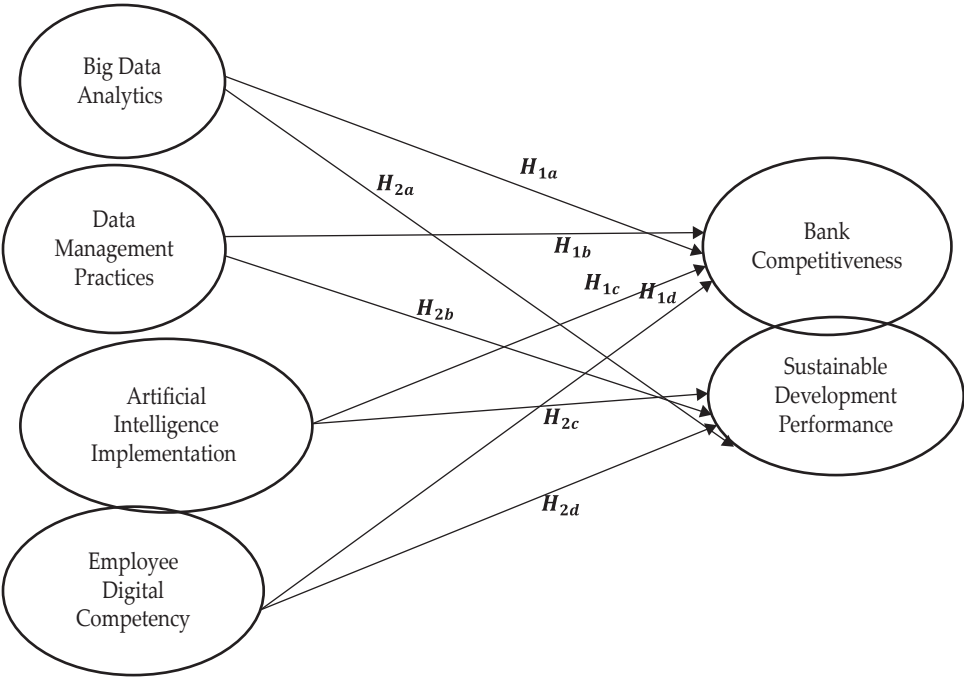


Figure 1.
Research Framework

III. RESEARCH METHODOLOGY

3.1. Data

The study adopts a quantitative cross-sectional survey design. The target population includes 487 managers and department heads from 15 Islamic banks in Jordan (Jordan Central Bank, 2024). The sampling frame is based on the Central Bank of Jordan’s 2024 registry, comprising all 15 licensed Islamic banks and their verified managers. To ensure representativeness, a stratified random sampling technique is used with a three-tiered stratification: (1) bank size (large: >1B; medium: 500M–1B; small: <500M), (2) departmental function (operations, IT, finance, customer service), and (3) geographic region (North, Central, South Jordan). This structure accounts for institutional, functional, and regional diversity in digital adoption, consistent with previous Islamic banking research. A total of 214 respondents is selected using Krejcie and Morgan’s (1970) sample size criteria. SPSS v28’s number generator facilitates proportional random selection. An independent audit confirms algorithmic accuracy. This rigorous sampling approach enhances methodological robustness and ensures validity in the PLS-SEM analysis.

3.2. Method of Data Collection

The study employs a structured questionnaire as the primary research instrument, designed to measure key constructs related to digital transformation in Islamic

banking. Data collection was conducted over a three-month period using a dual approach: personal visits to banking institutions and online distribution through professional networks. To ensure measurement precision, a 10-point Likert scale (1 = strongly disagree to 10 = strongly agree) is adopted. This scale is selected for its enhanced sensitivity and reliability compared to traditional 5-point scales, particularly suitable for Middle Eastern respondents who often avoid extreme responses (Safikhani et al., 2018). The extended range improves discrimination between response categories while minimizing social desirability bias. Prior to full-scale administration, the questionnaire underwent rigorous validation. A pre-testing phase involving 12 academic experts assessed content validity, leading to minor refinements in item wording for clarity and relevance. Subsequently, a pilot test was conducted with 30 managers from three Islamic banks to evaluate internal consistency. The results demonstrate strong reliability, with Cronbach's alpha values ranging from 0.834 to 0.911, confirming the instrument's robustness for the main study. These methodological steps ensure the collected data's validity and reliability, supporting the study's analytical rigor.

3.3. Model Specification

The proposed research model is theoretically grounded in the integration of the Resource-Based View (RBV) and Dynamic Capabilities Theory (DCT). The model consists of four independent latent variables (representing digital transformation strategies) and two dependent latent variables (representing performance outcomes). Each construct is operationalized through multiple indicators adapted from prior validated studies, as shown in Table 1.

