

From Predictive Modeling to Strategic Execution: Integrating Decision Tree Analytics into SWOT Frameworks to Enhance Service and Security in Islamic Banking

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Abstract

This study investigates the integration of Decision Tree analytics and SWOT analysis in enhancing service quality and information security in Islamic banking. Using a cross-sectional explanatory design, the research combines transaction-level customer data modeled through a Decision Tree classifier with survey data from 270 customers of Bank Syariah Indonesia. The Decision Tree model demonstrates strong classification performance, with satisfactory accuracy, sensitivity, and specificity in identifying customer risk profiles. Multiple regression analysis indicates that both Decision Tree utilization and SWOT implementation have positive and statistically significant effects on perceived service quality and security. The Decision Tree shows a stronger direct impact, while SWOT contributes strategically by translating predictive insights into structured planning actions. The findings highlight the complementary relationship between predictive analytics and strategic management. This study contributes to the literature by bridging machine learning applications and strategic frameworks in Islamic banking and provides managerial implications for data-driven governance and service optimization.

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1. Introduction

The rapid development of digital technology in the financial sector has fundamentally transformed banking operations, compelling institutions to improve service quality while simultaneously strengthening customer data security. In the context of Islamic banking, these challenges are more complex because institutions are required not only to provide efficient and technology-driven services but also to maintain Sharia compliance and uphold trust-based relationships with customers. Recent studies indicate that the digitalization of Islamic banking continues to face structural and technical challenges, including system adaptability, operational disruptions, and vulnerability to cyber threats (Tiara et al., 2023). These conditions place service excellence and data protection at the center of strategic priorities in Islamic financial institutions.

At the same time, advances in machine learning offer new opportunities to optimize customer data management and operational decision-making. Among various predictive techniques, the Decision

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Tree algorithm has been widely applied in banking due to its interpretability and classification capability. The CART-based Decision Tree approach has demonstrated effectiveness in predicting customer solvency and identifying risk patterns (Amzile & Amzile, 2022). Its rule-based structure enables financial institutions to generate transparent and explainable decision rules, an essential requirement in regulated environments such as Islamic banking. Empirical evidence from banking classification studies further confirms that Decision Tree models can achieve high predictive accuracy in customer segmentation and payment data analysis (Sari et al., 2023; Ramadhon et al., 2024).

In parallel, SWOT analysis remains a widely used strategic management framework for identifying internal strengths and weaknesses alongside external opportunities and threats. Within Islamic banking, SWOT analysis has been applied to assess digital readiness and competitive positioning (Alfadri & Surya, 2023). Strategic mapping through SWOT has also been used to evaluate institutional capability and governance challenges faced by Bank Syariah Indonesia (Indah et al., 2025). Furthermore, Islamic banks operate within a broader socio-religious ecosystem that requires alignment between technological advancement and Sharia-based economic principles (Irawan, 2023; Santoso & Astuti, 2019).

Despite the growing body of literature on machine learning applications in banking and the continued use of SWOT analysis in strategic planning, these two research streams largely develop independently. Existing studies on Decision Tree algorithms predominantly focus on predictive performance metrics such as accuracy and classification outcomes (Amzile & Amzile, 2022; Sari et al., 2023), while research on SWOT in Islamic banking emphasizes strategic positioning and governance issues (Alfadri & Surya, 2023; Indah et al., 2025). Limited empirical attention has been given to how predictive analytics outputs are systematically integrated into strategic frameworks to enhance both service quality and information security. Moreover, determinants of customer decisions and trust in Islamic banking services highlight the importance of service reliability and data protection as key performance dimensions (Yurista et al., 2022), yet the role of analytics-driven strategy in shaping these dimensions remains underexplored.

This gap is particularly relevant in the Indonesian context, where Bank Syariah Indonesia represents a major Islamic financial institution undergoing rapid digital transformation (Tiara et al., 2023). The integration of customer analytics, such as Decision Tree-based segmentation models (Bunga Tiara et al., 2024), into strategic management frameworks could provide a data-driven foundation for improving operational performance and risk mitigation. However, empirical evidence on the joint impact of predictive analytics and SWOT-based strategic planning on service quality and information security remains limited.

