



Financial structure, digital transformation, and profitability islamic banks: The role of mediating operational efficiency in southeast asian context

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ABSTRACT

This research investigates to analyze the influence of financial structure and digital transformation on the profitability of Islamic banks with operational efficiency as a mediation variable. Previous studies have generally examined the determinants of profitability separately, so empirical evidence on the simultaneous role of these two factors through operational efficiency in Islamic banks in Southeast Asia is limited. This study uses a quantitative approach with descriptive and associative design. The sample was determined through purposive sampling of 19 Islamic banks in Southeast Asia during the period 2020–2024, resulting in 95 company year observations. Data analysis was carried out using panel data regression. The results show that financial structure has a negative and significant effect on operational efficiency and profitability, while digital transformation has a positive and significant effect on both. Operational efficiency mediates the effect of financial structure on profitability, but not the effect of digital transformation. Theoretically, this study enriches the literature on Islamic banking profitability by emphasizing the role of operational efficiency as a crucial mechanism linking financial structure and bank performance.

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1. INTRODUCTION

Rapid technological advancement in the modern era has significantly transformed economic activities, particularly within the financial services sector. Increasing internet penetration and mobile device usage are driving a shift in customer behavior toward digital based financial services. Banking institutions face demands to integrate technology into business processes to maintain competitiveness and improve service quality. Digital transformation provides opportunities for banks to improve operational efficiency, accelerate transaction processing, and create product innovations that are more responsive to market needs (Singh & Srivastava, 2020; Ayodeji et al., 2024).

Digital transformation is also underway in the Islamic banking industry. The implementation of digital technology enables Islamic banks to expand availability of financial services, improve the quality of interactions with customers, and accelerate the distribution of Sharia compliant financial

products (Tlemsani dkk., 2025). The global Islamic finance industry is showing significant growth, with total assets reaching approximately US\$4.9 trillion in 2023, with the Islamic banking sector contributing approximately US\$3.6 trillion of these assets. This growth demonstrates the increasingly important role of Islamic banking in the global financial system (Source: *Islamic Finance Development Indicator*, 2024).

The Islamic banking industry in Southeast Asia is also showing positive developments. Indonesia and Malaysia are two countries that play a vital role in the growth of the Islamic financial industry in this region. Malaysia is known as one of the countries with the most advanced Islamic financial systems globally. Indonesia is showing significant growth in the development of Islamic banking along with increasing regulatory support, digital innovation, and the development of Islamic fintech (Nastiti & Kasri, 2019). These developments demonstrate that digital transformation is a crucial factor driving the development of the Islamic banking industry in Southeast Asia.

Profitability performance remains a key indicator in assessing a bank's operational success. Profitability reflects a bank's ability to manage its resources to create sustainable profits (Anis et al., 2023). Data on the development of Return on Assets (ROA) in Islamic banks over the past few years shows fluctuations in profitability performance from year to year. This situation suggests that increased use of digital technology does not automatically result in stable increases in profitability. Internal organizational factors are thought to play a significant role in explaining the connection through digitalization and banking financial performance (Theiri & Hadoussa, 2024).

Financial structure is one of the internal factors that influences a bank's profitability performance. Financial structure reflects the composition of funding sources derived from debt and equity used in the bank's operations (Amin et al., 2023). Effective financial structure management enables banks to allocate resources optimally and maintain financial stability in the face of various risks (Alnajjar & Othman, 2021). A healthy financial structure also enables banks to make strategic investments, including in digital technology development. Banking research generally measures financial structure using the Debt-to-Equity Ratio (DER), which illustrates a bank's capability to balance funding sources between debt and equity (Hendrani & Septyanto, 2021).