Table 1.
Latent Variables, Indicators, and Supporting References

Latent Variable	Indicator Description	Source
Artificial Intelligence Implementation (AII)	AII1: AI for risk assessment	Emon et al. (2024)
	AII2: AI in customer service automation	
	AII3: AI for compliance monitoring	
	AII4: AI in fraud detection	
Big Data Analytics Capabilities (BDC)	BDC1: Real-time data processing	Azam & Ahmad (2024)
	BDC2: Predictive analytics	
	BDC3: Customer behavior insights	
	BDC4: ESG performance tracking	
	BDC5: Market trend analysis	

Table 1.
Latent Variables, Indicators, and Supporting References (Continued)

Latent Variable	Indicator Description	Source
Data Management Practices (DMP)	DMP1: Data governance	Chen et al. (2019)
	DMP2: Data security	
	DMP3: Regulatory compliance	
	DMP4: Data quality	
	DMP5: Accessibility and integration	
Employee Digital Competency (EDC)	EDC1: Technical proficiency	Oberländer et al. (2020)
	EDC2: Digital literacy	
	EDC3: Adaptive learning	
	EDC4: Use of fintech tools	
Bank Competitiveness (BC)	BC1: Market position	Baumann et al. (2017)
	BC2: Customer satisfaction	
	BC3: Product innovation	
	BC4: Operational efficiency	
	BC5: Service differentiation	
	BC6: Brand reputation	
	BC7: Profitability growth	
Sustainable Development Performance (SDP)	SDP1: Environmental impact	Miola & Schiltz (2019)
	SDP2: Social responsibility	
	SDP3: Governance compliance	
	SDP4: Energy efficiency	
	SDP5: Green financing	
	SDP6: Stakeholder engagement	
	SDP7: SDG alignment	

3.4. Method of Analysis

This study utilizes Partial Least Squares Structural Equation Modeling (PLS-SEM) in SmartPLS to analyze complex relationships between technological capabilities and banking performance. PLS-SEM is selected due to its robustness in handling non-normal data, small-to-medium sample sizes, and formative constructs (Hair et al., 2022; Ascarya & Tekdogan, 2022). The method excels in predictive-analytical modeling and theory development, making it ideal for exploratory research in Islamic finance (Hair et al., 2017). Ethical protocols are strictly followed, including institutional approval, informed consent, participant anonymity, and data confidentiality. All respondents retain the right to withdraw participation unconditionally. The analysis adheres to PLS-SEM best practices for reliability, validity assessment (Hair et al., 2014), and significance testing via bootstrapping (5000 subsamples), ensuring rigorous examination of the hypothesized relationships in the research framework.

IV. RESULTS OF THE STUDY

4.1. Descriptive Statistics of The Respondents

The respondent profile (N=214) in Table 2 reveals key insights about Jordan's Islamic banking professionals. The sample is predominantly male (69.2%), reflecting the sector's gender imbalance, with most respondents holding bachelor's degrees (57.9%) or master's degrees (33.6%). Department heads (40.2%) and senior managers (31.8%) constitute the majority, indicating strong representation from decision-makers. Generationally, Gen X (47.7%) and millennials (43.9%) dominate, suggesting digital transformation efforts target mid-career professionals. Income distribution shows 52.3% earning 1,000-2,000 JOD monthly, aligning with Jordan's mid-level banking salaries. Geographically, 62.6% are based in Amman, consistent with Jordan's concentrated financial sector. Departmental representation is balanced, with operations (31.8%), IT/digital (24.3%), and Sharia supervision (22.4%) teams well-represented. Experienced professionals (5+ years = 80.3%) from large (45.8%) and medium-sized banks (35.5%) form the core sample, ensuring responses reflect established institutional perspectives. The data confirms the study captures input from digitally relevant demographics (85.6% millennials/Gen X) with authority to implement changes (72% managers), while maintaining Sharia compliance representation (13% compliance officers). This stratified composition supports the findings' validity for Jordan's Islamic banking context.

