

Digital Transformation, Financing Risk, and Islamic Intellectual Capital: A Governance-Based Model of Sustainable Islamic Banking

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Abstract

This study investigates how digital transformation, financing risks, and Islamic intellectual capital (IIC) affect the sustainability of Islamic commercial banks in Indonesia, considering Islamic corporate governance (ICG) as mediator and Sharia compliance (SC) as moderator. Using panel data regression on 11 banks (2021–2023), findings reveal that IIC positively drives sustainability, while ICG exerts a negative effect. ICG mediates financing risk's influence on sustainability, and SC strengthens ICG's contribution. Results highlight the strategic role of IIC, governance, and Sharia principles in enhancing Islamic banking sustainability in the digital era.

Keywords: Digital Transformation, Financing Risks, Islamic Intellectual Capital, Islamic Corporate Governance, Sharia Compliance, Islamic Bank Sustainability.

INTRODUCTION

The global commitment to sustainable development, as reflected in the Sustainable Development Goals (SDGs) introduced by the United Nations in 2015, emphasizes the integration of economic growth, social inclusion, and environmental sustainability as interconnected dimensions of development. Within this broader framework, the banking sector, particularly Islamic banking, plays a strategic role in supporting the realization of these objectives [Fisk (2010); Mir & Bhat (2022)]. Unlike conventional financial systems, Islamic banking is grounded in principles such as justice, the prohibition of interest (*riba*), and risk-sharing, which align closely with the objectives of *maqasid al-shariah* in promoting social welfare and environmental responsibility [Kamri *et al.* (2014); Putritama (2018); Kartika *et al.* (2022)].

The growing emphasis on Environmental, Social, and Governance (ESG) considerations has further strengthened the relevance of sustainability within Islamic banking. This development has encouraged financial institutions to expand sustainability-oriented instruments, including green bonds, environmentally responsible financing, and sustainable investment funds, thereby contributing to the achievement of the SDGs [Friedman (1970); Hill (2020)]. In this context, the concept of green banking, where sustainability principles are embedded across banking operations has increasingly become an integral part of the industry's transformation [Harvey (1995); Islam *et al.* (2020)].

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Despite this strong conceptual foundation, the actual contribution of Islamic banking to sustainability remains limited, particularly in Indonesia. Although Indonesia has the largest Muslim population globally (approximately 87% of the total population), the market share of Islamic banking was only 7.44% in 2023 [Nawawi *et al.* (2023)]. While this reflects an improvement from 5.96% in 2018, it also indicates that the potential of Islamic banking has not yet been fully optimized.

In response to these challenges, digital transformation has emerged as an important driver of change within the Islamic banking sector. The adoption of digital technologies enhances operational efficiency, expands access to financial services, and strengthens financial inclusion. The rapid development of Islamic fintech further illustrates this shift, with projected transaction values reaching US\$179 billion by 2025 [Jamshidi and Kazemi (2019); GIFTR (2022)]. Consequently, digital transformation has become essential for Islamic banks to remain competitive in an increasingly technology-driven environment [McGrath and Maiye (2010); Vial (2019); Zhu and Jin (2023)].

Beyond technological advancements, Islamic Intellectual Capital (IIC) represents a critical internal resource that supports sustainability. Comprising knowledge, expertise, and relational networks, IIC enables innovation and value creation within Islamic banking institutions [Yang and Lin (2009); Schiavone *et al.* (2014); Schislyaeva *et al.* (2022)]. Empirical evidence suggests that effective intellectual capital management enhances operational performance while mitigating financing-related risks [Al-Musali and Ku Ismail (2016); Buallay (2019)].

At the same time, financing risk remains a persistent challenge, particularly as reflected in the Non-Performing Financing (NPF) ratio. Although NPF has declined from 4.8% in 2017 to 2.1% in 2023, it continues to pose risks, especially in financing segments such as SMEs that are more vulnerable to default [Laela (2012); Apriyanti (2019); Nawawi *et al.* (2023)]. This condition highlights the need for robust governance mechanisms to ensure effective risk management.

In this regard, Islamic Corporate Governance (ICG) plays a vital role in sustaining Islamic banking institutions. The Sharia Supervisory Board (SSB) ensures compliance with Sharia principles while promoting transparency and accountability [Budi (2021); Boudawara *et al.* (2023)]. Previous studies also indicate that strong Sharia governance enhances the relationship between sustainability practices and financial performance in Islamic banks [Farook *et al.* (2011); Almutairi and Quttainah (2017)].

Based on these considerations, this study aims to address a gap in the literature by examining the influence of digital transformation, financing risk, and Islamic Intellectual Capital on the sustainability of Islamic commercial banks in Indonesia. Furthermore, it investigates the mediating role of Islamic Corporate Governance (ICG) and the moderating role of Sharia Compliance (SC) in these relationships. Through this integrated approach, the study seeks to provide both theoretical insights and practical implications for strengthening the sustainability of Islamic banking in the digital era.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Theoretical Foundation

This study is grounded in several theoretical perspectives that are closely related to Islamic banking and sustainability. Sustainability theory serves as a primary foundation, emphasizing the need to integrate economic, social, and environmental dimensions in achieving long-term development [Cosma *et al.* (2020)]. Within the Islamic banking context, this perspective is further strengthened by the maqasid al-shariah framework, which prioritizes the protection of religion, life, intellect, lineage, and property as essential elements in promoting social welfare and sustainable outcomes [Hamidi and Worthington (2021)].

In addition, stakeholder theory [Freeman (2010)] and agency theory [Jensen and Meckling (1976)] provide complementary insights into the relationships between banks, shareholders, and the wider community. These theories highlight the importance of balancing diverse interests while ensuring accountability and effective governance within financial institutions. From a strategic perspective, the Resource-Based View (RBV) underscores the importance of intellectual capital as a key organizational resource capable of generating sustainable competitive advantage [Barney (1991)].

