Management Analysis Journal 15 (2) (2026)

https://journal.unnes.ac.id/journals/maj

Intellectual Capital on Financial Performance: Islamic Commercial Banks in Indonesia 2021-2025

Asa Hafsa Nabela[1]✉, Ruspita Rani Pertiwi[2], Camalia Fadila[3]

[1,2]Master of Sharia Economics, FEBI, UIN Sunan Kalijaga, Yogyakarta
[3]Sharia Economics, Sharia Economics, STIES KHAS Aljaelani, Cirebon

Article Information

History of article:
Submitted 19 July 2026
Revised 28 September 2026
Accepted 30 September 2026

Keywords:
Intellectual Capital, VAIC, Financial Performance, ROA, Islamic Commercial Banks, Analysis, Panel Regresion

Abstract

This study aims to examine the influence of intellectual capital on the financial performance of Islamic commercial banks in Indonesia during the 2021–2025 period. Intellectual capital has become increasingly relevant to banking performance, as financial institutions rely on employee expertise, organizational capabilities, and efficient capital utilization to sustain profitability. In Islamic banking, understanding the contribution of these resources is particularly important given the need to maintain financial performance while operating under Sharia principles. This study evaluates intellectual capital through Human Capital Efficiency (HCE), Structural Capital Efficiency (SCE), and Capital Employed Efficiency (CEE), as well as their combined contribution using the Value Added Intellectual Coefficient (VAIC). Financial performance is measured by Return on Assets (ROA). A quantitative approach was employed using quarterly financial data from nine Islamic commercial banks, comprising 180 balanced panel observations. The data were analyzed using panel regression with appropriate model selection and heteroscedasticity correction procedures. The findings show that HCE, SCE, and CEE each have a positive and significant relationship with ROA. The aggregate VAIC measure also exhibits a significant positive relationship with bank profitability. These findings indicate that human capital, organizational resources, and capital utilization are important determinants of financial performance in Islamic banking. This study contributes to the literature by providing empirical evidence on the role of individual intellectual capital components and the aggregate VAIC measure in explaining the profitability of Islamic commercial banks in Indonesia.

✉correspondence Address:
Laksda Adisucipto Street, Papringan, Caturtunggal, Depok District, Sleman Regency, DIY 55281
E-mail: asabella643@gmail.com

© 2026 Universitas Negeri Semarang
e-ISSN 2502-1451

INTRODUCTION

Indonesia's Islamic banking industry has experienced significant growth in the past decade. According to the Islamic Banking Statistics published by the Financial Services Authority (Otoritas Jasa Keuangan/OJK) in 2024, total national Islamic banking assets reached IDR 896 trillion by the end of 2024, with an annual average growth (CAGR) of 15.3% during the 2019-2024 period. This growth momentum was further strengthened by the merger of three state-owned Islamic banks that gave birth to Bank Syariah Indonesia (BSI) in February 2021, making it the largest Islamic bank in Indonesia and included in the category of Commercial Bank for Business Activities (BUKU) IV. In the context of increasingly fierce competition, both from fellow Islamic banks and conventional banks that have Sharia Business Units, the ability of Sharia Commercial Banks (BUS) to create added value in a sustainable manner is a determining factor for competitive advantage.

One of the interesting paradoxes in the Islamic banking industry is that although its

performance continues to grow in aggregate, there is a significant disparity in profitability between banks. OJK data for 2024 also show that BUS's Return on Assets (ROA) ranges from 0.4% (Bank BJB Syariah) to 2.3% (BTPN Syariah), indicating a very wide range. This extreme difference in profitability, which goes far beyond differences in access to capital or physical infrastructure, indicates that intangible factors, especially intellectual capital, play a critical but often overlooked role in determining the financial performance of Islamic banks.

Intellectual capital (IC) has been a central construct in strategic management and corporate finance research since the early 2000s. Pulic (2000) developed the Value Added Intellectual Coefficient (VAIC) method which measures the efficiency of intellectual capital through three components, namely Human Capital Efficiency (HCE), Structural Capital Efficiency (SCE), and Capital Employed Efficiency (CEE). The VAIC method has the advantage of being based on audited financial statement data, can be replicated, and allows comparisons across companies and industries (Pulic, 2000). The VAIC framework and its modified version continue to be widely applied in recent banking studies across India, ASEAN, and the European Union (Barak & Sharma, 2024; Rehman et al., 2024; Rong et al., 2025).

In the context of Indonesian Islamic banking, intellectual capital has a unique strategic relevance compared to conventional banking. This industry relies heavily on the expertise of human resources (HR) who have dual competencies, namely mastery of modern finance as well as a deep understanding of fiqh muamalah, sharia contracts such as mudharabah, musharakah, murabahah, and ijarah, as well as a sharia compliance supervision system. The scarcity of sharia-competent human resources makes human capital a strategic resource that meets the criteria of VRIN (Valuable, Rare, Inimitable, Non-substitutable) within the framework of Resource-Based Theory. In addition, the development of innovative Islamic financial products and Islamic banking technology systems is a form of structural capital that distinguishes BUS from its competitors.

Recent studies using post-pandemic data have also reinforced the urgency of this issue. Research on 16 Indonesian Islamic banks for the 2019-2023 period found that VAIC had a positive and significant effect on ROA, while company size was not proven to have a significant effect when positioned as a pure control variable, not as a moderation variable (Fadhilah et al., 2026). Meanwhile, evidence from Islamic banks in the Gulf Cooperation Council (GCC) countries shows that bank size is significantly related only to HCE and not to the other IC components, indicating that the role of size in the IC-performance relationship is not uniform (Ousama et al., 2020). Cross-regional evidence further shows that VAIC has a significant positive effect on the ROA of Islamic banks (Prasojo et al., 2022), and that intellectual capital enhances the profitability of Islamic banks in nine Asian countries (Hashmi et al., 2026). This inconsistency of findings is one of the main motivations for this study to explicitly test the role of bank size moderation, not just a control variable, on the relationship between IC components and BUS profitability.

Although the literature on IC and the performance of Indonesian Islamic banking continues to grow, some research gaps are still wide open. First, most studies use annual data so it has the potential to lose the dynamics of quarterly changes that are important for managerial decision-making. Second, the role of firm size (SIZE) on the IC-performance relationship in Indonesia's BUS sector has not been explored in depth and the results are still mixed, even though bank size has a direct impact on IC investment capacity and regulatory capital requirements. Third, there has been no study that comprehensively examines all components of VAIC and the moderation effect of SIZE using BSI's post-independence quarterly panel data in the 2021-2025 period, which is the most significant era of Islamic banking transformation in Indonesian history.