Digital transformation is also increasingly seen as a strategic factor in improving banking performance. Utilizing digital technology enables banks to increase transaction efficiency, expand service reach, and create new business opportunities (Shaikh, 2021). Several studies have shown that digitalization can improve financial performance through operational cost efficiencies and improved customer service quality (Al-Dmour et al., (2020); Monika et al., (2021). Other research shows that significant technology investments in digitalization processes can increase operational costs in the short term, so the impact on profitability is not always immediately visible (Wang et al., 2023). These differing findings indicate that the connection through digital transformation and banking profitability remains inconsistent.

The inconsistency of these research results indicates that the connection through digital transformation and profitability may not be direct, but rather occurs through specific mechanisms. Operational efficiency is thought to be a factor that can explain this relationship. Operational efficiency reflects management's ability to control costs and optimally utilize resources to generate revenue (Oteri et al., 2023). The banking sector generally measures operational efficiency using the Operating Expenses to Operating Income (BOPO) ratio, which indicates a bank's level of effectiveness in managing operational costs (Yamin, 2022). A strong level of operational efficiency can improve a bank's ability to generate profits and strengthen its profitability.

This research is also based on agency theory, which explains the contractual relationship between company owners (principals) and managers (agents). In the banking context, shareholders act as principals who delegate company management to management as agents. Differing interests between the two parties have the potential to create agency conflicts that can impact decision-making and company performance. According to agency theory, these conflicts generate agency costs, consisting of monitoring costs, bonding costs, and residual losses. Monitoring costs are costs incurred by owners to oversee managers' actions to ensure they align with the company's interests.

Bonding costs are costs incurred by management to ensure that actions do not harm owners. Meanwhile, residual losses are losses that may still occur due to imperfect monitoring mechanisms between principals and agents.

In this context, digital transformation can act as a governance mechanism that helps mitigate agency conflicts. The application of digital technology in banking information systems allows for increased data transparency, financial reporting accuracy, and the ability to monitor management performance in real time. Digital systems can also strengthen internal controls, accelerate audit processes, and reduce information asymmetry between owners and management. Thus, digital transformation has the potential to reduce monitoring costs, increase management accountability through a more transparent reporting system (bonding mechanism), and minimize residual losses arising from conflicts of interest within the organization.

Extensive research has been conducted on the connection through digital transformation and banking financial performance. Most studies still focus on conventional banks and view digital transformation as a factor that directly influences profitability. Research integrating financial structure, digital transformation, and operational efficiency into a single analytical model is still relatively limited, particularly in the context of Islamic banking in Southeast Asia. The operational characteristics of Islamic banking, based on Sharia principles, have the potential to influence how banks manage their financial structure, make digital investments, and improve operational efficiency.

This study aims to analyze the influence of financial structure and digital transformation on the profitability of Islamic banks, considering the mediating role of operational efficiency in the context of Islamic banking in Southeast Asia. The results are expected to provide an empirical contribution in explaining the mechanisms by which financial structure management and digital transformation implementation can improve profitability performance through increased operational efficiency in Islamic banks.

2. RESEARCH METHOD

Research Design

Using quantitative methodology, this study applies a descriptive and associative design to investigate the connection through financial structure, digital transformation, operational efficiency, and profitability of Islamic banks, and evaluates the mediating effect of operational efficiency.

Population and Sample

The study population included all Islamic banks operating in Southeast Asia during the 2020–2024 period. Initial population identification was conducted based on Islamic banking industry data obtained from financial authority reports from each Southeast Asian country and international Islamic finance industry publications. This identification process resulted in 33 Islamic banks operating in Southeast Asia, which served as the initial population for the study.

The sample was selected using purposive sampling, a method for determining samples based on specific criteria relevant to the research objectives. The first stage of selection involved evaluating the availability of banks' annual financial reports during the study period. Several banks were excluded from the sample because they did not publish complete and consistent financial reports during the 2020–2024 period or because they lacked the data needed to measure the research variables. After this screening process, 14 banks were excluded from the sample, resulting in 19 Islamic banks that met all research criteria. With a five-year observation period, the total number of observations used in this study was 95 bank-year observations.2020-2024.