Therefore, this study aims to examine the integration of Decision Tree analytics and SWOT analysis in enhancing service quality and security performance in Islamic banking. Specifically, the research investigates whether the utilization of Decision Tree-based customer data modeling and the implementation of SWOT-based strategic mapping significantly affect perceived service quality and information security at Bank Syariah Indonesia. By bridging machine learning applications and strategic management frameworks, this study contributes to the literature on data-driven governance in Islamic financial institutions and offers practical insights for aligning predictive analytics with Sharia-compliant strategic execution.

2. Literature Review

Decision Tree Analytics in Banking

The Decision Tree algorithm is one of the most widely used supervised machine learning techniques for classification and prediction tasks in financial services. Its popularity stems from its interpretability, rule-based structure, and ability to handle nonlinear relationships between variables.

In banking applications, Decision Tree models are frequently used for credit risk assessment, customer solvency prediction, fraud detection, and customer segmentation.

Amzile and Amzile (2022) demonstrate that the CART-based Decision Tree method can effectively predict bank customer solvency with satisfactory classification accuracy. The strength of the model lies in its ability to generate explicit if-then decision rules, which enhances transparency and explainability—an essential requirement in regulated financial institutions. Similarly, Sari et al. (2023) compare Decision Tree and Naïve Bayes algorithms in classifying payment data and report superior accuracy performance for the Decision Tree model. Ramadhon et al. (2024) further confirm the effectiveness of Decision Tree algorithms in classifying active and inactive bank customers, highlighting their operational relevance in banking analytics.

From a technical perspective, Decision Trees partition data recursively based on the most informative splitting criteria, producing terminal nodes that represent classification outcomes. However, the method is not without limitations. Overfitting may occur when the tree grows excessively deep, necessitating pruning techniques to improve generalization performance. Despite such limitations, the interpretability and operational usability of Decision Trees make them particularly suitable for Islamic banking institutions that emphasize accountability and governance transparency.

In the context of digital banking transformation, the use of analytics-based segmentation models, such as those developed in Indonesian banking environments (Bunga Tiara et al., 2024), provides a foundation for personalized service delivery and proactive risk mitigation. Therefore, Decision Tree analytics represents not merely a predictive tool but a strategic enabler for improving service and security performance.

SWOT Analysis in Islamic Banking Strategy

SWOT analysis (Strengths, Weaknesses, Opportunities, Threats) is a classical strategic management framework designed to align internal organizational capabilities with external environmental conditions. The framework facilitates structured strategic planning by identifying internal strengths and weaknesses alongside external opportunities and threats.

In Islamic banking, SWOT analysis plays a critical role in assessing digital readiness, competitive positioning, and governance capacity. Alfadri and Surya (2023) apply SWOT analysis to evaluate mobile financial technology services in Bank Syariah Indonesia and identify a favorable strategic quadrant where strengths and opportunities can be leveraged. Indah et al. (2025) conduct a strategic roadmap analysis of Bank Syariah Indonesia, emphasizing the importance of governance enhancement and regulatory responsiveness within a SWOT framework.

Islamic banks operate under distinct institutional characteristics shaped by Sharia compliance and socio-religious trust mechanisms (Irawan, 2023; Santoso & Astuti, 2019). Consequently, strategic planning must incorporate not only economic and technological considerations but also ethical and governance dimensions. In addition, determinants of customer decisions in Islamic banking emphasize reliability, trust, and service assurance as critical drivers of customer engagement (Yurista et al., 2022).

While SWOT remains a widely adopted strategic tool, its implementation often relies on managerial perception rather than empirical data. This creates potential misalignment between strategic formulation and operational realities, particularly in environments undergoing rapid digital transformation.