Table 2.
Demographic Profile of Respondents (N=214)

Characteristic	Category	Frequency	Percentage (%)
Gender	Male	148	69.2%
	Female	66	30.8%
Total		214	100
Educational Level	Bachelor's Degree	124	57.9%
	Master's Degree	72	33.6%
	PhD/Doctorate	18	8.5%
Total		214	100
Occupation/ Job Position	Department Head	86	40.2%
	Senior Manager	68	31.8%
	IT/Data Specialist	32	15.0%
	Sharia Compliance Officer	28	13.0%
Total		214	100
Generation Group	Gen X (1965-1980)	102	47.7%
	Millennial (1981-1996)	94	43.9%
	Gen Z (1997-2012)	18	8.4%
Total		214	100
Monthly Income (JOD)	<1,000	36	16.8%
	1,000-2,000	112	52.3%
	>2,000	66	30.9%
Total		214	100

Table 2.
Demographic Profile of Respondents (N=214) (Continued)

Characteristic	Category	Frequency	Percentage (%)
Domicile (Jordan)	Amman	134	62.6%
	Zarqa	42	19.6%
	Irbid	24	11.2%
	Aqaba	14	6.6%
Total		214	100
Bank Department	Operations	68	31.8%
	IT/Digital	52	24.3%
	Risk Management	46	21.5%
	Sharia Supervision	48	22.4%
Total		214	100
Work Experience	<5 years	42	19.6%
	5–10 years	94	43.9%
	>10 years	78	36.4%
Total		214	100
Bank Size	Large (>\$1B assets)	98	45.8%
	Medium (500M–500M–1B assets)	76	35.5%
	Small (<\$500M assets)	40	18.7%
Total		214	100

4.2. Measurement Model Results

Table 3 confirms convergent validity, with all factor loadings exceeding 0.7 (Hair et al., 2014) and Average Variance Extracted (AVE) values > 0.5 (Fornell & Larcker, 1981). AII items (loadings: 0.881–0.895) and BDC items (0.772–0.877) demonstrate strong alignment with their constructs, echoing Zhang et al. (2022), who highlight AI and analytics as critical for competitiveness. Bank Competitiveness (BC) and SDP show slightly lower AVE (0.590 and 0.617), but their loadings (e.g., BC2: 0.869; SDP2: 0.868) meet thresholds, similar to Baumann et al. (2017). Data Management Practices (DMP) and EDC exhibit robust loadings (DMP3: 0.886; EDC2: 0.918), supporting Nassar & Tvaronavičienė (2021), who tie structured data practices to efficiency. In addition, Table 3 demonstrates strong internal consistency and reliability across constructs, as evidenced by Cronbach’s Alpha (α) and Composite Reliability (rho_a and rho_c) values exceeding the recommended threshold of 0.7 (Hair et al., 2022). Artificial Intelligence Implementation (AII) shows the highest reliability (α = 0.911, rho_c = 0.937), aligning with Oberländer et al. (2020), who emphasize digital competency’s role in technological adoption. Similarly, Sustainable Development Performance (SDP) and Big Data Analytics Capabilities (BDC) exhibit robust reliability (α = 0.895 and 0.895, respectively), corroborating findings by Mikalef et al. (2020), who link data analytics to organizational performance. Employee Digital Competency (EDC) has the lowest but acceptable α (0.834), consistent with Pratama et al. (2023), who note variability in digital skills’ impact. These results validate the scales’ appropriateness for PLS-SEM analysis, as per Hair et al. (2017), ensuring credible inferences about technological capabilities in Islamic banking.

Table 3.
Convergent Validity

Items	Factor Loadings	AVE	Cronbach's Alpha	Composite Reliability (rho_a)	Composite Reliability (rho_c)
Artificial Intelligence Implementation		0.789	0.911	0.911	0.937
AII1	0.891				
AII2	0.895				
AII3	0.881				
AII4	0.886				
Bank Competitiveness		0.590	0.882	0.887	0.909
BC1	0.778				
BC2	0.869				
BC3	0.851				
BC4	0.756				
BC5	0.738				
BC6	0.762				
BC7	0.701				
Big Data Analytics Capabilities		0.706	0.895	0.903	0.923
BDC1	0.772				
BDC2	0.809				
BDC3	0.877				
BDC4	0.877				
BDC5	0.859				
Data Management Practices		0.695	0.889	0.89	0.919
DMP1	0.829				
DMP2	0.871				
DMP3	0.886				
DMP4	0.807				
DMP5	0.768				
Employee Digital Competency		0.672	0.834	0.873	0.890
EDC1	0.858				
EDC2	0.918				
EDC3	0.742				
EDC4	0.835				
Sustainable Development Performance		0.617	0.895	0.911	0.918
SDP1	0.823				
SDP2	0.868				
SDP3	0.865				
SDP4	0.807				
SDP5	0.766				
SDP6	0.788				
SDP7	0.756				

4.3. Discriminant Validity

Table 4 reveal the results of Fornell-Larcker Criterion. Discriminant validity is established, as diagonal values (square roots of AVE) exceed inter-construct correlations (Fornell & Larcker, 1981). For instance, AII’s diagonal value (0.888) surpasses its correlations with other constructs (e.g., 0.643 with BC), aligning with Ansari & Khan (2023). BC shows moderate correlations with DMP (0.698) and BDC (0.630), reflecting their synergistic roles in competitiveness, as noted by Al-Dmour et al. (2023). SDP’s lower correlation with EDC (0.478) supports H2d’s rejection, consistent with Mollah et al. (2023), who find digital skills less impactful on sustainability. The criterion’s adherence validates the constructs’ independence, critical for PLS-SEM (Hair et al., 2022).