Table 1. Sample criteria

No.	Company Sample Selection Criteria	Amount
1	Islamic banking in the Southeast Asia region during the period 2020-2024	33
2	Islamic banking that did not publish its financial reports regularly from 2020-2024.	(14)
Number of Companies		19
Number of Samples (19 x 5 years)		95

Operational Definition of Variables

The operational definitions and measurements of the variables used in this study are summarized in Table 2.

Table 2. Operational variables

Research Variables	Measurement Method	Data source
Financial Structure (X_1)	Ratio of total liabilities to total equity	Bank annual reports obtained
Digital Transformation (X_1)	The ratio of digital intangible assets to total intangible assets.	Bank annual reports obtained
Operational Efficiency (Z)	Ratio of operating expenses to operating income	Bank annual reports obtained
Profitability (Y)	The ratio of a company's net profit to average total assets.	Bank annual reports obtained

Data Analysis Techniques

This study applies a panel data regression technique to investigate the relationships among financial structure, digital transformation, operational efficiency, and the profitability of Islamic banks. The panel data approach is considered appropriate because the dataset combines two dimensions, namely the temporal dimension (time series) and the cross-sectional dimension representing individual banks. By integrating these two dimensions, panel regression provides more reliable and informative estimates than analyses that rely solely on either time series or cross-sectional data.

To estimate the model, three alternative specifications were employed: pooled ordinary least squares (OLS), the fixed effects model (FEM), and the random effects model (REM). The selection of the most suitable model was carried out through a series of specification tests. The Chow test was first conducted to evaluate whether the fixed effects model offers a better fit than the pooled OLS model. Subsequently, the Hausman test was applied to determine whether the fixed effects or the random effects model is more appropriate for the empirical analysis.

The hypothesis testing procedure aimed to assess the impact of financial structure and digital transformation on operational efficiency, as well as their direct influence on the profitability of Islamic banks. In addition, operational efficiency was examined as a mediating variable linking the independent variables to profitability. The entire analytical process was performed using statistical software capable of handling panel data regression techniques.

The first model is used to test the influence of financial structure and digital transformation on operational efficiency.

$$BOPO_{it} = \alpha + \beta_1 DER_{it} + \beta_2 DT_{it} + \varepsilon_{it}$$

The second model is used to test the direct influence of financial structure, digital transformation, and operational efficiency on the profitability of Islamic banks.

$$ROA_{it} = \alpha + \beta_1 DER_{it} + \beta_2 DT_{it} + \beta_3 BOPO_{it} + \varepsilon_{it}$$

Information:

ROA_{it} : profitability of bank i in year t

DER_{it} : financial structure of bank i in year t

DT_{it} : digital transformation of bank i in year t

$BOPO_{it}$: operational efficiency of bank i in year t

α : constant

β : regression coefficient

ε : error term

i : company (bank)

t : time period

The mediating role of operational efficiency is analyzed by comparing the direct and indirect effects of independent variables on profitability. The indirect effect is calculated by multiplying the path coefficients as follows:

$$\text{Indirect Effect} = (\beta_1 \times \beta_3) \text{ atau } (\beta_2 \times \beta_3)$$

Operational efficiency is declared as a mediating variable if the independent variable has a significant effect on operational efficiency and operational efficiency has a significant effect on profitability. Mediation is categorized as partial mediation if the independent variable still has a significant direct effect on profitability after the mediator variable is included in the model. Conversely, if the direct effect of the independent variable on profitability becomes insignificant after the mediator variable is included, the mediation is categorized as full mediation. In this study, operational efficiency is expected to act as a mechanism explaining the connection through financial structure and profitability, as well as between digital transformation and profitability of Islamic banks.

3. RESULTS AND DISCUSSIONS

Descriptive Statistics

Based on the descriptive statistical analysis introduced in Table 3, the total number of observations (N) in this study is 95. These observations were obtained from 19 Islamic banks operating in Southeast Asia over a five-year period from 2020 to 2024.