Based on the research gap, this study proposes two main contributions. First, empirically tested the influence of HCE, SCE, and CEE on ROA in nine BUSs in Indonesia using quarterly panel data during 2021Q1-2025Q4 (180 observations), with appropriate estimation methods (FEM/REM) and strict heteroscedasticity correction. Second, to test the role of SIZE moderation on the three relationships as well as on the VAIC-ROA relationship as a robustness check, so as to produce a more nuanced understanding of the boundary conditions of the influence of IC on the profitability of Islamic banks.

Based on this background, this study formulated eight research questions, namely: (1) whether HCE has a positive and significant effect on ROA BUS in Indonesia; (2) whether SCE has a positive and significant effect on ROA; (3) whether CEE has a positive and significant effect on ROA; (4) whether SIZE moderates the effect of HCE on ROA; (5) whether SIZE moderates the effect of SCE on ROA; (6) whether SIZE moderates the influence of CEE on ROA; (7) whether VAIC has a positive and significant effect on ROA; and (8) whether SIZE moderates the influence of VAIC on ROA. In line with the formulation of the problem, this study aims to analyze the influence of HCE, SCE, and CEE on

ROA BUS in Indonesia, analyze the role of SIZE moderation in the three relationships, and test the robustness of the influence of VAIC and SIZE moderation on ROA as confirmation of the consistency of research results.

This research provides a theoretical contribution by enriching the intellectual capital literature of Indonesian Islamic banking through the integration of Resource-Based Theory and Intellectual Capital Theory in a comprehensive testing framework. The use of quarterly panel data (2021Q1-2025Q4) fills a methodological gap in the literature that is still dominated by annual data, while the findings of the asymmetric moderation effect of SIZE provide new theoretical contributions that go beyond simple propositions about scale and intellectual capital. Practically, the results of this study provide evidence-based strategic guidance for BUS management in allocating IC investment optimally according to the scale of each bank's operations, and can be the basis for consideration of IC incentive policies for BUS by OJK regulators, especially in the context of Indonesia's Islamic banking roadmap towards a global Islamic financial market.

HYPOTHESES DEVELOPMENT

The Characteristic Resource-Based Theory (RBT) was first proposed by Penrose (1959) in *The Theory of the Growth of the Firm*, which states that a company's growth and profitability are determined by the internal resources it has. This theory was later developed by Wernerfelt (1984) who emphasized that a company can be seen as a heterogeneous bundle of resources, and by Barney (1991) who formulated the criteria of VRIN, namely Valuable, Rare, Imperfectly Imitable, and Non-substitutable, as a condition that resources can create a sustainable competitive advantage. Intellectual capital, especially competent human capital in the field of Islamic finance, meets these four VRIN criteria, making it the most relevant source of competitive advantage for BUS. Human resources who master fiqh muamalah, sharia contract products, and risk management based on Islamic values are scarce resources due to the limited number of educational institutions that produce experts in this field, and at the same time are not easy to imitate in a short time because they require an accumulation of experience and a deep understanding of Islamic principles.

The concept of intellectual capital has developed since the 1990s, with an important contribution from Stewart (1997) who defines IC as intellectual material in the form of knowledge, information, intellectual property, and experience that can be used to create wealth. Edvinsson and Malone (1997) then classified IC into human capital and structural capital. The most widely used IC measurement framework in empirical research is the Value Added Intellectual Coefficient (VAIC) developed by Pulic (2000), which offers an audited financial performance-based measurement approach so that it can be replicated and compared across companies and countries. VAIC measures the efficiency of value-added creation through three components, namely HCE which measures value added per unit of employee load, SCE which measures the contribution of structural capital in value creation, and CEE which measures the efficiency of physical and financial capital use. VAIC as a composite index (HCE + SCE + CEE) is the sum of the three components that reflects the overall efficiency of intellectual capital.

In addition to RBT and IC Theory, Agency Theory introduced by Jensen and Meckling (1976) is relevant to explain the role of bank size moderation. This theory explains the conflict of interest between principals and agents, where larger banks generally face more complex agency problems, including higher monitoring costs, managerial entrenchment, and stricter regulatory pressures. The implication is that the size of the bank does not necessarily have a positive impact on the IC-profitability relationship; In large banks, higher agency costs can reduce the elasticity of converting capital efficiency into profit. From a regulatory perspective, OJK Regulation No. 38/POJK.03/2016 subjects large Islamic banks such as BSI to additional requirements as Domestic Systemically Important Banks (DSIB), including a capital surcharge of between 0.5%-3.5% of the ATMR, which has the potential to reduce the ability of large banks to convert physical capital efficiency into profitability.

Human capital is the most fundamental component of intellectual capital in the Islamic banking industry because it includes not only general banking competencies, but also an understanding of Islamic principles in financial transactions, which greatly determine the quality of Islamic products and services. Ulum (2008), in his pioneering research on VAIC and the performance of Indonesian Islamic banking, found that HCE is the most consistent component of IC that has a positive effect on ROA. This finding continues to be confirmed by recent studies: research on state-owned Islamic commercial banks found that intellectual capital, including the human capital component in it, has a significant effect on profitability (Rosida & Aisyah, 2021), while a study on 16 Indonesian BUSs for the 2019–2023 period confirmed that VAIC, in which HCE is the dominant component, still has a significant positive effect on ROA (Fadhilah et al., 2026). Internationally, studies on Islamic banks in Bahrain also found HCE to be the strongest determinant of profitability (Hamdan, 2018). More recent cross-country evidence confirms that intellectual capital

positively affects the profitability of Islamic banks (Asutay & Ubaidillah, 2024), and that human capital efficiency has a positive relationship with the performance of Islamic banks in the GCC and other regions (Akkas & Asutay, 2023; Prasojo et al., 2022). Based on this description, the first hypothesis is formulated as follows.

H1: Human Capital Efficiency (HCE) has a positive and significant effect on the ROA of Sharia Commercial Banks in Indonesia.

Structural capital is the intellectual capital left in the organization when employees return home, including information systems, procedures, databases, intellectual property, organizational culture, and innovation capabilities codified in the company's systems (Edvinsson & Malone, 1997). In the Islamic banking industry, important structural capital includes a contract-based Islamic banking technology system, standard operating procedures for each sharia contract, a fatwa management system and sharia supervision, as well as customer databases and financing portfolios. Strong structural capital allows banks to operate efficiently despite key employee turnover, as knowledge has been codified in the system. Firer and Williams (2003), in a study of firms listed on the Johannesburg Stock Exchange, found that SCE has a positive effect on profitability, although the effect is not as strong as the CEE. The consistency of SCE's findings in the context of Indonesian Islamic banks is still debated, with some studies reporting a significant effect of SCE (Prasojo et al., 2022; Rehman et al., 2024), while others report insignificant results (Nawaz & Haniffa, 2017; Ousama et al., 2020). Based on this description, the second hypothesis is formulated as follows.