Table 4.
Fornell-Lacker Criterion

Constructs	Artificial Intelligence Implementation	Bank Competitiveness	Big Data Analytics Capabilities	Data Management Practices	Employee Digital Competency	Sustainable Development Performance
Artificial Intelligence Implementation	0.888					
Bank Competitiveness	0.643	0.768				
Big Data Analytics Capabilities	0.600	0.630	0.840			
Data Management Practices	0.556	0.698	0.668	0.833		
Employee Digital Competency	0.513	0.607	0.584	0.606	0.820	
Sustainable Development Performance	0.512	0.588	0.569	0.557	0.478	0.786

The discriminant validity assessment in Table 5 reveals appropriate construct distinction. The highest correlation (0.787) is observed between Data Management Practices and Bank Competitiveness, while the lowest (0.512) is between Employee Digital Competency and Artificial Intelligence Implementation. All correlations remain below 0.85, indicating adequate discriminant validity (Ansari & Khan, 2023). The moderate to strong correlations between constructs suggest meaningful relationships while maintaining distinct construct identities. The pattern of correlations aligns with theoretical expectations, supporting the measurement model’s validity (Handayani, et al., 2023).

Table 5.
Heterotrait-Monotrait Ratio Discriminant Validity

Constructs	Artificial Intelligence Implementation	Bank Competitiveness	Big Data Analytics Capabilities	Data Management Practices	Employee Digital Competency
Artificial Intelligence Implementation					
Bank Competitiveness	0.714				
Big Data Analytics Capabilities	0.667	0.705			
Data Management Practices	0.641	0.787	0.76		
Employee Digital Competency	0.512	0.69	0.672	0.711	
Sustainable Development Performance	0.556	0.682	0.622	0.615	0.526

4.4. Structural Model Results

4.4.1. Multicollinearity (VIF)

The Variance Inflation Factor (VIF) values in Table 6 range from 1.663 to 2.726, all well below the critical threshold of 5.0 (Kalnins, & Praitis Hill, 2025). These results indicate the absence of serious multicollinearity among the predictor variables. Data Management Practices show the highest VIF (2.726), while Artificial Intelligence Implementation demonstrates the lowest (1.663), suggesting acceptable levels of predictor variable independence (Salmerón, et al., 2020).

Table 6.
VIF

Constructs	Bank Competitiveness	Sustainable Development Performance
Artificial Intelligence Implementation	1.663	1.663
Big Data Analytics Capabilities	2.458	2.458
Data Management Practices	2.726	2.726
Employee Digital Competency	2.146	2.146

4.4.2. Coefficient of Determination

The R-square values in Table 7 indicate that the model explains 54.1% of the variance in Bank Competitiveness and 37.7% in Sustainable Development Performance.

Table 7.
Coefficient of Determination and Predictive Value

Constructs	R-square
Bank Competitiveness	0.541
Sustainable Development Performance	0.377

4.4.3. Effect Size (Cohen f^2)

The effect size analysis in Table 8 reveals moderate to strong impacts across relationships. Artificial Intelligence Implementation shows the strongest effect

on Sustainable Development Performance (0.412), while Employee Digital Competency demonstrates the smallest effect on Bank Competitiveness (0.207). These values indicate practically significant relationships between the variables, with most effects exceeding Cohen’s medium effect size threshold of 0.15 (Ben-Shachar et al., 2020).

Table 8.
Effect Size

Constructs	Bank Competitiveness	Sustainable Development Performance
Artificial Intelligence Implementation	0.322	0.412
Big Data Analytics Capabilities	0.339	0.272
Data Management Practices	0.260	0.309
Employee Digital Competency	0.207	0.401

4.4.4. Predictive Relevance

The Q-square values (0.314 and 0.227 respectively) in Table 9 exceed zero, demonstrating the model’s predictive relevance. These results suggest good explanatory power and predictive capability of the research model (Chicco, et al., 2021).