In the context of Islamic banking, intellectual capital—comprising knowledge, capabilities, and relational assets—plays a critical role in enhancing adaptability and performance, particularly in an increasingly digitalized financial environment. Furthermore, Islamic Corporate Governance (ICG) represents an essential governance mechanism that promotes transparency, accountability, and effective risk management, thereby supporting the long-term sustainability of Islamic banking institutions. In parallel, legitimacy theory explains that adherence to Sharia principles contributes to the social acceptance and credibility of Islamic banks within society [Suchman (1995)]. Finally, Good Corporate Governance (GCG) provides a broader evaluative framework for assessing the effectiveness of governance practices, particularly in ensuring that banking operations remain aligned with Islamic principles and ethical standards [Rahman and Bukair (2013)].

Hypothesis Development

Within the broader discourse on sustainability and Islamic banking strategies, digital transformation has emerged as an increasingly influential factor in enhancing efficiency and transparency across the banking sector. It can be understood as the comprehensive integration of digital technologies into organizational processes and functions, leading to fundamental changes in operational systems, customer engagement, and value creation mechanisms [Sama *et al.* (2022); Han *et al.* (2023)].

In the context of financial institutions, digital transformation is widely recognized for its potential to generate positive outcomes not only for organizational performance but also for society at large. The adoption of digital technologies improves operational efficiency, strengthens transparency, and enhances accountability in financial activities. Moreover, digitalization facilitates more effective communication with stakeholders, promotes financial inclusion, and contributes to sustainability through more efficient resource utilization [Oktavenus (2019); Siswanti *et al.* (2024)].

Empirical evidence further supports the significance of digital transformation in advancing banking sustainability. Several studies have demonstrated its positive contribution to the sustainability performance of banks, particularly in Indonesia [Saputra *et al.* (2023); Siswanti *et al.* (2024)]. In addition, research conducted in China identifies a non-linear, U-shaped relationship between digital transformation and sustainability, indicating that its impact evolves over different stages of technological adoption [Yang *et al.* (2023)].

H1: Digital transformation positively influences the sustainability of Islamic banks.

After discussing the relevance of digital transformation, which affects the efficiency and sustainability of banks, we must also consider another significant challenge in Islamic banking: financing risk. Non-Performing Financing (NPF), which represents the share of problematic financing, serves as an indicator of portfolio quality as well as the financial stability of Islamic banking institutions [Damanhur *et al.* (2018); Munifatussa'idah (2020)].

A high NPF indicates financing risk, negatively impacting profitability, stability, and customer trust [Effendi *et al.* (2017); Hidayah and Tabrani (2019); Hosen and Muhari (2019)]. Several studies emphasize the negative impact of NPF on the sustainability of banks, particularly in Indonesia and regionally [Apriyanti (2019); Setiawan (2021); Isnurhadi *et al.* (2023); Nawawi *et al.* (2023)]. Although some researchers argue that its impact is not always direct [Said and Ali (2017); Jusni *et al.* (2019)], the majority of the literature considers NPF to be a crucial factor for sustainability [Trimulato (2022)].

H2: Financing risk negatively influences the sustainability of Islamic banks.

In addition to technological factors, financing risk and Islamic Intellectual Capital (IIC) are increasingly recognized as critical determinants of long-term sustainability in Islamic banking institutions. IIC, which encompasses organizational knowledge, competencies, and relational capabilities, functions as a strategic resource that supports value creation and institutional resilience. Within this framework, the Value Added Intellectual Coefficient (VAIC) model is frequently employed to capture the contribution of intellectual capital through its core components—human capital, structural capital, and relational capital—which collectively enhance performance while helping banks manage financing-related risks [Yang and Lin (2009); Stewart (2010); Dzemyda and Jurgelevičius (2014)].

Beyond its role in risk mitigation, IIC is also fundamental in driving innovation, improving operational efficiency, and strengthening competitive advantage within Islamic banking institutions [Stewart (2010); Al-Musali and Ku Ismail (2016); Buallay (2019)]. A growing body of empirical evidence further confirms that Islamic Intellectual Capital contributes positively to both performance and sustainability outcomes, not only in Islamic banking institutions but also across small and medium-sized enterprises (SMEs) [Akhtar *et al.* (2015); Siswanti *et al.*, (2017b); Xu and Wang (2018); Soewarno and Tjahjadi (2020); Siswanti and Cahaya (2021); Prasojo *et al.* (2022); Barak and Sharma (2023)].

H3: Islamic intellectual capital positively influences the sustainability of Islamic banks.

Beyond the contribution of Islamic Intellectual Capital (IIC) to sustainability, governance structures—particularly Islamic Corporate Governance (ICG)—play a central role in shaping both the effectiveness and long-term viability of Islamic banking institutions. ICG is conceptualized as a governance system rooted in Sharia principles, emphasizing compliance, transparency, accountability, independence, and fairness in managerial practices within Islamic financial institutions [Rahman and Bukair (2013)]. This governance orientation is closely aligned with the Triple Bottom Line (TBL) perspective introduced by Committee [1992]; and further developed by Elkington [1997], which asserts that organizational sustainability is achieved through the balanced integration of economic, social, and environmental objectives. In this regard, the implementation of ICG contributes to strengthening institutional legitimacy and enhancing stakeholder confidence [Farook *et al.* (2011); Sari and Marsono (2013); Janggu *et al.* (2014); Ahmad (2015)], while simultaneously reinforcing the social, environmental, and economic dimensions consistent with the TBL framework. Nevertheless, an overly rigid or purely formalistic application of governance practices may generate unintended consequences, including reduced flexibility and constraints on innovation [Almutairi and Quttainah (2017)].

H4: Islamic corporate governance positively influences the sustainability of Islamic banks.

Digital transformation in Islamic banking strengthens transparency, accountability, and the effectiveness of governance [Chaudhry *et al.* (2020); Panjwani and Shili (2020); KILIÇ (2023)]. The incorporation of advanced technologies, including artificial intelligence (AI), blockchain, and Islamic fintech contributes to improving operational efficiency while simultaneously maintaining Sharia compliance, as demonstrated in Malaysia through the adaptation of the Sharia Supervisory Board [Arif *et al.* (2024)]. Prior research has also identified a favorable correlation between digital transformation and the governance of Islamic banks [Abueid *et al.* (2020); Siswanti *et al.* (2024)]. Therefore, there appears to be a strong potential linkage between digitalization and the effectiveness of Islamic corporate governance (ICG) [Kitsios *et al.* (2021)].

H5: Digital transformation positively influences Islamic corporate governance.