H2: Structural Capital Efficiency (SCE) has a positive and significant effect on the ROA of Sharia Commercial Banks in Indonesia.

Capital Employed Efficiency measures how efficiently a bank uses its physical and financial capital, proxied with equity, in creating value added. Although physical capital is more tangible than other components of IC, its management efficiency remains an important determinant of profitability, especially in capital-intensive industries such as banking (Chen et al., 2005). Firer and Williams (2003) found that CEE is the most dominant component of IC in determining company performance in South Africa, while Chen et al. (2005), in a study on companies in Taiwan, also found that CEE has a significant positive effect on ROE and market value. In the Islamic banking context, Nawaz and Haniffa (2017), in a study of 64 Islamic financial institutions across 18 countries, found that CEE has a significant positive effect on ROA, consistent with RBT's proposition that the efficiency of physical capital use is a reflection of management capabilities. Recent evidence likewise shows that capital employed has a significant effect on the financial performance of listed firms in Pakistan and India (Ali et al., 2022) and is a critical determinant of value added in European Union commercial banks (Rong et al., 2025). Based on this description, the third hypothesis is formulated as follows.

H3: Capital Employed Efficiency (CEE) has a positive and significant effect on the ROA of Sharia Commercial Banks in Indonesia.

Firm size, which is proxied by the natural logarithm of total assets, has been widely researched as a variable that moderates or mediates the relationship between intellectual capital and performance, although the direction and significance still vary between studies (Hamdan, 2018; Nimtrakoon, 2015). From an RBT perspective, larger banks have a greater capacity to invest in human capital, which is to offer more competitive compensation packages to attract top talent, run more extensive training and certification programs, and build more sophisticated talent management systems. Hamdan (2018), in a study in Bahrain, found that bank size positively moderated the relationship between HCE and profitability, while Nimtrakoon (2015), in a study of companies in ASEAN, found a positive moderating effect of SIZE on the HCE–performance relationship, although its significance varied by country and sector. A recent study of Saudi commercial banks also examined bank size alongside intellectual capital as pathways to sustainable growth, underscoring that scale and intellectual resources should be analysed jointly (Abdelrahim, 2024). Based on this description, the fourth hypothesis is formulated as follows.

H4: Bank size (SIZE) positively moderates the influence of HCE on the ROA of Sharia Commercial Banks in Indonesia.

The hypothesis regarding the moderation of SIZE in the SCE-ROA relationship can be formulated from two opposing perspectives. On the one hand, large banks generally have more sophisticated technological infrastructure and more institutionalized knowledge management systems, so they should be more efficient in converting SCE into profitability (Edvinsson & Malone, 1997). On the other hand, OJK Regulation No. 38/POJK.03/2016, which sets minimum standards for information technology systems and risk management, tends to equalize the quality of structural capital between large and small BUSs, so that the scale of banks may not provide differential advantages in terms of SCE.

The latest empirical findings are also inconsistent regarding the direction of this moderation, as studies on Islamic banks report that SCE has no significant relationship with financial performance, while bank size is related only to HCE (Nawaz & Haniffa, 2017; Ousama et al., 2020). Based on this description, the fifth hypothesis is formulated in two directions as follows.

H5: Bank size (SIZE) moderates the influence of SCE on the ROA of Sharia Commercial Banks in Indonesia.

The relationship between SIZE and the effect of CEE on profitability is more complex than that of other components of IC. On the one hand, large banks have access to cheaper and more diversified capital markets, so they can increase CEE through lower capital costs. On the other hand, under OJK Regulation No. 38/POJK.03/2016, large banks categorized as DSIBs face stricter regulatory capital requirements and higher compliance costs. These regulatory pressures, along with the greater complexity of portfolio management, can reduce the elasticity of CEE conversion to profitability, resulting in a negative moderation of SIZE according to the logic of Agency Theory (Jensen & Meckling, 1976). Based on this description, the sixth hypothesis is formulated as follows.

H6: Bank size (SIZE) moderates the influence of CEE on the ROA of Sharia Commercial Banks in Indonesia.

The use of VAIC as a composite index (HCE + SCE + CEE) has a strong theoretical justification because it captures the efficiency of intellectual capital holistically, without assuming independence between components (Pulic, 2000; Ulum, 2008). A recent study on Indonesian Islamic banks confirms that VAIC has a positive and significant effect on ROA, confirming that intellectual capital management is the main determinant of the profitability and competitiveness of Islamic banks (Fadhilah et al., 2026). Evidence from 42 Indonesian banks during 2017–2021 similarly shows that the VAIC model significantly affects ROA, ROE, and asset turnover (Al-Azizah & Wibowo, 2023). This study uses VAIC as the main variable in the robustness model to confirm whether the findings of the separate component model are robust to changes in IC measurement specifications. Based on this description, the seventh and eighth hypotheses are formulated as follows.

H7: VAIC has a positive and significant effect on the ROA of Sharia Commercial Banks in Indonesia.

H8: Bank size (SIZE) positively moderates the influence of VAIC on the ROA of Sharia Commercial Banks in Indonesia.

Previous research, which is the foundation and reference for this research, includes international classical studies and the latest domestic studies in the 2021-2026 period. Based on the review, there are several gaps that justify this research. First, the majority of studies on BUS Indonesia, including the latest studies, still use annual data so that it does not capture quarterly dynamics. Second, the role of SIZE moderation has not been comprehensively and consistently tested in the context of Indonesian BUS, with some recent studies even reporting that SIZE is insignificant when positioned as a mere control variable, rather than as a pure moderator. Third, there has been no study using data from the post-establishment panel data of BSI (2021-2025), which is the most significant transformation era of Indonesian Islamic banking. Conceptually, intellectual capital measured through the three components of the VAIC (HCE, SCE, CEE) and the VAIC composite index is positioned to have a direct effect on ROA, while bank size (SIZE) serves as a moderating variable that can strengthen or weaken the three relationships, depending on the characteristics of the moderated IC components, with VAIC as a robustness check to confirm the consistency of the results.

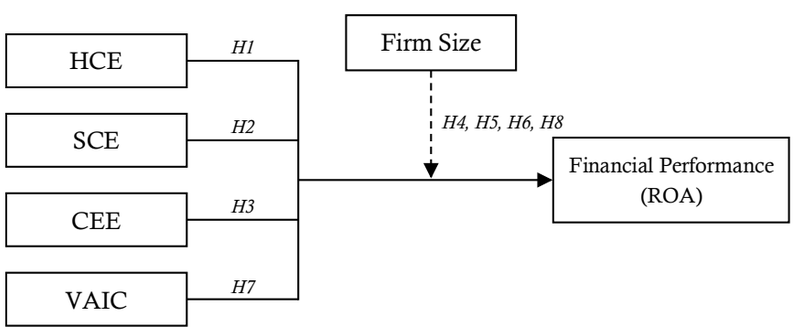


Figure 1. Research Model

METHOD

This study uses a quantitative approach with a panel data regression analysis method (panel data regression). This approach was chosen because the research data combines a cross-section dimension in the form of nine Sharia Commercial Banks in Indonesia with a time-series dimension for 20 quarters (2021Q1-2025Q4). The panel data technique allows for the control of unobserved heterogeneity, resulting in more efficient and unbiased estimates than separate cross-section and time-series regressions.