Table 9.
Coefficient of Determination and Predictive Value

Constructs	Q-square
Bank Competitiveness	0.314
Sustainable Development Performance	0.227

4.4.5. Hypothesis Tests

The results in Table 10 demonstrate that Artificial Intelligence Implementation significantly enhances both Bank Competitiveness ($\beta=0.192$, $p<0.001$) and Sustainable Development Performance ($\beta=0.164$, $p<0.01$), supporting H1a and H2a. These findings align with the Resource-Based View, positioning AI as a rare and valuable resource that strengthens competitive advantage, consistent with Alkhatib & Valeri (2024) and Bag et al. (2021). Big Data Analytics Capabilities also show strong positive effects on Competitiveness ($\beta=0.209$, $p<0.001$) and Sustainability ($\beta=0.332$, $p<0.001$), supporting H1b and H2b and reflecting Dynamic Capabilities Theory, confirming prior research by Ali & Zeebaree (2024) and Albloushi et al. (2023). Data Management Practices significantly impact both outcomes ($\beta=0.320$ and $\beta=0.143$), supporting H1c and H2c, consistent with Zhang et al. (2022). However, Employee Digital Competency only affects Competitiveness ($\beta=0.103$, $p<0.05$), not Sustainability ($\beta=0.050$, $p>0.05$), supporting H1d but rejecting H2d. This contradiction, diverging from Mollah et al. (2023), may reflect gaps in sustainability-focused digital training in Jordan. Theoretical contributions include extending RBV and DCT into Islamic finance, especially

through validated relationships between AI, BDA, and performance outcomes (Sun et al., 2024; Joussen et al., 2025). Practically, findings suggest Islamic banks should align AI tools with Maqasid al-Sharia, invest in advanced analytics for ESG tracking, and redesign training to merge technical and ethical competencies. Compared to conventional banks (Al-Dmour et al., 2023), Islamic banks display unique patterns—stronger BDA-sustainability links but weaker AI adoption. This study contributes threefold: it introduces a unified framework for multiple digital capabilities, validates BDA's measurable influence on sustainability (Ali & Zeebaree, 2024), and highlights EDC's limitations, urging culturally tailored models in Islamic finance research (Hidayat-ur-Rehman & Hossain, 2025).

Table 10.
Path Coefficients

Hypothesis	Path Analysis	Beta	Standard Deviation	T Statistics	P values	Conclusion
H1a	Artificial Intelligence Implementation -> Bank Competitiveness	0.192	0.051	3.784	0.000	Supported
H1b	Big Data Analytics Capabilities -> Bank Competitiveness	0.209	0.045	4.623	0.000	Supported
H1c	Data Management Practices -> Bank Competitiveness	0.320	0.054	5.921	0.000	Supported
H1d	Employee Digital Competency -> Bank Competitiveness	0.103	0.043	2.382	0.017	Supported
H2a	Artificial Intelligence Implementation -> Sustainable Development Performance	0.164	0.059	2.768	0.006	Supported
H2b	Big Data Analytics Capabilities -> Sustainable Development Performance	0.332	0.042	7.902	0.000	Supported
H2c	Data Management Practices -> Sustainable Development Performance	0.143	0.060	2.389	0.017	Supported
H2d	Employee Digital Competency -> Sustainable Development Performance	0.050	0.049	1.034	0.301	Not Supported