The Non-Performing Financing (NPF) ratio serves as a key indicator of financing risk, representing problematic financing that can weaken the financial performance and stability of Islamic banking institutions [Effendi *et al.* (2017); Damanhur *et al.* (2018); Hidayah and Tabrani (2019); Hosen and Muhari (2019); Munifatussa'idah (2020)]. Weak governance exacerbates risk exposure, as demonstrated by Sanusi [2019]; Rehman *et al.* [2021], while effective governance practices can mitigate bankruptcy risks [Ali *et al.* (2021)]. Other empirical studies emphasize that high financing risk triggers the strengthening of ICG [Maulidar and Majid (2020); Kashani and Shiri (2022); Qibtiyah and Wicaksono (2022); Shahzad (2024)].

H6: Financing risk positively influences Islamic corporate governance.

Islamic Intellectual Capital (IIC), which integrates human, structural, and relational capital, strengthens governance quality by enhancing organizational capabilities, improving institutional processes, and fostering stronger stakeholder relationships, while simultaneously

encouraging ethical conduct and innovation [Nawaz and Haniffa (2017); Siswanti *et al.* (2017a); Jan *et al.* (2021); Prativi *et al.* (2021); Praptiningsih *et al.* (2022); Uddin (2023)].

H7: Islamic intellectual capital positively influences Islamic corporate governance.

Existing literature consistently highlights the mediating role of Islamic Corporate Governance (ICG) in linking internal organizational factors to sustainability outcomes [Farook *et al.* (2011); Almutairi and Quttainah (2017); Nawaz and Haniffa (2017); Khan *et al.* (2023)]. In the context of digital transformation, the expansion of fintech-driven systems has been shown to improve operational efficiency and promote financial inclusion; however, its effectiveness depends on the presence of Sharia governance to ensure alignment with core principles such as justice, trust, and public interest [Asutay (2012); Hartono (2018); Mahmood (2018); Indriastuti and Najihah (2020); Mansoor *et al.* (2020); Jihad *et al.* (2022); Sunarya and Rusydiana (2022); Norrahman (2023); Ullah *et al.* (2023)]. With regard to financing risk, Islamic Corporate Governance functions as an intermediary mechanism that mitigates the impact of Non-Performing Financing (NPF) through effective oversight by the Sharia Supervisory Board (SSB) and the implementation of transparent governance policies [Hamdani *et al.* (2019); Jazil (2019); Indriastuti and Suhendi (2021); Roziq and Sukarno (2021); Sujendro *et al.* (2021)]. Meanwhile, in the domain of Islamic Intellectual Capital, ICG strengthens the contribution of human, structural, and relational capital by fostering ethical standards and encouraging innovation, thereby supporting sustainability objectives [Siswanti *et al.* (2017b); Jan *et al.* (2021); Prativi *et al.* (2021); Praptiningsih *et al.* (2022); Uddin (2023)]. Overall, these findings reinforce the position of Islamic Corporate Governance (ICG) as a critical mediating mechanism that connects digital transformation, financing risk, and Islamic Intellectual Capital (IIC) to sustainability in Islamic banking.

H8: Islamic corporate governance mediates the impact of digital transformation on the sustainability of Islamic banks.

H9: Islamic corporate governance mediates the impact of financing risk on the sustainability of Islamic banks.

H10: Islamic corporate governance mediates the impact of Islamic intellectual capital on the sustainability of Islamic banks.

As an integral element of Islamic Corporate Governance (ICG), Sharia compliance plays a fundamental role in ensuring the long-term sustainability of Islamic banking institutions. The Sharia Supervisory Board (SSB) is responsible for overseeing that all banking products and operational activities adhere to established Sharia principles [Alabbad *et al.* (2019); Abbas *et al.* (2020)]. Consistent adherence to these principles not only strengthens stakeholder trust but also contributes to the financial resilience of Islamic banks, thereby enhancing their stability over time [Aziz *et al.* (2019); Abdul Rahim *et al.* (2024); Munir *et al.* (2023); Solihati *et al.* (2023)]. This Sharia compliance mechanism creates synergy between Sharia principles and sustainability, which is highly relevant in maintaining public trust and enhancing the competitiveness of Islamic banks [Zain and Shafii (2018); Mansoor *et al.* (2020)].

H11: Sharia compliance strengthens the impact of Islamic corporate governance on sustainable business practices.

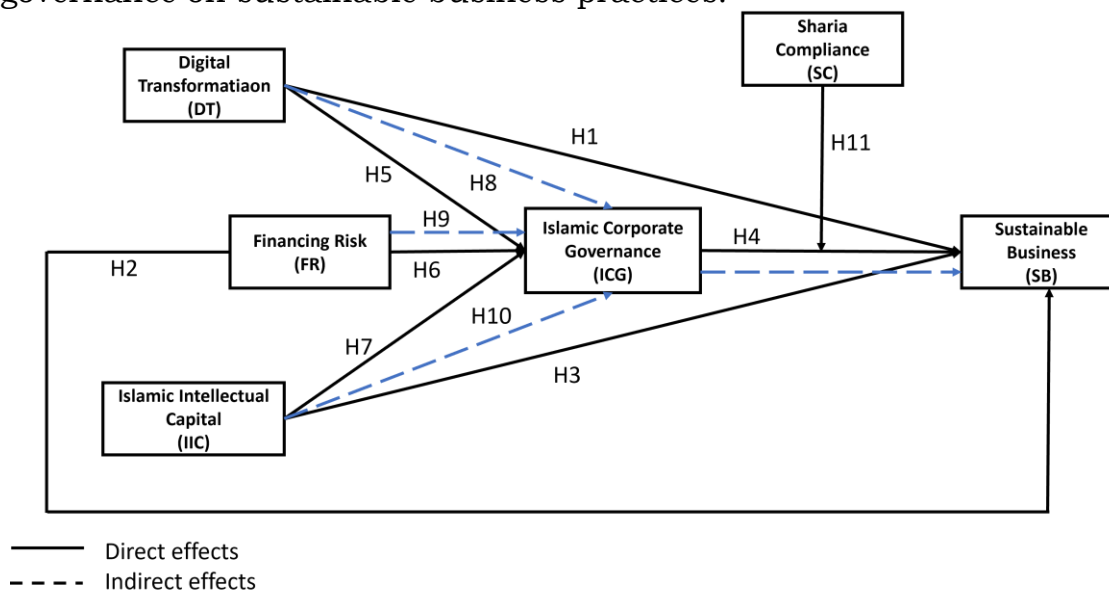


Figure 1. Presents a Conceptual Framework Based on the Variables and Hypotheses Mentioned Above