The study population was all Sharia Commercial Banks operating and registered with the Financial Services Authority during the observation period. Sampling was done using a purposive sampling method with the following criteria: (1) BUS that consistently publishes quarterly financial statements during 2021Q1-2025Q4; (2) provide complete data for all research variables; and (3) operate as a full BUS, not a Sharia Business Unit. Based on these criteria, nine BUSES were obtained as samples, namely Bank Syariah Indonesia (BRIS), BCA Syariah (BCAS), Panin Dubai Syariah Bank (PNBS), Bank NTB Syariah (BNTBS), BTPN Syariah (BTPS), Bank Mega Syariah (BMAS), Bank Muamalat Indonesia (BBMI), Bank Aceh Syariah (BACS), and Bank BJB Syariah (BJBS). The data is sourced from the quarterly financial statements published by each bank and accessed through the OJK website, the Indonesia Stock Exchange, and the official website of the bank concerned, resulting in 180 balanced panel observations, namely nine banks multiplied by 20 quarters.

This study uses the Value Added Intellectual Coefficient (VAIC) framework developed by Pulic (2000) as a method of measuring intellectual capital. Value added (VA) is calculated as revenue minus operating expenses excluding employee expenses, plus employee expenses, plus depreciation and amortization, reflecting the added value created by the bank's entire resources. The full operational definition of the variable is presented in Table 1.

Table 1. Operational Definition of Variables

Variable	Full Name	Definition / Formula	Variable
ROA	Return on Assets	Income before tax / Total assets × 100%	ROA
HCE	Human Capital Efficiency	VA / HC (Value Added per unit of employee expense)	HCE
SCE	Structural Capital Efficiency	SC / VA, where SC = VA − HC	SCE
CEE	Capital Employed Efficiency	VA / CE (Capital Employed = total equity)	CEE
VAIC™	Value Added Intellectual Coefficient	HCE + SCE + CEE (IC Composite Index; Pulic, 2000)	VAIC™
SIZE	Firm Size (Moderating)	Natural logarithm of total assets (Ln Total Assets)	SIZE
HCE×SIZE	HCE Moderation Interaction	Product of HCE and SIZE (mean-centered)	HCE×SIZE
SCE×SIZE	SCE Moderation Interaction	Product of SCE and SIZE (mean-centered)	SCE×SIZE
CEE×SIZE	CEE Moderation Interaction	Product of CEE and SIZE (mean-centered)	CEE×SIZE
VAIC×SIZE	VAIC Moderation Interaction	Product of VAIC and SIZE (mean-centered)	VAIC×SIZE

Based on this framework, five models of panel data regression equations were constructed to test eight research hypotheses. Model 1 as the main model tests H1, H2, and H3 with equations $ROA_{it} = \beta_0 + \beta_1 HCE_{it} + \beta_2 SCE_{it} + \beta_3 CEE_{it} + \mu_i + \varepsilon_{it}$. Model 2 tests moderation SIZE pada HCE (H4) dengan persamaan ROA_it = β0 + β1.HCE_it + β2.SIZE_it + β3.(HCE×SIZE)_it + vi + ε_it. Model 3 tests SIZE moderation on SCE (H5) with the same structure using SCE and interaction SCE×SIZE. Model 4 tests SIZE moderation on CEE (H6) using CEE and CEE×SIZE interactions. Model 5 as a robustness check tested the H7 and H8 by replacing all three components with a VAIC composite index, yaitu ROA_it = β0 + β1.VAIC_it + β2.SIZE_it + β3.(VAIC×SIZE)_it + vi + ε_it. The notation μi refers to individual fixed effects on the Fixed

Effect Model (FEM) and vi refers to the individual random effects on the Random Effect Model (REM), while ε_it is an idiosyncratic error. All interaction variables used mean-centering to minimize multicollinearity, and the estimation of the entire model used EViews software.

The selection of the best estimation model was carried out through three stages of sequential testing. The first stage is the Chow Test (Redundant Fixed Effects Test) which compares the Common Effect Model (CEM/Pooled OLS) with FEM, with the zero hypothesis that the fixed effects are redundant so that CEM is better. The second stage is the Hausman Test (Correlated Random Effects Test) which determines whether individual effects correlate with regressors, which has implications for FEM selection, or is uncorrelated, which has implications for more efficient REM selection. The third stage is the Breusch-Pagan Lagrange Multiplier (LM) Test which is carried out specifically for models indicated by REM in the Hausman Test, to confirm that REM is indeed superior to CEM. A summary of the results of the three stages of model testing is presented in Table 2

Table 2. Best Estimation Model Test

Model	Specification	Chow Test (Prob.)	Hausman Test (Prob.)	LM Test (Prob.)	Selected Model
M1	HCE, SCE, CEE → ROA	0.0000	0.0000	–	FEM
M2	HCE×SIZE → ROA	0.0000	0.6251	0.0000	REM
M3	SCE×SIZE → ROA	0.0000	0.6433	0.0000	REM
M4	CEE×SIZE → ROA	0.0000	0.0000	–	FEM
M5	VAIC×SIZE → ROA	0.0000	0.5868	0.0000	REM

Once the selected model was determined, all models were tested for heteroscedasticity using the Panel Cross-section Heteroskedasticity Likelihood Ratio (LR) Test, which compares the log-likelihood of a finite model (homoskedastic) with an infinite model (heteroscedastic inter-section). The LR statistic = 2(LogL_unrestricted − LogL_restricted) is distributed Chi-square with a degree of freedom of N−1, where N is the sum of the cross-section. The test results showed that all models required heteroscedasticity correction as they proved to be significant at the 1% level, with LR statistics ranging from 221.47 to 625.02 in the models tested. This is consistent with the characteristics of the banking finance panel data, where there is a huge asset size disparity between BSI as the largest Islamic bank with total assets of more than Rp300 trillion, and banks such as BCA Syariah or Panin Dubai Syariah which are much smaller. These scale differences inherently create significant residual variance differences between cross-sections.