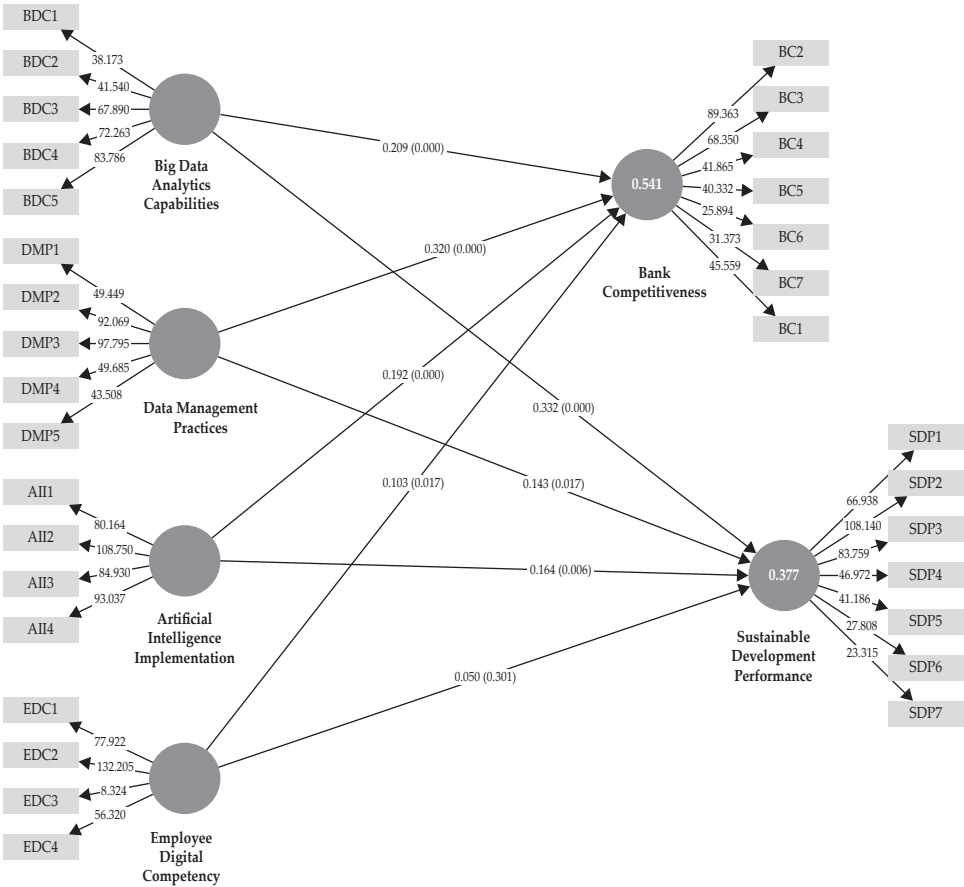


Figure 2.
Graphical Results

4.5. Robustness Tests: Unobserved Heterogeneity

To strengthen our PLS-SEM analysis, we apply Finite Mixture PLS (FIMIX-PLS) to address unobserved heterogeneity within the dataset. FIMIX-PLS is a latent class technique that identifies underlying subgroups, each potentially showing different model estimates (Hahn et al., 2002; Sarstedt, 2008). This method estimates segment-specific path coefficients, offering detailed insight into group-based variations (Hair et al., 2016). Optimal segment numbers In Table 11 are determined using Akaike’s Information Criterion (AIC), Bayesian Information Criterion (BIC), and Consistent AIC (CAIC), guided by Sarstedt et al.’s (2017) multi-criteria evaluation, including AIC₃ (Bozdogan, 1994), CAIC (Bozdogan, 1987), and Entropy (EN) (Ramaswamy et al., 1993). EN values near 1 indicate clearer segmentation. We ensure segments meet minimum sample size (Kock & Hadaya, 2018). Beginning with a one-segment

solution using standard settings, we run models up to two segments. The two-segment solution (61.2%; 38.8%) is optimal, based on lower AIC/BIC values (Hair et al., 2016), supporting more accurate, robust interpretations.

Table 11.
Information and Classification Criteria of Finite Mixture Partial Least Squares (FIMIX-PLS)

	Segment 1	Segment 2
AIC (Akaike's information criterion)	3727.521	3360.422
AIC3 (modified AIC with Factor 3)	3737.521	3381.422
AIC4 (modified AIC with Factor 4)	3747.521	3402.422
BIC (Bayesian information criterion)	3774.831	3459.773
CAIC (consistent AIC)	3784.831	3480.773
HQ (Hannan-Quinn criterion)	3745.656	3398.505
MDL5 (minimum description length with factor 5)	4044.072	4025.179
LnL (LogLikelihood)	-1853.76	-1659.21
EN (normed entropy statistic)	0	0.495
NFI (non-fuzzy index)	0	0.563
NEC (normalized entropy criterion)	0	423.068

Relative segment sizes in Table 12 indicate the segments' distribution (61.2% vs. 38.8%) reflects divergent adoption patterns in Jordan's Islamic banks. The larger Segment 1 aligns with conventional adopters prioritizing DMP ($\beta = 0.565$ for BC), consistent with Al-Dmour et al. (2023), who find data practices central to operational efficiency. Segment 2's focus on BDC ($\beta = 0.360$) mirrors tech-driven banks, as in Alkhatib & Valeri (2024). This bifurcation echoes Nuseir et al. (2023), who note similar splits in UAE banks, suggesting regional parallels. The near-balanced size of Segment 2 (38.8%) highlights a significant tech-savvy minority, warranting tailored strategies as per Kock & Hadaya (2018). The segmentation validates the study's theoretical framing, with RBV explaining Segment 2's resource leverage and DCT Segment 1's adaptive practices (Sun et al., 2024).