METHOD

After identifying the key variables and formulating the hypotheses, this research concentrates on the Islamic banking industry in Indonesia, utilizing data from 2021 to 2024. This focus is highly relevant, given the consolidation of several state-owned Islamic banks that resulted in the development of Bank Syariah Indonesia (BSI), which has introduced new dynamics into the Islamic banking industry within Indonesia. This research adopts a quantitative methodology utilizing a panel data regression model, with data derived from secondary sources, specifically the annual reports of 11 Islamic commercial banks in Indonesia between 2021 and 2024. This approach is chosen to ensure an objective analysis that can be applied across the entire Islamic banking sector in Indonesia.

Sampling is conducted applying a sampling approach based on purposive criteria, focusing on listed banks through the Financial Services Authority (OJK) that possess complete financial and governance reports during the specified period. By using this method, it is hoped that a representative sample in the context of the Islamic banking sector in Indonesia can be obtained.

To obtain data aligned with the research objectives, this study utilizes secondary data derived from financial reports, sustainability reports, and governance reports accessed through the official website of the Financial Services Authority (OJK) as well as the respective websites of selected Islamic commercial banks. The use of secondary data is justified by its reliability, as the data have undergone auditing processes and are therefore considered valid for analytical purposes. Secondary data enable more efficient data collection by eliminating the need for time-intensive primary data gathering. This approach also facilitates access to a broader and more representative dataset, allowing for a more comprehensive assessment of the operational performance of Islamic banking institutions in Indonesia.

This research adopts four groups of variables: (1) independent variables: sustainable business, (2) dependent variables: Digital Transformation, Financing Risk, and Islamic Intellectual Capital, (3) mediating variables: Islamic corporate governance, and (4) moderating variables: sharia compliance.

This study employs panel data regression analysis, which allows for the examination of multiple entities (Islamic banks) across different time periods. This approach is particularly advantageous as it enables the control of unobserved heterogeneity and enhances the precision of parameter estimation when analyzing relationships among variables. To ensure model appropriateness, the analysis incorporates both the Fixed Effects Model (FEM) and the Common Effects Model (CEM). The selection of the most suitable model is determined through a series of statistical tests, including the Chow test, Hausman test, and Lagrange Multiplier (LM) test.

The regression models are tested using the following methods:

1. *F-Test*: applied to evaluate the combined significance of all independent variables.
2. *t-Test*: applied to assess the significance of each independent variable individually.
3. R^2 (Coefficient of Determination): indicates the extent to which variations in the dependent variable are accounted for by the independent variables.
4. *Sobel Test*: Used to test for mediation effects, especially the mediating role of Islamic Corporate Governance.
5. *Moderated Regression Analysis (MRA)*: Applied to test for the role as a moderating variable of Sharia compliance.

Table 1: Variable Operationalization

Variable Definition	Indicators	Measurement	Scale
Sustainable Business (Y)	Profit (GRI Standards)	Disclosure of 11 Economic GRI Standards items. Formula: $ECd = \frac{\sum_{i=1}^n EcDi}{N}$	
	Planet (OJK G4)	Disclosure of 13 Environmental OJK G4 items. Formula: $ED = \frac{\sum_{i=1}^n Edi}{N}$	
	People (OJK G4)	Disclosure of 14 Social OJK G4 items. Formula: $SD = \frac{\sum_{i=1}^n Sdi}{N}$	
Digital Transformation (X1)	21 items for implementing digital transformation	N = 14 items Formula: $ED = \frac{\sum_{i=1}^n TDdi}{N}$	
Financing Risk (X2)	Non-Performing Financing (NPF) (OJK 2014)	Formula: $NPF = \frac{Non - Performing Financing}{Total Financing} \times 100\%$	
Islamic Intellectual Capital (X3)	iB-VAIC (Pulic, 2004; Ulum, 2013)	iB-VAIC = iB-VACA + iB-VAHU + iB-STVA iB-VACA = VA/CE iB-VAHU = VA/HC iB-STVA = SC/VA	
Islamic Corporate Governance (M)	11 indicators of GCG (self-assessment OJK)	Formula: $GCG = \sum_{i=1}^n (Score_i \times Weight_i)$	
Sharia Compliance (Z)	Profit Sharing Ratio (PSR) (Djuwita et al., 2019;	Score _i = score for factor i (scale 1 = very good to 5 = Formula: $PSR = \frac{Mudharabah Financing + Musyarakah Financing}{Total Financing}$	

RESULT

Research Data

Following the data collection process through document-based sources, an initial descriptive analysis is conducted to capture the fundamental characteristics of each research variable. This stage involves summarizing the distribution of the dataset using key statistical indicators, including the mean, median, maximum, minimum, and standard deviation (SD). The comparison between mean and median values is utilized to identify the direction of data distribution, while the standard deviation reflects the extent of variability around the central tendency. This step provides a foundational understanding of the dataset, which is subsequently examined in more detail through panel data regression analysis. The variables considered in this study consist of Sustainable Business (SB), Digital Transformation (DT), Financing Risk (FR), Islamic Intellectual Capital (IIC), Islamic Corporate Governance (ICG), and Sharia Compliance (SC). The descriptive statistics for these variables are summarized in Table 2.