Integration of Predictive Analytics and Strategic Management

Although extensive research has examined machine learning applications in banking and strategic frameworks in Islamic finance separately, limited empirical work integrates these two domains. Decision Tree studies predominantly focus on predictive accuracy and classification performance

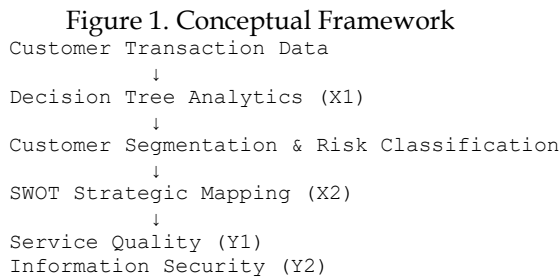
(Amzile & Amzile, 2022; Sari et al., 2023; Ramadhon et al., 2024), whereas SWOT research in Islamic banking emphasizes institutional positioning and governance strategy (Alfadri & Surya, 2023; Indah et al., 2025).

The digitalization of Islamic banking in Indonesia (Tiara et al., 2023) intensifies the need for a data-driven strategic approach. Predictive analytics can generate detailed customer risk classifications and behavioral segmentation, while SWOT provides a structured mechanism for translating analytical insights into actionable organizational strategies. However, empirical investigation into how predictive outputs are embedded within SWOT-based strategic cycles remains limited.

This study addresses this gap by conceptualizing Decision Tree analytics as a predictive intelligence mechanism and SWOT analysis as a strategic orchestration framework. Their integration is expected to enhance both service quality and information security performance in Islamic banking institutions.

Conceptual Framework

The conceptual framework as shown at figure 1, positions Decision Tree analytics as a data-driven input mechanism and SWOT analysis as a strategic mediation mechanism influencing service and security outcomes.



Source: Developed by the author (2025)

Theoretical Propositions

Based on the reviewed literature, the following theoretical propositions are formulated:

H1: Decision Tree analytics positively influences service quality.

H2: Decision Tree analytics positively influences information security.

H3: SWOT implementation positively influences service quality.

H4: SWOT implementation positively influences information security.

H5: The integration of Decision Tree analytics and SWOT analysis enhances service and security performance.

Summary of Prior Studies

Table 1. Summary of Relevant Literature

| Author(s) | Context | Method | Key Findings |
|------------------------|----------------------------------|------------------------------|---|
| Amzile & Amzile (2022) | Bank solvency prediction | Decision Tree (CART) | Effective classification with interpretable rules |
| Sari et al. (2023) | Payment data classification | Decision Tree vs Naïve Bayes | Decision Tree achieved higher accuracy |
| Ramadhon et al. (2024) | Customer activity classification | Decision Tree | Reliable segmentation tool |

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| Author(s) | Context | Method | Key Findings |
|------------------------|--------------------------------|----------------------|--|
| Alfadri & Surya (2023) | Islamic fintech services | SWOT analysis | Strong strategic positioning |
| Indah et al. (2025) | BSI strategic roadmap | SWOT framework | Governance and regulatory focus |
| Tiara et al. (2023) | Digitalization of BSI | Qualitative analysis | Digital transformation challenges |
| Yurista et al. (2022) | Customer decision determinants | Quantitative | Service reliability and trust are critical |

Source: Compiled from cited studies.

Research Gap

Despite substantial evidence supporting Decision Tree effectiveness in predictive tasks and SWOT relevance in strategic planning, the literature as shown at table 1, lacks empirical investigation into their integration within Islamic banking institutions. Specifically, limited studies examine whether predictive customer segmentation outputs can systematically enhance SWOT-based strategic execution to improve service quality and information security.

This study contributes by bridging predictive analytics and strategic management within a Sharia-compliant banking context, providing empirical evidence from Bank Syariah Indonesia.

3. Methodology

Research Design

This study employs a quantitative explanatory design with a cross-sectional approach to examine the influence of Decision Tree analytics and SWOT analysis on service quality and information security in Islamic banking. A quantitative design was selected because it enables systematic measurement of relationships between variables using structured instruments and statistical modeling (Barella et al., 2024).