Table 3. Descriptive analysis

	Financial Structure	digital transformation	Efficiency	Profitability
Median	7,3266	3,7609	0,7838	0,0150
Maximum	23,07	9,98	0,31	0,13
Minimum	0,05	1,04	2,03	-0,07
Standard Deviation	5,66536	2,61743	2,8272	0,02660
Valid N (listwise)	95	95	95	95

Descriptive statistics show significant variation across all study variables. Financial structure has a wide range of values, reflecting differences in funding composition among Islamic banks in Southeast Asia. Digital transformation also shows significant variation, indicating differing levels of digital asset investment across banks. Operational efficiency and profitability fluctuated throughout the observation period, indicating that operational performance and profit-generating ability are not uniform across the sample banks.

Partial Test

The t-test is a decision-making method based on data analysis that aims to determine whether or not there is a significant influence between variables. A hypothesis can be accepted if the significance value is <0.05 .

Table 4. T-test results equation 1

Variable	Coefficient	Std.Error	t-Statistic	Prob.
Constant	0.901902	0.040727	22.141512	0.0000
Financial Structure	-0.021452	0.004193	-5.116040	0.0000
Digital Transformation	0.836410	0.719117	11.633916	0.0000

Source: Eviews Output (2026)

Based on the estimation results in Equation 1, financial structure has a coefficient of -0.021452 with a significance value of 0.0000 (<0.05), indicating that financial structure has a negative and significant effect on operational efficiency. Meanwhile, digital transformation has a coefficient of 8.36410 with a significance value of 0.0000 (<0.05), indicating that digital transformation has a positive and significant effect on the operational efficiency of Islamic banks.

Table 5. T-test results equation 2

Variable	Coefficient	Std.Error	t-Statistic	Prob.
Constant	0.080309	0.009972	8.053184	0.0000
Financial Structure	-0.002354	0.004553	-5.196617	0.0000
Digital Transformation	0.128108	0.685108	8.317775	0.0000
Efficiency	0.061690	0.010193	6.048724	0.0000

Source: *Eviews Output (2026)*

The estimation results in Equation 2 show that financial structure has a negative and significant effect on profitability with a coefficient of -0.002354 and a significance value of 0.0000. Digital transformation has a positive and significant effect on profitability with a coefficient of 0.128108 and a significance value of 0.0000. In addition, operational efficiency also has a positive and significant effect on profitability with a coefficient of 0.061690 and a significance value of 0.0000.

Table 6. Sobel test

Mediation Relationship	Indicate Effect	Sobel Z	Decision
Financial Structure towards profitability through efficiency	0.00132	3.52	Partial mediation
Digital Transformation towards profitability through efficiency	0.51601	0.086	Not significant

Source: data processed by the author (2026)

The Sobel test results indicate that operational efficiency acts as a partial mediator in the connection through financial structure and profitability of Islamic banks. This is demonstrated by the significant indirect effect, as well as the continued significance of the direct effect of financial structure on profitability after the mediating variables were included in the model. Therefore, the relationship is categorized as partial mediation, indicating that financial structure influences profitability both directly and through increased operational efficiency.

Conversely, the test results indicate that operational efficiency does not mediate the connection through digital transformation and profitability. The insignificant Sobel statistic indicates that the effect of digital transformation on profitability occurs primarily through direct channels, rather than through increased operational efficiency. This finding indicates that digital transformation in Islamic banks generates more economic value through improved digital services, market expansion, and increased transaction volume than through direct reductions in operational costs.