Table 2. Descriptive Statistics of the Research Variables

Variable	Mean	Median	Max	Min	Std. Dev.
SB	87.6743	90.8850	100.0000	73.5100	9.3095
DT	82.7914	80.9500	95.2400	71.4300	6.9824
FR	2.4355	1.9800	8.8300	0.6700	1.7015
IIC	4.8591	4.7200	9.9000	-1.5400	2.0860
ICG	2.0080	2.0000	3.0000	1.0000	0.5655
SC	58.1898	66.4200	95.3200	0.1000	27.3717

Source: Output EViews, 2025

As presented in Table 2, the Sustainable Business (SB) variable exhibits a mean value of 87.67 and a median of 90.89, indicating a negatively skewed distribution with a moderate level of dispersion (minimum 73.51; maximum 100; standard deviation [SD] 9.31). Meanwhile, the Digital Transformation (DT) variable shows an average value of 82.79 and a median of 80.95, demonstrating a positively skewed distribution with a range of 23.81 and an SD of 6.98, indicating relatively high and clustered scores. The Financing Risk (FR) variable has a mean of 2.44, which is greater than the median of 1.98, suggesting a right-skewed distribution, with a range of 7.64 and an SD of 1.70, indicating considerable variation due to possible outliers. The Islamic Intellectual Capital (IIC) the variable exhibits a symmetrical distribution, with a mean of 4.86 and a median of 4.72, a range of 11.44, and an SD of 2.09, indicating moderate variation. The Islamic Corporate Governance (ICG) variable is also symmetric (mean 2.01; median 2.00), with a data range of 2 and an SD of 0.57, indicating relative homogeneity. Finally, the variable of Sharia Compliance (SC) exhibits a median amount of 66.42, exceeding its mean of 58.19, showing a left-skewed distribution with a range of 95.22 and an SD of 27.37, indicating high variation among samples.

Panel Data Estimation Model

This study uses two panel regression models:

Model 1: The impact of DT, FR, and IIC on SB, mediated by ICG and moderated by SC.

$$SB_{it} = \alpha + \beta_1 DT_{it} + \beta_2 FR_{it} + \beta_3 IIC_{it} + \beta_4 ICG_{it} + \beta_5 ICG_{it} * SC_{it} + \varepsilon \quad (1)$$

Model 2: The impact of DT, FR, and IIC on ICG.

$$ICG_{it} = \alpha + \beta_1 DT_{it} + \beta_2 FR_{it} + \beta_3 IIC_{it} + \varepsilon \quad (2)$$

Model selection is conducted using the Chow Test, Hausman Test, and Lagrange Multiplier (LM) Test. The results of the model selection are presented in Table 3.

Table 3. Model Selection Test Results

Test	Model 1 (SB)	Model 2 (ICG)
Chow Test	0.0000 < 0.05 (FEM)	0.0572 > 0.05 (CEM)
Hausman Test	0.0000 < 0.05 (FEM)	-
Lagrange Multiplier Test	-	0.0647 > 0.05 (CEM)
Conclusion	FEM	CEM

Source: Output EViews, 2025

Based on the model selection results presented in Table 3, the appropriate estimation techniques are determined through several statistical procedures, including the Chow test, Hausman test, and Lagrange Multiplier test. In Model 1, which evaluates the effects of Digital Transformation (DT), Financing Risk (FR), and Islamic Intellectual Capital (IIC) on Sustainable Business (SB), with Islamic Corporate Governance (ICG) acting as a mediating variable and Sharia Compliance (SC) as a moderating variable, the Fixed Effects Model (FEM) is identified as the most suitable specification. This decision is supported by the results of the Chow test ($p < 0.05$) and the Hausman test ($p < 0.05$), both of which indicate the preference for FEM.

In contrast, Model 2, which investigates the influence of DT, FR, and IIC on Islamic Corporate Governance (ICG), is best estimated using the Common Effects Model (CEM). The Lagrange Multiplier test result ($p > 0.05$) confirms that CEM is more appropriate for this model specification.

Prior to conducting panel regression analysis, a series of classical assumption tests are performed to ensure the robustness and reliability of the estimation results. These tests are essential to confirm that the dataset meets the required assumptions for panel data analysis. The normality test results indicate that both Model 1 and Model 2 satisfy the normality assumption, as reflected by Jarque-Bera values of 0.1949 ($p = 0.9280$) and 0.9915 ($p = 0.6091$), respectively, with skewness and kurtosis values approaching the expected benchmarks. Furthermore, multicollinearity diagnostics using the Variance Inflation Factor (VIF) show that all independent variables have values below the threshold of 10, indicating the absence of multicollinearity issues. The heteroscedasticity test, conducted using the Harvey method, produces p-values greater than 0.05 for both models, suggesting homoscedastic residuals. In addition, the Breusch-Godfrey LM test yields probability values exceeding 0.05, confirming that no autocorrelation is present in the residuals.

Results of Regression and Hypothesis Testing

This study tests the influence of Digital Transformation (DT), Financing Risk (FR), and Islamic Intellectual Capital (IIC) on Sustainable Business (SB) in Islamic Commercial Banks, through direct relationships as well as indirect effects involving mediation by Islamic Corporate Governance (ICG), with Sharia Compliance (SC) acting as a moderating variable. The analysis employs panel data regression using Fixed Effects

Model (FEM) for Model 1 and the Common Effects Model (CEM) for Model 2.

Model 1: Sustainable Business (SB) as the Dependent Variable

Table 4 presents the results of Model 1 regression, which tests the impact of DT, FR, IIC, and ICG on SB, with the interaction SC*ICG as a moderating variable.

Table 4: Model 1 Regression Results

Variable	Coeff.	Std. Error	t-Statistic	Prob.
DT	0.1982	0.1631	1.2147	0.2346
FR	0.3542	1.4214	0.2492	0.8050
IIC	4.1700	1.7000	2.4530	0.0207
ICG	-20.6463	4.5084	-4.5795	0.0000
ICG*SC	0.2726	0.0612	4.4506	0.0001
C	72.6583	15.0215	4.8370	0.0000

Source: Output EViews, 2025

Model 5: ICG as Dependent Variable

The regression outcomes for Model 2, as summarized in Table 5, evaluate the influence of Digital Transformation (DT), Financing Risk (FR), and Islamic Intellectual Capital (IIC) on Islamic Corporate Governance (ICG).