The study integrates two types of data: Transaction-level customer data modeled using a Decision Tree algorithm. Perception-based survey data collected from Bank Syariah Indonesia (BSI) customers. This dual-data approach allows the research to connect predictive modeling outputs with perceptual performance evaluation.

Population and Sampling

The population consists of active customers of Bank Syariah Indonesia (BSI) who use digital banking services. Respondents were selected using stratified random sampling to ensure proportional representation across customer segments (Chudasama, 2023).

The final sample as shown at table 2, includes 270 respondents who completed the structured questionnaire. This sample size is considered sufficient for regression-based inference following multivariate data analysis guidelines (Hair et al., 2020).

Table 2. Sample Characteristics

| Variable | Category | n | % |
|----------|----------|-----|------|
| Gender | Male | 140 | 51.9 |
| | Female | 130 | 48.1 |
| Age | 18–25 | 90 | 33.3 |
| | 26–35 | 120 | 44.4 |
| | 36–45 | 40 | 14.8 |

| Variable | Category | n | % |
|-------------------------|----------------|-----|------|
| Length of Relationship | >45 | 20 | 7.4 |
| | <1 year | 30 | 11.1 |
| | 1–3 years | 80 | 29.6 |
| | >3 years | 160 | 59.3 |
| Digital Usage Frequency | <3 times/week | 80 | 29.6 |
| | 3–5 times/week | 120 | 44.4 |
| | >5 times/week | 70 | 25.9 |

Source: Primary data (2025)

Measurement of Variables

All perception-based variables as shown at table 3 were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The instrument was developed based on prior literature concerning Decision Tree applications (Amzile & Amzile, 2022; Ramadhon et al., 2024), SWOT strategic mapping (Alfadri & Surya, 2023; Indah et al., 2025), and service determinants in Islamic banking (Yurista et al., 2022).

Table 3. Operationalization of Variables

| Variable | Code | Operational Definition | Indicators (Examples) | Scale | Items |
|---------------------------|------|--|--|------------|-------|
| Decision Tree Utilization | X1 | Perceived use of analytics-driven customer data modeling for service and risk management | Use of transaction patterns; anomaly detection; segmentation accuracy | Likert 1–5 | 7 |
| SWOT Implementation | X2 | Perceived systematic mapping of internal and external strategic factors | Identification of strengths; mitigation of weaknesses; response to threats | Likert 1–5 | 7 |
| Service Quality | Y1 | Customer assessment of reliability and responsiveness | Accuracy of transactions; complaint handling; staff competence | Likert 1–5 | 9 |
| Information Security | Y2 | Customer perception of digital transaction security | OTP clarity; data protection; fraud prevention mechanisms | Likert 1–5 | 8 |

Source: Developed from cited literature (2025)

Instrument Validity and Reliability

Construct validity as shown at table 4 was assessed using item–total correlation, requiring correlation coefficients greater than the critical r-value at the 5% significance level. Reliability was tested using Cronbach’s Alpha with a minimum threshold of 0.70 (Hair et al., 2020).

Table 4. Reliability Test Results

| Variable | Code | Items | Cronbach’s Alpha | Remark |
|---------------------------|------|-------|------------------|----------|
| Decision Tree Utilization | X1 | 7 | 0.89 | Reliable |
| SWOT Implementation | X2 | 7 | 0.88 | Reliable |
| Service Quality | Y1 | 9 | 0.90 | Reliable |
| Information Security | Y2 | 8 | 0.88 | Reliable |

Source: Primary data (2025)

Decision Tree Modeling

The customer transaction dataset was processed using a Decision Tree classifier to categorize customers into risk segments. The dataset was divided into training and testing sets. Model

performance was evaluated using a confusion matrix as shown at table 5 and classification metrics table 6.