For the models selected as FEM, namely Model 1 and Model 4, corrections were made using the Panel Estimated Generalized Least Squares (EGLS) Cross-section Weights, which allowed for different variance-covariance matrices between bank units. For the models selected as REM, namely Model 2, Model 3, and Model 5, White Cross-section standard errors with period clustering were used, which is a method that simultaneously corrects heteroscedasticity and serial correlation potential in time clusters. Both of these correction approaches are standard practice in research of internationally reputable banking financial data panels, and all of the estimated results reported in Chapter IV are results after the correction has been applied.

The theoretical basis underlying the interpretation of the estimation results is Resource-Based Theory which states that sustainable competitive advantage comes from internal resources that meet the VRIN criteria, and Intellectual Capital Theory which is formalized through the VAIC framework as a standardized measurement method based on public financial statements. In the context of Indonesian Islamic banking, human resources who have competence in fiqh muamalah, sharia risk management, and innovation of Islamic financial products are strategic assets that directly affect profitability, while the size of banks as a moderation variable reflects the hypothesis that larger banks have a greater capacity to convert intellectual capital investments into profitability through economies of scale and more capable infrastructure. although as explained by Agency Theory, large scale can also carry agency costs and regulatory burdens that reduce the elasticity of those conversions for certain components.

RESULT AND DISCUSSION

The research data is sourced from the quarterly financial statements published by each BUS and accessed through the OJK website, the Indonesia Stock Exchange, and the official website of the bank concerned. The final sample consisted of nine BUSs with 180 balanced panel observations during 2021Q1-2025Q4. The

dependent variable of ROA reflects the bank's profitability measured as the ratio of profit before tax to total assets in percentage, the three components of the VAIC (HCE, SCE, CEE) measure the dimension of intellectual capital efficiency based on the Pulic (2000) method, while SIZE measured by the natural logarithm of total assets functions as a moderation variable that represents the operational scale of the bank.

Table 3. Descriptive Statistics

Variable	Mean	Maximum	Minimum	Std. Dev
ROA	2.1067	11.5700	-6.7200	2.7056
HCE	1.9306	5.1600	-7.6200	1.0049
SCE	0.4336	1.1300	0.0300	0.2077
CEE	0.0254	0.1600	-0.0500	0.0309
VAIC	2.3896	6.0300	-6.5400	1.1259
SIZE	16.8961	19.9400	13.9200	1.2883

Based on Table 3, the average value of ROA of 2.1067% shows that in general BUS is able to generate a profit of 2.11% of the total assets owned, with a maximum value of 11.57% indicating that there are banks with very high profitability, while the minimum value of -6.72% indicates the existence of loss conditions in several observation periods. The HCE variable has an average of 1.9306, indicating that human capital is able to generate added value of 1.93 times the costs incurred, with a maximum value of 5.16 which indicates that some banks manage their human resources very efficiently. The SCE variable has an average of 0.4336, indicating that structural capital makes a positive contribution to the creation of added value, while the CEE has a relatively low average of 0.0254, indicating that the efficiency of physical and financial capital utilization is still relatively low compared to other IC components. The average VAIC value of 2.3896 indicates that the level of intellectual capital efficiency is generally in the fairly good category, while SIZE has an average of 16.8961 with a standard deviation of 1.2883 which indicates the variation in the size of assets between banks in the sample.

Before the final model estimation, this study carried out three stages of sequential model selection testing as described in Chapter III. In summary, the Chow Test rejects Pooled OLS for all models (p=0.0000), the Hausman Test assigns FEM to Model 1 and Model 4 and REM for Model 2, Model 3, and Model 5, and the LM Test confirms REM to be superior to CEM for the latter three models. The differences in the selected models between the main model (FEM) and the moderation (REM) model reflect the different nature of the relationships between variables, i.e. the unobserved bank-specific effect strongly correlated with the aggregate IC component in Model 1 and physical capital efficiency in Model 4, but not with the HCE, SCE, and VAIC-based moderation interaction variables. The Cross-section Heteroscedasticity Panel test The LR Test further indicated significant heteroscedasticity across all models prior to the correction, and correction through the EGLS Panel resulted in a more efficient and consistent estimator, as demonstrated by the increase in weighted R-squared and the reduction in standard error in the final models. Tables 4-8 present the final estimate results of the five models after heteroscedasticity correction.

Table 4. Model 1 FEM (Cross-section Weights)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.030620	0.068500	0.447016	0.6554
HCE	0.805785	0.031081	25.92518	0.0000
SCE	1.027054	0.137841	7.451019	0.0000
CEE	2.951642	1.241272	2.377917	0.0185

Goodness of Fit (Weighted)	Value	Statistics	Score
R-squared (Weighted)	0.980976	F-statistic	787.5580
Adj. R-squared	0.979731	Prob(F-stat)	0.0000
DW-statistic (Weighted)	0.816597	Method	FEM + CS Weights
R-squared (Unweighted)	0.948502	DW (Unweighted)	0.221050

Model 1 is the main model that tests the simultaneous influence of the three components of intellectual capital on ROA. After heteroscedasticity correction using the EGLS Cross-section Weights Panel, the model yielded a weighted R-squared of 0.9810 with an F-statistic of 787.56 (p=0.0000), indicating that HCE, SCE, and CEE together explained 98.1% of the ROA variation among the nine BUSs after controlling for the bank-specific fixed effect, a very high explanatory power. HCE has a coefficient of β=0.8058 (p=0.0000), significant at the level of 1%, which means that every increase in one unit of HCE is associated with an increase in ROA of 0.8058 percentage points, ceteris paribus. These findings support H1 and are consistent with the Resource-Based Theory proposition that competent human resources are the main drivers of added value, in line with the findings of Ulum (2008) as well as recent studies on Indonesian Islamic banks that confirm the dominance of HCE in VAIC (Fadhilah et al., 2026).

SCE shows a coefficient of β=1.0271 (p=0.0000), significant at the level of 1%. A coefficient greater than this one indicates that structural capital efficiency, which includes Islamic banking information technology systems, standard operating procedures based on sharia principles, knowledge management systems, and product innovation capabilities, has a greater impact on ROA than the efficiency of individual human resources. These results support H2 and confirm the importance of a resilient institutional infrastructure; Islamic banks that are able to codify collective knowledge into efficient systems and procedures will achieve higher profitability on a sustainable basis, even when there is a turnover of key human resources. CEE has a coefficient of β=2.9516 (p=0.0185), significant at the level of 5%. Although the coefficient is the largest, the relatively higher standard of error (1.241) reflects greater variability in the efficiency of physical and financial capital use between BUSs. These results support H3 and show that physical and financial capital, while more malleable, still contribute significantly to profitability when managed efficiently. It should be noted that at the initial estimate without heteroscedasticity correction, the CEE was not significant (p=0.1426), indicating the importance of heteroscedasticity correction in producing accurate inferences.