Table 5: Model 2 Regression Results

Variable	Coeff.	Std. Error	t-Statistic	Prob.
DT	0.0109	0.0117	0.9265	0.3598
FR	0.3068	0.1286	2.3852	0.0219
IIC	-0.0515	0.1647	-0.3128	0.7561
C	0.9811	1.0548	0.9302	0.3579

Source: Output EViews, 2025

The results of the t-test presented in Table 6 provide an overview of the direct relationships between the independent variables and both Sustainable Business (SB) and Islamic Corporate Governance (ICG), as outlined below:

Table 6. Model 1 Results of Direct Effect Test

Hypothesis	Coefficient	t-Statistic	p-value	Description
H1: DT → SB	0.1982	1.2147	0.2346	Rejected
H2: FR → SB	0.3542	0.2492	0.8050	Rejected
H3: IIC → SB	4.1700	2.4530	0.0207	Accepted
H4: ICG → SB	-20.6463	-4.5795	0.0000	Accepted
H5: DT → ICG	0.0109	0.9265	0.3598	Rejected
H6: FR → ICG	0.3068	2.3852	0.0219	Accepted
H7: IIC → ICG	-0.0515	-0.3128	0.7561	Rejected

Source: Output EViews, 2025

Table 7. Results of Mediation and Moderation Testing

Hypothesis	t-Statistic	p-value	Description
H8 DT→ICG→SB	-0.9129	0.3213	Rejected
H9 FR→ICG→SB	-2.1158	0.0344	Accepted
H10 IIC→ICG→SB	0.3119	0.7551	Rejected
H11 ICG*SC→SB	4.4506	0.0001	Accepted

Source: Output EViews, 2025

Following the selection of the most appropriate regression model, the analysis proceeds by interpreting the estimation results to assess the influence of each variable on Sustainable Business (SB). The results for Model 1 (Table 4) show that Islamic Intellectual Capital (IIC) exerts a statistically significant positive effect on sustainability, as reflected by a coefficient of 4.1700 ($p = 0.0207$). This finding suggests that stronger intellectual capital capabilities are associated with improved sustainability performance in Islamic banking institutions.

In contrast, Islamic Corporate Governance (ICG) is found to have a negative and statistically significant relationship with SB, with a coefficient of -20.6463 ($p = 0.0000$), indicating that insufficient or ineffective Sharia governance practices may hinder sustainability outcomes. However, the interaction between ICG and Sharia Compliance (SC) produces a positive and significant coefficient ($\beta = 0.2726$; $p = 0.0001$), demonstrating that stronger Sharia compliance enhances the effectiveness of governance in supporting sustainability.

Meanwhile, Digital Transformation (DT) and Financing Risk (FR) are not statistically significant in explaining variations in sustainability ($p > 0.05$), suggesting that their direct contributions to sustainability remain limited within the context of Islamic banking in Indonesia. Turning to Model 2 (Table 5), the findings indicate that Financing Risk (FR) is the only variable that significantly influences Islamic Corporate Governance (ICG), with a coefficient of 0.3068 ($p = 0.0219$). This result implies that higher levels of financing risk may encourage stronger governance mechanisms as part of risk mitigation efforts. In contrast, Digital Transformation (DT) and Islamic Intellectual Capital (IIC) do not exhibit statistically significant effects on ICG ($p > 0.05$), indicating that their roles in directly shaping Sharia governance practices remain less pronounced.

The model fit test (F-test) reveals that both models are statistically significant. Model 1 has an F value of 15.36 ($p=0.0000$) and $R^2=0.8916$, reflecting a very strong predictive ability, while Model 2 has an F value of 2.737 ($p=0.0449$) and $R^2=0.1725$, indicating moderate predictive ability. The t-test confirms the regression results, where DT and FR do not directly affect SB (H1 and H2 are rejected), while IIC and ICG do affect SB (H3 and H4 are accepted). Furthermore, FR is found to affect ICG (H6 is accepted), while DT and IIC do not significantly affect ICG (H5 and H7 are rejected).

The Sobel Test for mediation suggests that ICG functions as an important mediating factor linking FR and SB ($p=0.0344$); thus, H9 is accepted. Meanwhile, ICG's mediation in the relationship between DT and IIC with SB is not significant ($p>0.05$), resulting in the rejection of H8 and H10. Furthermore, the Moderated Regression Analysis (MRA) reveals that SC serves as a key moderating mechanism that strengthens the effect of ICG on SB ($t=4.4506$; $p=0.0001$), thereby accepting H11. This finding highlights that the sustainability of Islamic banks is not solely determined by IIC and ICG, but also by through the mediation mechanism of financing risks and the role of Sharia compliance, which fortifies the linkage between Sharia governance and business sustainability [Baron and Kenny (1986); Abdul Rahim (2024b)].

DISCUSSION

This study reveals that, despite digital transformation holds great potential to improve the operational efficiency of Islamic banks, its impact on the sustainability of these banks has not been fully optimized. This finding aligns with the research conducted by Siswanti *et al.* [2024], which emphasizes that digitalization in the Islamic banking sector is often hindered by limitations in infrastructure and regulations that are not yet fully supportive. Moreover, Listiana and Edriyanti [2023] found that, although many Islamic banks in Indonesia have adopted basic digital innovations, including mobile banking and QRIS, the quality of their implementation in supporting sustainable finance still needs improvement. One contributing factor to this issue is that the utilization of digital technologies in Islamic banking in Indonesia remains at an early stage, with greater emphasis on improving operational efficiency rather than addressing the social, economic, and environmental dimensions that should be covered by the Triple Bottom Line [Amidjaya and Widagdo (2019); Saputra *et al.* (2023); Garg and Kumar (2024); Nurcahyo *et al.* (2025)]. Additionally, challenges related to regulations, infrastructure, and limited digital literacy also affect the magnitude to which digitalization supports the sustainability of Islamic banking [Putri and Fasa (2024)]. These results indicate that, although digitalization holds the potential to enhance sustainability, its role within the Indonesian Islamic banking sector remains limited.

From a Resource-Based View (RBV) perspective, the absence of a comprehensive digital strategy integration prevents the development of sustained competitive advantage, while Institutional Theory explains that digitalization often remains ceremonial and does not reach the core of sustainability. Therefore, a more strategic approach to integrating digital technologies, aligned with Sharia principles and sustainability objectives, is needed to make a substantial effect on the Islamic banking industry.