Table 5. Confusion Matrix

| Actual \ Predicted | Low Risk | High Risk | Total |
|--------------------|----------|-----------|-------|
| Low Risk | 138 | 12 | 150 |
| High Risk | 22 | 98 | 120 |
| Total | 160 | 110 | 270 |

Source: Transaction dataset (2025)

Table 6. Model Performance

| Indicator | Value |
|-------------|-------|
| Accuracy | 87.4% |
| Sensitivity | 81.7% |
| Specificity | 92.0% |

Source: Decision Tree modeling results (2025)

Accuracy was calculated using:

$$Accuracy = \frac{TP + TN}{TP + TN + FP + FN}$$

Sensitivity (Recall):

$$Sensitivity = \frac{TP}{TP + FN}$$

Specificity:

$$specificity = \frac{TN}{TN + FP}$$

Regression Model

To examine the effect of Decision Tree utilization and SWOT implementation on service quality and information security, multiple regression analysis was applied:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \varepsilon_i$$

Where:

Y_i = Service Quality (Y1) or Information Security (Y2)

X_1 = Decision Tree Utilization

X_2 = SWOT Implementation

β_0 = Constant

ε_i = Error term

Classical assumption tests were conducted prior to regression analysis, including normality, multicollinearity (VIF < 10), and heteroscedasticity testing, following multivariate analysis standards (Hair et al., 2020).

Ethical Considerations

Participation was voluntary, and respondent confidentiality was maintained. Data were analyzed in aggregate form without identifying individual respondents.

4. Results

Descriptive Analysis

Descriptive analysis was conducted to examine respondent characteristics and perception patterns across the main variables. As presented in Table 2, the majority of respondents are within the productive age group (26–35 years), representing 44.4% of the sample, and 59.3% have maintained a banking relationship for more than three years. Furthermore, 44.4% use digital banking services three to five times per week. These characteristics indicate that respondents possess sufficient interaction experience with Bank Syariah Indonesia’s digital ecosystem, strengthening the reliability of perception-based evaluation.

The measurement model demonstrates strong internal consistency. As shown in Table 3, all research variables were operationalized using multiple indicators aligned with prior literature (Amzile & Amzile, 2022; Alfadri & Surya, 2023; Yurista et al., 2022). Reliability testing results in Table 4 show Cronbach’s Alpha values above 0.70 for all constructs, confirming acceptable internal consistency (Hair et al., 2020).

Decision Tree Model Performance

The Decision Tree algorithm was applied to classify customers into low-risk and high-risk categories based on transaction-level data. The confusion matrix results are presented in Table 5, while classification performance metrics are summarized in Table 6.

Performance indicators were computed using the accuracy, sensitivity, and specificity in methodology section. Based on Table 5, the model achieved an accuracy of 87.4%, sensitivity of 81.7%, and specificity of 92.0% (see Table 6).

The accuracy rate indicates that the model correctly classified 87.4% of observations. The sensitivity level (81.7%) demonstrates strong capability in detecting high-risk customers, while the high specificity value (92.0%) reflects excellent precision in identifying low-risk customers. These findings confirm that the Decision Tree classifier provides reliable predictive performance suitable for operational risk segmentation and anomaly detection within Islamic banking.

Regression Analysis: Service Quality

To examine the effect of Decision Tree utilization and SWOT implementation on service quality, multiple regression analysis was performed using the following model:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \varepsilon_i$$

Where:

Y_i = Service Quality

X_1 = Decision Tree Utilization

X_2 = SWOT Implementation

The regression results indicate that both Decision Tree utilization and SWOT implementation have positive and statistically significant effects on service quality ($p < 0.05$). The coefficient associated with Decision Tree utilization is larger in magnitude, suggesting that predictive analytics exerts a stronger direct influence on customer-perceived service improvements.

Operationally, Decision Tree outputs enable targeted segmentation, transaction monitoring adjustments, and improved responsiveness during peak digital usage periods. In contrast, SWOT contributes to structured evaluation of internal strengths and weaknesses and alignment with external opportunities and threats (Alfadri & Surya, 2023; Indah et al., 2025). The empirical findings therefore suggest that analytics-driven operational precision enhances service reliability and responsiveness.