Table 5. Model 2 REM (White Cross-section)

Variable	Coefficient	Std. Error (Robust)	t-Statistic	Prob.
C	7.580662	2.432862	3.115944	0.0057
HCE_C	0.960814	0.106039	9.060974	0.0000
SIZE	-0.324391	0.146571	-2.213200	0.0393
HCE_FS	0.085098	0.041178	2.066573	0.0527
Goodness of Fit (Weighted)	**Value**		**Statistics**	**Score**
R-squared (Weighted)	0.612111		F-statistic	92.57929
Adj. R-squared	0.605499		Prob(F-stat)	0.0000

Model 2 tests whether SIZE moderates the influence of HCE on ROA. The selection of REM was confirmed by the Hausman Test (Chi-sq=1.754; p=0.625) and the LM Breusch-Pagan Test (BP=1370.967; p=0.0000), with a cross-section rho value of 0.9460 indicating that 94.6% of the total residual variance was derived from interbank heterogeneity. A comparison between the estimates before and after the White Cross-section correction showed a significant change in the error standard of the HCE×SIZE interaction variable, from 0.0797 to 0.0412, which changed the t-statistic from 1.067 (p=0.287, insignificant) to 2.067 (p=0.053, significant at 10%). The HCE×SIZE interaction variable yielded a coefficient of β=0.0851 (p=0.0527), significant at 10%, providing marginal support for H4. The positive direction of interaction indicates that larger Islamic banks are able to convert human capital efficiency more effectively into profitability, likely because large banks like BSI have the resources to recruit top talent with

Islamic economic backgrounds, run more intensive Islamic training programs, and provide more competitive compensation to retain key human resources. This marginal significance needs to be interpreted carefully, but in the context of panel data with 180 observations, the significance level of 10% is still accepted in many academic studies of economics and finance, especially when supported by consistent robustness checks in Model 5. The SIZE variable itself had a negative coefficient of β=-0.3244 (p=0.0393), indicating that by controlling for IC efficiency and interaction effects, larger banks tended to have lower ROAs directly, a phenomenon commonly called diseconomies of scale in the banking literature.

Table 6. Model 3 REM (White Cross-section)

Variable	Coefficient	Std. Error (Robust)	t-Statistic	Prob.
C	4.905077	4.645078	1.055973	0.3042
SCE_C	2.185424	2.552975	0.856030	0.4026
SIZE	-0.165668	0.245795	-0.674008	0.5084
SCE_FS	0.143549	0.552469	0.259832	0.7978
Goodness of Fit (Weighted)	**Value**		**Statistics**	**Score**
R-squared (Weighted)	0.063926		F-statistic	4.006456
Adj. R-squared	0.047970		Prob(F-stat)	0.0086

Model 3 tests SIZE's moderation of SCE's effect on ROA. In the initial estimate, the SCE variable had a significant coefficient (β=2.185; p=0.0028), but after heteroscedasticity correction using White Cross-section with period clustering, the significance disappeared (p=0.4026). This phenomenon shows that in the initial estimates, the error standard that is underestimated due to heteroscedasticity creates the illusion of significance which is then corrected by a more conservative and accurate error standard. All variables in Model 3 were not significant in the final estimate, namely SCE (β=2.185; p=0.4026), SIZE (β=-0.166; p=0.5084), and SCE×SIZE interactions (β=0.144; p=0.7978). A very low weighted R-squared (0.064) indicates that the model explains only 6.4% of the variation in ROA, and although the overall F-statistic of the model is still significant (p=0.0087), this is most likely driven by the cross-sectional influence of random effects (rho=0.8811) rather than the influence of explanatory variables. This finding rejects H5. The H5 rejection has an important theoretical interpretation: structural capital efficiency does not appear to be differentially affected by the scale of the bank, possibly because OJK regulations require a relatively uniform minimum standard of information technology, risk management, and sharia compliance systems for all BUSs, the core banking system is now commercially available to all bank scales, as well as structural capital related to organizational culture and innovation capabilities in an Islamic context is more organic and not directly proportional to the size of the bank.

Table 7. Model 4 FEM (Cross-section Weights)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.473425	1.554482	0.304555	0.7611
CEE_C	10.30559	2.364697	4.358100	0.0000
SIZE	0.097719	0.091921	1.063079	0.2893
CEE_FS	-9.944232	2.347565	-4.235978	0.0000
Goodness of Fit (Weighted)	**Value**		**Statistics**	**Score**
R-squared (Weighted)	0.931031		F-statistic	206.1709
Adj. R-squared	0.926515		Prob(F-stat)	0.0000
DW-statistic (Weighted)	0.923997		Method	FEM + CS Weights
R-squared (Unweighted)	0.879395		DW (Unweighted)	0.794554

Model 4 tested the role of SIZE moderation on the CEE-ROA relationship using FEM with Cross-section Weights. The FEM was selected based on the highly significant Hausman Test (Chi-sq=130.041; p=0.0000), indicating a substantial correlation between the bank-specific fixed effect and the CEE and its interactions. After the correction of heteroscedasticity, the weighted R-squared increased from 0.884 to 0.931, confirming the effectiveness of the correction. The CEE×SIZE interaction variable had a negative and very significant coefficient, β=-9.9442 (p=0.0000), consistent with the initial estimate although the magnitude was different due to differences in correction methods. This negative direction supports H6 in the sense that bank size moderation is proving significant, although the direction is the opposite of what is usually hypothesized positively. SIZE's negative moderation of the CEE-ROA relationship has a rich economic interpretation: larger Islamic banks, despite having a much larger equity base, face pressures that actually reduce the elasticity of CEE's conversion to profitability. These pressures include capital surcharge requirements as a DSIB imposed on BSI, the complexity of managing a much larger and diversified sharia financing portfolio that increases monitoring costs and credit risk, the need for greater infrastructure investment to support the scale of operations, and tighter financing margin pressures due to more intense competition in the corporate and state-owned market segments served by large banks. The positive and very significant CEE coefficient in small banks (β=10.306; p=0.0000) confirms that in small banks with low SIZE, the increase in capital efficiency has a huge impact on profitability, implying that medium-small BUS has a significant opportunity to increase ROA through more efficient capital management, for example through optimization of financing allocation to the segment with the highest return per unit of capital.