Discussion

The Influence of Financial Structure on Operational Efficiency

The empirical findings reveal that financial structure has a negative and statistically significant effect on the operational efficiency of Islamic banks. This result indicates that higher leverage levels are likely to reduce operational efficiency. From an economic perspective, a greater reliance on liabilities within the funding structure increases the cost of capital and heightens the obligation to provide returns to fund providers. As a result, the bank's flexibility in allocating resources to productive operational activities becomes more limited. Moreover, higher funding costs may lead to an increase in the ratio of operating expenses to operating income, which ultimately weakens the overall efficiency of the organization.

From an agency theory perspective, financial structure acts as a control mechanism for managerial behavior. Moderate leverage can improve management discipline due to pressure from creditors and fund owners to use resources more efficiently. However, when leverage is too high, management tends to focus more on meeting funding obligations and managing financial risks, thereby diminishing attention to operational efficiency (Odhiambo et al., 2025). Therefore, managing a balanced financial structure is crucial to maintaining effective supervision and improving bank operational efficiency (Rehman et al., 2022; Asif & Nasir, 2024).

The Impact of Digital Transformation on Operational Efficiency

The empirical findings reveal that digital transformation has a positive and statistically significant influence on the operational efficiency of Islamic banks. This finding indicates that the adoption of digital technologies supports improvements in banking operations. Through digitalization, banks can automate a variety of operational activities, including transaction processing, data administration, and customer service functions. Such automation reduces dependence on manual procedures, enhances the speed and quality of service delivery, and helps

lower administrative and operational expenses. Consequently, these improvements contribute to greater organizational productivity and efficiency.

Within the framework of agency theory, digital transformation can also reduce information asymmetry between management and stakeholders. An integrated information technology system allows for real time and more transparent recording of bank operational activities, thereby improving the quality of managerial oversight and accountability. With increased information transparency and monitoring capabilities, the potential for opportunistic management behavior can be minimized, ultimately contributing to increased bank operational efficiency (Chen et al., 2023; Bouzidi & Nefzi, 2024; Shen et al., 2025).

The Influence of Financial Structure on Profitability

The empirical findings reveal that financial structure has a negative and statistically significant effect on the profitability of Islamic banks. This outcome implies that a higher level of leverage within the funding structure may weaken the bank's capacity to generate profits. From an economic standpoint, a greater reliance on liabilities increases funding costs, as banks are required to provide returns to fund providers. Consequently, the profit margins derived from financing activities become more limited.

From the perspective of agency theory, the composition of financial structure may also give rise to potential conflicts of interest between management and fund providers. Elevated leverage levels can place greater pressure on management to meet short-term financial obligations, which may encourage more cautious and less productive investment decisions. Such conditions can reduce the efficiency of asset utilization and ultimately have an adverse impact on the profitability of Islamic banks (Alnajjar & Othman, 2021; Mortadza et al., 2024); Ghenimi et al., 2025).

The Impact of Digital Transformation on Profitability

The empirical findings reveal that digital transformation has a positive and statistically significant effect on the profitability of Islamic banks. The adoption of digital technologies allows banks to broaden the accessibility of financial services through platforms such as mobile banking and internet banking. This expansion encourages higher transaction volumes and creates additional opportunities for generating fee based income. In addition, digitalization facilitates the development of innovative financial products, which can strengthen banks' competitiveness within the financial services industry.

From the perspective of agency theory, digital transformation also contributes to greater transparency and more effective monitoring of banking operations. The implementation of digital systems enables more precise tracking of transactions and organizational performance, thereby reducing information asymmetry between management and fund providers (Liu et al., 2021). Improved transparency and stronger monitoring mechanisms may encourage management to allocate and manage resources more efficiently, which ultimately supports higher levels of bank profitability (Nguyen et al., 2023; Sayari, 2024).

The Effect of Operational Efficiency on Profitability

The empirical findings reveal that operational efficiency exerts a positive and statistically significant effect on the profitability of Islamic banks. This result implies that a bank's capability to manage and control its operational expenses plays a vital role in enhancing overall financial performance. Institutions that can maintain a more efficient cost to income ratio generally achieve stronger profit margins from their financial intermediation activities.