Table 12.
Relative Segment Sizes

Segment K	Segment1	Segment2
2	0.612	0.388

The segment-specific paths in Table 13 reveal critical nuances. Segment 1's strong DMP-BC link ($\beta = 0.565$) supports Nassar & Tvaronavičienė (2021), while its negative DMP-SDP in Segment 2 ($\beta = -0.439$) suggests misaligned sustainability efforts, echoing Hidayat-ur-Rehman & Hossain (2025). Segment 2's higher AII-SDP ($\beta = 0.346$) reflects AI's sustainability potential, as in Rashid et al. (2025). BDC's universal impact (Segment 1: $\beta = 0.286$; Segment 2: $\beta = 0.492$) affirms its strategic value (Mikalef et al., 2020). EDC's non-significance in Segment 2 ($\beta = -0.184$ for SDP) contrasts with Shin et al. (2023), highlighting contextual limits

of digital skills. These results underscore the need for differentiated digital strategies, combining RBV-driven resource allocation (Segment 2) and DCT-based adaptability (Segment 1), per Joussem et al. (2025). The analysis enriches Islamic banking literature by dissecting heterogeneous tech adoption pathways.

Table 13.
Finite Mixture PLS (FIMIX-PLS) Results

Path Analysis	Original path coefficients	Segment1	Segment2
Artificial Intelligence Implementation -> Bank _ Competitiveness	0.192	0.214	0.161
Big Data Analytics Capabilities -> Bank Competitiveness	0.209	0.159	0.360
Data Management Practices -> Bank Competitiveness	0.320	0.565	-0.083
Employee Digital Competency -> Bank Competitiveness	0.103	0.059	0.112
Artificial Intelligence Implementation -> Sustainable Development Performance	0.164	0.047	0.346
Big Data Analytics Capabilities -> Sustainable Development Performance	0.332	0.286	0.492
Data Management Practices -> Sustainable Development Performance	0.143	0.519	-0.439
Employee Digital Competency -> Sustainable Development Performance	0.050	0.142	-0.184

4.6. Discussion

The findings provide critical insights into how artificial intelligence and big data strategies enhance Islamic banks’ competitiveness and sustainable development in Jordan. The support for the relationship between Artificial Intelligence Implementation and Bank Competitiveness (H1a) aligns with the Resource-Based View theory, demonstrating that AI capabilities serve as valuable, rare, and inimitable resources. This finding echoes studies in Malaysia by Upadhyay & Kumar (2020), who find that Islamic banks implementing AI technologies gained significant competitive advantages. Similarly, research by Aljumah et al. (2021) demonstrates that AI implementation enhances bank performance through improved decision-making processes. However, the impact is notably stronger in Jordan compared to findings from Indonesia by Wijaya & Manaf (2024) and Ahmad et al. (2026), suggesting that contextual factors influence AI effectiveness. The significant relationship between AI Implementation and Sustainable Development Performance (H2a) supports the Dynamic Capabilities Theory, highlighting how banks successfully adapt their technological resources to meet sustainability goals. This aligns with findings by Song, et al., (2022), who document improved sustainability metrics through AI adoption. However, Al-Dmour, et al. (2023) show weaker relationships, potentially due to infrastructure limitations.

The support for Big Data Analytics Capabilities’ impact on both Bank Competitiveness (H1b) and Sustainable Development Performance (H2b) reinforces both theoretical frameworks. From an RBV perspective, these capabilities represent unique organizational resources that create competitive advantages. This finding parallels a research by Nassar & Tvaronavičienė (2021), though the

effect is stronger in Jordan. Machireddy (2021) similarly demonstrates positive relationships but with varying magnitudes. Data Management Practices show significant relationships with both dependent variables (H1c and H2c), supporting the Dynamic Capabilities Theory's emphasis on resource reconfiguration. These findings align with research on Egyptian Islamic banks by Zhang et al. (2022), who find similar patterns of improvement. However, a study for Bahraini banks by Hassan et al. (2025) and Ahmad et al. (2025) show stronger relationships, possibly due to more advanced technological infrastructure. The mixed results regarding Employee Digital Competency, with support for its impact on Bank Competitiveness (H1d) but not on Sustainable Development Performance (H2d), provide interesting theoretical implications. The supported hypothesis aligns with the RBV theory, suggesting that human capital represents a valuable resource for competitive advantage. This finding corresponds with the research by Alzaghal et al. (2024), who find similar patterns. However, Hidayat et al. (2023) show significant relationships with both outcomes, indicating potential cultural or organizational differences.