Financing risk is often viewed as a key indicator of financial stability in banking institutions; however, the results of this study indicate that it does not significantly contribute to the sustainability of Islamic banking operations. This finding aligns with previous research suggesting that Non-Performing Financing (NPF) does not consistently exert a direct influence on sustainability within Islamic banking contexts [Said and Ali (2017); Jusni *et al.* (2019); Siswanti *et al.* (2024)]. Financing risk is often viewed as a key indicator of financial stability in banking institutions; however, the results of this study indicate that it does not significantly contribute to the sustainability of Islamic banking operations. This finding aligns with previous research suggesting that Non-Performing Financing (NPF) does not consistently exert a direct influence on sustainability within Islamic banking contexts. Therefore, while financing risk remains a relevant consideration, it should not be viewed as the sole determinant of Islamic bank sustainability, but rather as one component within a more comprehensive risk management framework.

The findings confirm that Islamic Intellectual Capital (IIC) positively and significantly contributes to sustainability, suggesting that the strategic use of human, structural, and relational capital when aligned with Sharia principles creates value that strengthens the economic, social, and environmental dimensions of Islamic banking. These results

are in line with previous studies that emphasize the critical role of intellectual capital in improving both organizational performance and long-term sustainability in Islamic banking. [Siswanti *et al.* (2017); Ousama *et al.* (2019); Soewarno and Tjahjadi (2020); Prativi *et al.* (2021); Prasojo *et al.* (2022)]. From the Resource-Based View (RBV) perspective, IIC is considered an intangible asset that meets the VRIN (Value, Rarity, Imitability, and Non-substitutability) criteria, enabling the creation of a long-term competitive advantage. Meanwhile, stakeholder theory highlights that IIC can enhance legitimacy and public trust because the management of intellectual capital aligns with Sharia principles. Therefore, IIC serves as a key pillar in achieving the sustainability of Islamic banks.

In a similar context, Islamic Corporate Governance (ICG) exerts a significant influence on the sustainability of Islamic banking institutions, highlighting its essential role in supporting long-term sustainability. Proper implementation of ICG can strengthen legitimacy, transparency, and the resilience of Islamic banking institutions. This evidence reinforces prior research suggesting that well-established governance systems are positively associated with the sustained performance and resilience of Islamic banks [Sari and Marsono (2013); Jangu *et al.* (2014); Ahmad (2015); Djameluddin *et al.* (2018); Amidjaya and Widagdo (2019); Yusuf *et al.* (2021); Al-Qudah *et al.* (2022)]. From the perspective of stakeholder theory, business sustainability can only be achieved if the institution meets the expectations of diverse stakeholders through accountable and transparent governance. Legitimacy Theory also explains that ICG strengthens social legitimacy through Sharia compliance, ensuring that the operations of Islamic banks align with principles accepted by society. Therefore, the application of strong Sharia governance constitutes a primary driver of the enduring sustainability of Islamic banking institutions.

While digital transformation does not show a statistically significant impact on the quality of Islamic Corporate Governance (ICG), Sharia Compliance (SC) remains a key factor in strengthening governance practices within Islamic banking institutions. Although digitalization can improve service efficiency, Sharia governance is largely determined by managerial commitment, regulations, and organizational culture that adhere to Sharia principles [Tjendani *et al.* (2018); Alshammari (2022); Alipour *et al.* (2025); Haidar (2025)]. From a Resource-Based View (RBV) perspective, digital technology will provide strategic value only if it is integrated with a governance mechanism that complies with Sharia principles. Agency theory also emphasizes that while digitalization enhances efficiency, it does not automatically improve accountability and oversight. Institutional theory highlights that the adoption of digitalization is often mimetic, following existing trends without improving governance quality. Therefore, Sharia Compliance (SC) functions as an enabling factor that bridges Sharia governance with business sustainability.

Financing risk significantly affects Islamic corporate governance. Lower financing risk is associated with higher quality of Sharia governance. This finding is consistent with literature showing a strong relationship between financial risk and governance [Shahzad *et al.* (2013); Sanusi (2019); Rehman *et al.* (2021)]. Agency theory explains that high financing risk can worsen the agency conflict between managers and

owners, weakening oversight. In contrast, good corporate governance theory emphasizes that good risk management will strengthen transparency and accountability. Therefore, financing risk management is a crucial component in strengthening Sharia governance.

Islamic intellectual capital has not been proven to significantly influence Islamic corporate governance. Although IIC is important in enhancing efficiency, the results suggest that its impact on Sharia governance quality is limited. This finding aligns with prior studies indicating the contribution of IIC to governance is indirect [Nawaz (2015); Muhammad *et al.* (2021); Risman and Susanti (2023)]. Differences in measurement instruments between VAIC and ICG based on self-assessment may be a factor contributing to the weak relationship. RBV explains this as a resource capability gap, where intellectual capital efficiency does not automatically enhance governance. Stakeholder theory argues that governance is more driven by regulations and formal compliance than by intellectual capabilities. Therefore, the quality of ICG requires structural and regulatory strengthening, not just an increase in IIC.

The results of this study indicate that Islamic Corporate Governance (ICG) does not act as a significant mediating mechanism in the relationship between digital transformation and business sustainability. This suggests that the effectiveness of digitalization in enhancing sustainability is influenced more by external conditions—such as regulatory frameworks and infrastructure readiness—than by internal governance practices embedded within ICG [Lathifah *et al.* (2021); Cong *et al.* (2022); Nasrallah and El Khoury (2022); Siswanti *et al.* (2024)]. From the perspective of the Resource-Based View (RBV), this finding implies that Sharia governance has not yet been optimally leveraged to direct the strategic use of digital technologies for sustainability objectives. In line with Good Corporate Governance theory, ICG tends to operate primarily as a compliance-oriented mechanism rather than as a proactive strategic tool for achieving sustainability. Consequently, its role in linking digital transformation with sustainability remains relatively limited.

In contrast, Islamic Corporate Governance (ICG) is shown to play a significant mediating role in the relationship between financing risk and business sustainability. Effective implementation of Sharia governance contributes to mitigating financing risk, thereby supporting the long-term sustainability of Islamic banking institutions [Indriastuti and Suhendi (2021); Jan *et al.* (2021); Sujendro *et al.* (2021); Mutoharoh and Kartikasari (2024)]. From an RBV standpoint, ICG can be viewed as a strategic asset that enhances institutional competitiveness through improved transparency and strengthened stakeholder trust. Agency theory further explains that elevated financing risk can intensify conflicts of interest between managers and shareholders, potentially weakening oversight mechanisms. Conversely, Good Corporate Governance theory highlights that effective governance structures enhance accountability and transparency in risk management. Accordingly, ICG serves as a critical mechanism in connecting financing risk with sustainability outcomes in Islamic banking.