Table 8. Model 5 REM (White Cross-section)

Variable	Coefficient	Std. Error (Robust)	t-Statistic	Prob.
C	8.732812	2.640573	3.307165	0.0037
VAIC_C	0.954581	0.060006	15.90800	0.0000
SIZE	-0.392655	0.154822	-2.536162	0.0201
VAIC_FS	0.092898	0.037034	2.508454	0.0214
Goodness of Fit (Weighted)	**Value**		**Statistics**	**Score**
R-squared (Weighted)	0.638354		F-statistic	103.5546
Adj. R-squared	0.632190		Prob(F-stat)	0.0000

Model 5 serves as a robustness check that uses VAIC as a composite measure of intellectual capital, replacing the three separate components in Model 1. A comparison between the initial and post-correction estimates showed a key change, i.e. the VAIC×SIZE interaction coefficient increased significantly from p=0.140 to p=0.021 after the White Cross-section correction, again demonstrating the importance of heteroscedasticity correction. The VAIC has a coefficient of β=0.9546 (p=0.0000), significant at the 1% level, which means that every increase in one unit of composite VAIC increases the ROA by 0.955 percentage points. These findings support H7 and confirm the consistency of the results of Model 1, with coefficient values approaching one indicating an almost proportional relationship between the efficiency of aggregate intellectual capital and the profitability of Islamic banks. The VAIC×SIZE interaction variable has a coefficient of β=0.0929 (p=0.0214), significant at the level of 5%, with a positive sign confirming that larger Islamic banks are able to convert intellectual capital efficiency more effectively into profitability, supporting H8. These findings are consistent with the results of the HCE×SIZE moderation in Model 2, and together provide a coherent picture that the bank-scale effect positively moderates the relationship between human resource-based intellectual capital and overall intellectual capital on ROA, although this is not the case for both structural and physical components, where SIZE is either ineffectual (SCE) or debilitating (CEE). The success of Model 5 in confirming H7 and H8 reinforces the internal validity of this study, as the consistency of findings between the separate component approach and the composite approach suggests that the results of this study are not sensitive to the specification of the intellectual capital measurement used.

A summary of the overall test results of the eight hypotheses is presented in Table 9.

Table 9. Hypothesis Testing Results

H	Var.	Hypothesis Statement	Estimation Result	Decision
H1	HCE → ROA	HCE has a significant positive effect on ROA BUS	β=0.806; p=0.0000	Accepted
H2	SCE → ROA	SCE has a significant positive effect on ROA BUS	β=1.027; p=0.0000	Accepted
H3	CEE → ROA	CEE has a significant positive effect on ROA BUS	β=2.952; p=0.0185	Accepted
H4	HCE×SIZE	SIZE moderates (strengthens) the influence of HCE → ROA	β=0.085; p=0.0527	Accepted (marginal)
H5	SCE×SIZE	SIZE moderates (strengthens) the influence of SCE → ROA	β=0.144; p=0.7978	Rejected
H6	CEE×SIZE	SIZE moderates the influence of CEE → ROA	β=-9.944; p=0.0000	Accepted (negative)
H7	VAIC → ROA	VAIC has a significant positive effect on ROA BUS	β=0.955; p=0.0000	Accepted
H8	VAIC×SIZE	SIZE moderates (strengthens) the influence of VAIC → ROA	β=0.093; p=0.0214	Accepted

Seven of the eight hypotheses received empirical support (H1-H4, H6-H8), providing strong confirmation of Resource-Based Theory and Intellectual Capital Theory in the context of Indonesian Islamic banking. The findings that HCE, SCE, and CEE have a positive effect on ROA confirm that intellectual capital is a real source of competitive advantage for BUSs, not just physical or financial assets. The SCE coefficient greater than the HCE in Model 1 (1.027 vs 0.806) indicates that in the medium term, investment in structural capital in the form of systems, procedures, and technology provides a higher return than investment in individual human resources, a finding that has important strategic implications for BUS management.

DISCUSSION

The moderation effect of SIZE showed an interesting asymmetric pattern, i.e. it amplified the influence of HCE marginally and VAIC significantly, significantly weakened the influence of CEE, and was not shown to moderate the influence of SCE. The most consistent interpretation is that bank scale creates a selective advantage in the utilization of intellectual capital (Barney, 1991; Wernerfelt, 1984): large banks excel at optimizing human capital and aggregate intellectual capital through human resource recruitment, training, and retention capacity (Penrose, 1959; Abdelrahim, 2024), but instead face diminishing returns on physical capital efficiency due to regulatory complexity and competitive pressures. This asymmetrical pattern provides an important nuance that goes beyond the simple proposition that larger banks are always more efficient at converting all types of their intellectual capital into profitability (Barak & Sharma, 2024; Rong et al., 2025).

The findings of this study enrich the limited Islamic banking literature, especially those using quarterly frequency panel data and the post-Covid-19 pandemic period (Asutay & Ubaidillah, 2024; Prasojo et al., 2022). The results that HCE is the most consistently significant IC component are in accordance with the Ulum (2008) study on BUS in Indonesia and Hamdan's (2018) study on Islamic banking in Bahrain, and are in line with the latest findings that affirm the dominant role of VAIC in determining the profitability of Indonesian Islamic banks post-pandemic (Fadhilah et al., 2026). The findings of SIZE's negative moderation in CEE make an original contribution as it shows that not all IC dimensions provide scale-amplified benefits, a nuance that has not been widely explored in the Islamic banking IC literature, including in recent studies that generally treat SIZE as a single control variable rather than a moderator tested separately for each IC component (Fadhilah et al., 2026; Nawaz & Haniffa, 2017).

From a managerial perspective, these findings provide clear strategic guidance for BUS's board of directors. Investment in human capital development, namely the recruitment of dual competency human resources between conventional and Islamic finance, Islamic banking competency certification programs, and value-based talent retention systems (Pulic, 2000; Nawaz & Haniffa, 2017), should be the highest strategic priority, especially for large banks that can leverage economies of scale in human

resource management. Structural capital development through the digitization of sharia services, standardization of SOPs based on sharia contracts, and institutional knowledge management (Edvinsson & Malone, 1997; Stewart, 1997) has also proven to be critical, even more impactful than HCE, and relevant for BUS of various scales because it is not moderated by the size of banks. For medium-small and medium-sized BUSs, optimizing physical and financial capital efficiency through more targeted financing allocation (Firer & Williams, 2003; Chen et al., 2005) is an area of improvement with a huge profitability impact, considering that the CEE coefficient in the small bank group is much higher than that of large banks. For OJK regulators, the findings of negative moderation of SIZE in CEE can be the basis for policy considerations, for example through the relaxation of measurable capital requirements for medium-small-scale BUSES that show consistent improvement in IC efficiency, as part of a strategy to encourage equitable competitiveness in Indonesia's Islamic banking industry.

CONCLUSION AND RECOMMENDATION

The study examined the effect of intellectual capital, measured through Human Capital Efficiency (HCE), Structural Capital Efficiency (SCE), and Capital Employed Efficiency (CEE), on the firm performance (ROA) of Sharia Commercial Banks in Indonesia, with firm size as a moderating variable. The findings show that HCE, SCE, and CEE have a positive and significant effect on ROA, indicating that banks' ability to manage human resources, organizational systems, and capital is an important factor in increasing the company's profitability. In addition, testing using the VAIC index also showed a significant positive influence on the bank's financial performance.