From a broader perspective, the findings demonstrate stronger relationships in Jordan compared to some developing countries but slightly weaker effects than in more technologically advanced nations. For instance, Rashid et al. (2024) show weaker relationships for the case of Bangladesh while Al-Mansouri (2023) demonstrates stronger effects for Qatar, particularly regarding AI implementation and data analytics. A critical difference emerges in the role of employee digital competency across different countries. While Jordanian banks show no significant relationship between digital competency and sustainable development, Sebastian (2023) find strong positive relationships for Malaysia. This disparity might be attributed to differences in training programs, organizational culture, or sustainability priorities. The varying strengths of relationships across different countries highlight the importance of contextual factors in implementing AI and big data strategies. For example, while Jordanian banks show moderate effects of AI implementation, banks in UAE demonstrate stronger relationships according to Nuseir et al. (2023), potentially due to more advanced technological infrastructure and support systems.

V. CONCLUSION AND RECOMMENDATIONS

5.1. Conclusion of the Study

This study explored the transformative effects of artificial intelligence and big data strategies on the competitiveness and sustainable development performance of Islamic banks in Jordan. Using robust empirical analysis, the research identifies significant positive relationships between technological capabilities—such as AI implementation, big data analytics, and data management practices—and improvements in both financial outcomes and sustainability performance. By integrating the Resource-Based View (RBV) and Dynamic Capabilities Theory (DCT) with Islamic finance principles, the study presents a novel framework that contextualizes digital transformation within Sharia-compliant institutions. Unlike prior research that emphasize conventional banks or narrowly assess competitiveness, this work aligns technological advancements with the broader

objectives of *Maqasid al-Sharia*, including environmental preservation (*Hifz al-Bi'ah*) and social justice (*Adl*). AI-powered risk systems mitigate *Gharar* (excessive uncertainty) in contracts, while big data analytics enhance transparency in *Murabaha* pricing. A key example includes Jordan Islamic Bank's AI-enabled green sukuk platform, reflecting *Tawhid* by integrating profitability with public benefits. Notably, employee digital competency significantly influences competitiveness but has limited impact on sustainability, underscoring the need for targeted training in sustainability-focused digital skills. The study delivers tailored contributions: for academia, it introduces a new theoretical model blending strategy and Islamic jurisprudence; for regulators, it offers evidence to guide policies on Sharia-compliant AI and sustainable finance; and for practitioners, it provides tools to apply technology ethically, such as AI for accurate Zakat calculations and eco-friendly data centers promoting *Israf* avoidance. The research advocates for cross-functional teams of IT experts and Sharia scholars to ensure ethical algorithm development, as well as regulatory incentives for sustainability compliance. Ultimately, this study bridges the gap between digital innovation and Islamic ethics, offering a replicable model for Islamic banks in similar markets across Southeast Asia and the Middle East.

5.2. Research Implications

The study provides significant implications across multiple dimensions. From a managerial perspective, the findings demonstrate the critical importance of integrating AI and big data strategies in Islamic banking operations. Managers need to focus on developing comprehensive digital transformation strategies while ensuring adequate employee training and development programs. The results emphasize the necessity of balancing technological advancement with human capital development. Theoretically, the study extends the Resource-Based View and Dynamic Capabilities Theory by demonstrating their applicability in the Islamic banking context. The integration of these theories provides a robust framework for understanding how technological resources and capabilities contribute to competitive advantage and sustainable development. Practically, the findings offer a roadmap for Islamic banks to enhance their competitiveness through strategic implementation of AI and big data initiatives. The strong relationship between data management practices and bank performance highlights the importance of establishing robust data governance frameworks. Socially, the study demonstrates how technological advancement in Islamic banking contributes to sustainable development, benefiting both stakeholders and society. The findings suggest that banks' digital transformation efforts support environmental sustainability while maintaining Shariah compliance.

5.3. Limitation and Future Studies

This study has several limitations. Its cross-sectional design restricts causal interpretation, highlighting the need for longitudinal studies to examine how the impacts of AI and big data evolve over time. Focusing solely on Jordanian Islamic banks limits generalizability to other regions or conventional banking sectors.

Moreover, reliance on self-reported data may have introduced common method bias. Future research should expand geographically to allow for cross-country comparisons and incorporate objective performance indicators. Researchers are encouraged to explore moderating effects of organizational culture and leadership styles on the relationship between digital capabilities and performance outcomes. Practically, Islamic banks should integrate AI and big data strategies with Sharia principles, while investing in employee training that combines technical skills with sustainability awareness. Cross-functional teams of IT experts and Sharia scholars can ensure ethical technology adoption. Policymakers should create frameworks for Sharia-compliant AI governance and offer incentives such as tax relief for sustainability reporting. Qualitative methods can uncover deeper implementation challenges.

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