Furthermore, the findings reveal that Islamic Corporate Governance (ICG) does not mediate the relationship between Islamic Intellectual Capital (IIC) and business sustainability. This indicates that the contribution of IIC to sustainability operates more directly, without

relying on governance as an intermediary mechanism. Such results are consistent with prior studies emphasizing that intellectual capital contributes directly to performance and sustainability outcomes, rather than indirectly through governance structures [Nawaz *et al.* (2021); Risman and Susanti (2023)]. From the RBV perspective, IIC represents a strategic resource capable of generating value independently through knowledge, capabilities, and innovation. Meanwhile, governance theory suggests that governance quality is more strongly shaped by institutional and regulatory factors than by intellectual capital. Therefore, the linkage between IIC and sustainability appears to be stronger in the absence of mediation by ICG.

Sharia Compliance (SC) has been shown to function as a moderating variable that strengthens the relationship between ICG and business sustainability. The application of Sharia compliance enhances the effectiveness of governance, thereby increasing its positive impact on sustainability. This result aligns with literature that underscores the critical importance of Sharia compliance in strengthening the legitimacy of Islamic banks and improving stakeholder trust [Yusuf *et al.* (2021)]. Agency theory emphasizes that Sharia compliance reduces agency conflicts by ensuring decision-making is aligned with Islamic principles. Legitimacy theory explains that Sharia compliance increases social acceptance. Thus, Sharia compliance serves a strategic role in reinforcing the relationship between governance and sustainability.

The empirical results reveal a differentiated contribution of digital transformation (DT), financing risk (FR), and Islamic Intellectual Capital (IIC) to the sustainability of Islamic banks (SB). Among these variables, IIC emerges as a direct driver of sustainability, whereas financing risk primarily operates through its influence on Islamic Corporate Governance (ICG), which subsequently shapes sustainability outcomes. The significance of the FR → ICG → SB pathway indicates that governance mechanisms play a critical role in translating risk dynamics into sustainable performance. In addition, Sharia Compliance (SC) strengthens the effectiveness of governance, particularly in reinforcing the relationship between ICG and sustainability. These patterns suggest that sustainability in Islamic banking is more strongly anchored in governance quality and Sharia alignment than in purely technological or risk-related factors.

A deeper interpretation of these findings can be drawn by positioning intellectual capital and governance within a strategic resource framework. Rather than acting as isolated variables, elements such as Sharia knowledge, organizational capabilities, and governance structures function as interdependent resources that shape long-term performance. This perspective is consistent with the Resource-Based View (RBV), which emphasizes that competitive advantage is derived from the effective orchestration of internal capabilities. Within this context, Sharia Compliance should not be viewed merely as a regulatory requirement, but as a mechanism that enhances the strategic value of governance in sustaining institutional performance.

From an operational perspective, the results point to the need for a more integrated approach to sustainability management in Islamic banking. Institutional strengthening should focus on enhancing the capacity of governance structures, particularly the Sharia Supervisory Board, while simultaneously improving transparency and accountability

in reporting practices. In addition, digital transformation initiatives should be aligned with Sharia-based governance principles to ensure that technological adoption contributes meaningfully to sustainability objectives. Such alignment is essential for building stakeholder confidence and maintaining institutional resilience in a rapidly evolving financial environment.

The implications of this study also extend to the broader sustainable development agenda. The findings demonstrate that governance quality and adherence to Sharia principles contribute to inclusive economic growth, aligning with SDG 8. At the same time, the role of digital transformation in reinforcing governance structures supports the objectives of SDG 9. Ethical financing practices grounded in Sharia values reflect the principles of responsible consumption and production under SDG 12, while the emphasis on transparency and accountability corresponds with the institutional integrity promoted in SDG 16. Collectively, these insights highlight the relevance of Islamic banking as a strategic actor in advancing sustainable development.

CONCLUSION

The sustainability of Islamic banking institutions in Indonesia is primarily driven by the interplay between intellectual capital, governance quality, and adherence to Sharia principles. Among these factors, Islamic Intellectual Capital (IIC) emerges as a core strategic resource that strengthens competitiveness while supporting not only financial outcomes but also social and environmental performance in line with the triple bottom line perspective. In contrast, digital transformation and financing risk do not exhibit a direct contribution to sustainability, indicating that their effects are likely indirect or contingent upon other institutional mechanisms.

Governance dynamics further reveal that Islamic Corporate Governance (ICG), as reflected in its measurement scale, demonstrates an inverse relationship with sustainability performance, where stronger governance quality corresponds with higher sustainability outcomes. In this context, Sharia Compliance (SC) reinforces the effectiveness of governance structures, enabling Islamic banks to maintain sustainability even when formal governance indicators are not fully optimized. This finding highlights the complementary relationship between formal governance mechanisms and value-based compliance.

From a practical perspective, the results point toward the need for a more integrated sustainability strategy within Islamic banking institutions. Strengthening intellectual capital should remain a priority, particularly through the development of human resource capabilities and the enhancement of institutional capacity within the Sharia Supervisory Board. At the same time, digital transformation initiatives should be implemented in a more adaptive and inclusive manner, ensuring alignment with Sharia principles so that technological advancement contributes meaningfully to sustainability performance.

The implications of this study also resonate with broader sustainable development priorities. The emphasis on governance quality and Sharia adherence supports inclusive economic growth, aligns with innovation-driven institutional development, promotes responsible financial practices, and reinforces transparency and accountability

within financial systems. These dimensions collectively position Islamic banking as a relevant contributor to the global sustainability agenda. Nevertheless, several limitations should be acknowledged. The reliance on secondary data and the focus on the Indonesian context may restrict the generalizability of the findings. Future research is therefore encouraged to expand the geographical scope, particularly by including other Muslim-majority countries, and to adopt qualitative approaches that allow for a deeper exploration of governance practices and Sharia compliance in Islamic banking.

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