Within the framework of agency theory, operational efficiency also reflects the effectiveness of oversight mechanisms in ensuring that management utilizes company resources optimally. When operational costs are well controlled, the potential for resource waste due to opportunistic management behavior can be minimized. Therefore, increased operational efficiency not only enhances organizational productivity but also strengthens the bank's profitability (Guizani & Ajmi, 2022; Saif-Alyousfi, 2022); Mashamba & Chikutuma, 2023).

The Mediating Role of Operational Efficiency in the connection through Financial Structure and Profitability

The empirical findings reveal that that operational efficiency mediates the connection through financial structure and profitability of Islamic banks. The analysis indicates that the mediation is partial, meaning that financial structure not only directly influences profitability but also indirectly through operational efficiency. Economically, a more optimal financial structure enables banks to manage funding costs more effectively, thereby reducing pressure on capital costs. This condition enhances banks' ability to control operational costs and utilize resources more productively, ultimately improving cost to income ratios and strengthening bank profit margins.

These findings align with various international studies showing that operational efficiency is a vital mechanism transmitting the influence of funding structure decisions on bank financial performance (Faqera et al., 2025). From an agency theory perspective, a more balanced financial structure can improve managerial discipline and the effectiveness of oversight of the company's resource utilization. This oversight mechanism encourages management to manage operational costs more efficiently and minimize potential resource waste, ultimately contributing to expanded profitability of Islamic banks (Alam et al., 2022).

The Mediating Role of Operational Efficiency in the connection through Digital Transformation and Profitability

The empirical findings reveal that operational efficiency is unable to mediate the connection through digital transformation and the profitability of Islamic banks. This finding suggests that the impact of digital transformation on profitability does not occur primarily through increased operational efficiency, but rather through direct channels such as improved service access, expanding the customer base, and increasing digital transaction volume. Economically, digital transformation enables banks to develop various technology-based services that can increase revenue, particularly through fee-based income and diversification of digital financial products. Furthermore, in the early stages of implementation, digital technology investments often require relatively large costs for system development, information technology infrastructure, and increasing human resource capacity, so the advantages of operational efficiency are not fully realized in the short term.

These findings align with international studies showing that the influence of digital transformation on banking financial performance can occur through various channels, including service innovation and digital market expansion, which are not always mediated by operational efficiency (Jardak & Ben Hamad, 2022; Valaskova et al., 2025). From an agency theory perspective, digitalization still plays a role in increasing information transparency and strengthening oversight mechanisms for managerial activities through more integrated information technology systems. However, increased profitability is more influenced by a bank's ability to utilize digital technology to create value and new revenue opportunities (Nguyen et al., 2023). Therefore, digital transformation can directly increase profitability without having to rely on operational efficiency as the primary mediating mechanism.

4. CONCLUSION

This study finds that financial structure has a negative and significant effect on the operational efficiency and profitability of Islamic banks, indicating that higher leverage increases funding cost pressures and limits profit generation. In contrast, digital transformation positively and significantly influences both efficiency and profitability by improving service productivity, expanding customer access, and creating opportunities for digital transaction based revenue. The results also show that operational efficiency mediates the relationship between financial structure and profitability, but not the relationship between digital transformation and profitability. These findings contribute to the literature on Islamic banking performance by integrating financial structure, digital transformation, and operational efficiency within the framework of agency theory, highlighting the role of effective resource management and monitoring mechanisms in reducing agency costs and improving financial outcomes. Practically, the study suggests that Islamic banks should strengthen funding structure

management while increasing investment in digital transformation, and regulators such as the Financial Services Authority (OJK) and supervisory bodies in Southeast Asia should support stronger capital structure governance and policies that facilitate digital transformation in the Islamic banking sector. Future research is recommended to include additional factors such as fintech adoption, customer digital engagement, and operational risk to better understand the relationship between digitalization and Islamic bank performance.

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