The results of the study also show that the size of the bank (firm size) has a different moderation role in each component of intellectual capital. Firm size is able to strengthen the influence of HCE and VAIC on ROA, but weakens the influence of CEE on ROA and has not been shown to moderate the relationship between SCE and ROA. These findings indicate that the benefits of intellectual capital to bank performance are not always the same at every company scale.

Sharia Commercial Bank management needs to increase investment in human resource development, Islamic banking competency training, and strengthening organizational systems and technology to increase intellectual capital efficiency and company profitability. In addition, banks need to optimize capital management in order to be able to generate greater added value.

The next study is suggested to expand the observation period, increase the number of samples including Sharia Business Units (UUS), and include sharia governance variables, banking digitalization, or macroeconomic factors as additional variables to gain a more comprehensive understanding of the factors that affect the performance of Islamic banks.

AUTHOR CONTRIBUTIONS

Asa Hafsa Nabela: Conceptualization, Methodology, Formal analysis, Investigation, Data curation, Writing – original draft, Visualization, and Project administration.

Ruspita Rani Pertiwi: Supervision, Validation, Resources, and Writing – review & editing.

Camalia Fadila: Investigation, Data curation, Validation, Writing – review & editing, and Visualization.

FINANCIAL DISCLOSURE

This research was conducted without any financial support for the study, the writing, or the publication of this article.

CONFLICT OF INTEREST

The authors have no conflicts of interest to declare in relation to the research, analysis, or publication of this article.

DECLARATION OF ARTIFICIAL INTELLIGENCE USE

The authors affirm that no generative artificial intelligence tools were used to generate the content of this manuscript, construct its arguments, or develop its conceptual framework.

REFERENCES

Abdelrahim, S. S. (2024). Intellectual capital, bank longevity, and size: Pathways to sustainable growth in Saudi banking through competitive advantage. *Banks and Bank Systems, 19*(4), 177–193.

Akkas, E., & Asutay, M. (2023). The impact of intellectual capital formation and knowledge economy on banking performance: A case study of GCC's conventional and Islamic banks. *Journal of Financial Reporting and Accounting, 21*(5), 1149–1170.

Al-Azizah, U. S., & Wibowo, B. P. (2023). Impact of intellectual capital on financial performance: Panel evidence from banking industry in Indonesia. *Economic Studies, 32*(5), 51–65.

Ali, S., Murtaza, G., Hedvicakova, M., Jiang, J., & Naeem, M. (2022). Intellectual capital and financial performance: A comparative study. *Frontiers in Psychology, 13*, Article 967820.

Asutay, M., & Ubaidillah. (2024). Examining the impact of intellectual capital performance on financial performance in Islamic banks. *Journal of the Knowledge Economy, 15*(1), 1231–1263.

Barak, M., & Sharma, R. K. (2024). Analyzing the impact of intellectual capital on the financial performance: A comparative study of Indian public and private sector banks. *Journal of the Knowledge Economy, 15*(4), 20320–20348.

Barney, J. B. (1991). Firm resources and sustained competitive advantage. *Journal of Management, 17*(1), 99–120.

Chen, M. C., Cheng, S. J., & Hwang, Y. (2005). An empirical investigation of the relationship between intellectual capital and firms' market value and financial performance. *Journal of Intellectual Capital, 6*(2), 159–176.

Edvinsson, L., & Malone, M. S. (1997). *Intellectual capital: Realizing your company's true value by finding its hidden brainpower*. HarperBusiness.

Fadhilah, C. V. N., Paminto, A., & Hidayani. (2026). Pengaruh intellectual capital terhadap kinerja keuangan bank syariah di Indonesia tahun 2019-2023. *Global Research and Innovation Journal, 2*(1), 1864–1869.

Firer, S., & Williams, S. M. (2003). Intellectual capital and traditional measures of corporate performance. *Journal of Intellectual Capital, 4*(3), 348–360.

Hamdan, A. (2018). Intellectual capital and firm performance: Differentiating between accounting-based and market-based performance. *International Journal of Islamic and Middle Eastern Finance and Management, 11*(1), 139–151.

Hashmi, M. A., Abdullah, & Sajid, A. (2026). Exploring the influence of intellectual capital and board idiosyncrasies on Islamic banks' profitability in Asian countries: An extensive interaction analysis. *International Journal of Disclosure and Governance*. Advance online publication.

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics, 3*(4), 305–360.

Nawaz, T., & Haniffa, R. (2017). Determinants of financial performance of Islamic banks: An intellectual capital perspective. *Journal of Islamic Accounting and Business Research, 8*(2), 130–142.

Nimtrakoon, S. (2015). The relationship between intellectual capital, firms' market value and financial performance: Empirical evidence from the ASEAN. *Journal of Intellectual Capital, 16*(3), 587–618.

Ousama, A. A., Hammami, H., & Abdulkarim, M. (2020). The association between intellectual capital and financial performance in the Islamic banking industry: An analysis of the GCC banks. *International Journal of Islamic and Middle Eastern Finance and Management, 13*(1), 75–93.

Penrose, E. T. (1959). *The theory of the growth of the firm*. Blackwell.

Prasojo, P., Yadiati, W., Fitrijanti, T., & Sueb, M. (2022). Cross-region comparison intellectual capital and its impact on Islamic banks performance. *Economies, 10*(3), Article 61.

Pulic, A. (2000). VAIC™ – An accounting tool for IC management. *International Journal of Technology Management, 20*(5–8), 702–714.

Rehman, W. U., Saltik, O., Degirmen, S., & Shabbir, H. (2024). Dynamics of intellectual capital and financial performance in ASEAN banks. *Arab Gulf Journal of Scientific Research, 42*(4), 1426–1443.

Rong, C., Sial, M. S., Álvarez-Otero, S., & Jo, H. (2025). Assessing the intellectual capital of value creation process of commercial banks in the European Union. *Journal of the Knowledge Economy, 16*(6), 17570–17599.

Rosida, S. N., & Aisyah, E. N. (2021). Analisis pengaruh intellectual capital dan working capital terhadap profitabilitas bank umum syariah BUMN. *JRAK: Jurnal Riset Akuntansi dan Komputerisasi Akuntansi, 12*(2), 96–110.

Stewart, T. A. (1997). *Intellectual capital: The new wealth of organizations*. Doubleday/Currency.

Ulum, I. (2008). Intellectual capital performance sektor perbankan di Indonesia. *Jurnal Akuntansi dan Keuangan, 10*(2), 77–84.

Wernerfelt, B. (1984). A resource-based view of the firm. *Strategic Management Journal, 5*(2), 171–180.