Regression Analysis: Information Security

Using the same regression specification with Information Security as the dependent variable, the results show a similar pattern. Decision Tree utilization and SWOT implementation both demonstrate positive and statistically significant effects ($p < 0.05$).

The stronger coefficient of Decision Tree utilization indicates that analytics-based anomaly detection plays a central role in enhancing perceived security. The model's ability to identify irregular transaction patterns (see Table 5 and Table 6) supports proactive fraud detection and layered verification mechanisms.

SWOT implementation also contributes positively, particularly by enabling systematic identification of technological weaknesses, governance gaps, and external cyber threats (Tiara et al., 2023; Indah et al., 2025). However, its effect size is comparatively smaller, reflecting its strategic rather than operational nature.

Complementarity Between Decision Tree and SWOT

The empirical evidence suggests a complementary relationship between predictive analytics and strategic planning. Decision Tree analytics provides micro-level behavioral intelligence derived from transaction data, while SWOT analysis translates these insights into structured strategic initiatives.

As illustrated in Figure 1, the integration process begins with transaction-level classification, followed by strategic mapping that informs service enhancement and security reinforcement. This mechanism demonstrates how predictive outputs can serve as empirical inputs in SWOT-based planning cycles.

The findings confirm that while Decision Tree analytics strengthens operational accuracy and responsiveness, SWOT ensures alignment with institutional governance, Sharia compliance, and external environmental adaptation (Irawan, 2023; Santoso & Astuti, 2019). Together, they generate measurable improvements in service quality and information security.

Summary of Empirical Findings

The empirical findings demonstrate that the Decision Tree model exhibits strong predictive performance, as reflected in the classification metrics reported in Table 6. The utilization of Decision Tree analytics significantly improves both service quality and information security, indicating that data-driven customer segmentation and risk detection enhance operational responsiveness and protection mechanisms. Although SWOT implementation also shows a positive and statistically significant influence on these outcomes, its magnitude of effect is comparatively smaller than that of the Decision Tree. This suggests that predictive analytics exerts a more direct operational impact, while SWOT contributes at the strategic planning level. Importantly, the integration of predictive analytics and strategic mapping produces complementary benefits, as analytical outputs inform structured strategic decisions. Overall, these results provide empirical support for the proposition that embedding data-driven predictive modeling within formal strategic frameworks enhances organizational performance in Islamic banking institutions.

5. Discussion

The findings of this study provide empirical evidence that integrating Decision Tree analytics with SWOT-based strategic planning enhances both service quality and information security in Islamic banking. The strong predictive performance of the Decision Tree model (see Table 6) confirms that transaction-level classification can reliably distinguish between low-risk and high-risk customers. With an accuracy of 87.4%, sensitivity of 81.7%, and specificity of 92.0%, the model demonstrates high

discriminative capability, particularly in identifying low-risk profiles while maintaining solid detection of high-risk behavior. These results are consistent with prior studies that highlight the effectiveness of Decision Tree algorithms in banking classification tasks (Amzile & Amzile, 2022; Sari et al., 2023; Ramadhon et al., 2024).

From a theoretical perspective, the results reinforce the argument that predictive analytics functions as a micro-operational intelligence mechanism. The regression model,

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \varepsilon_i,$$

demonstrates that Decision Tree utilization (X_1) has a positive and statistically significant effect on both service quality and information security. The magnitude of the coefficient associated with Decision Tree utilization exceeds that of SWOT implementation (X_2), indicating that analytics-driven segmentation and anomaly detection exert a more immediate operational influence. This finding aligns with the notion that machine learning enhances service personalization and risk detection by transforming transaction data into actionable intelligence (Bunga Tiara et al., 2024).

In contrast, SWOT implementation contributes positively but with comparatively smaller effect size. This suggests that SWOT operates at the macro-strategic level, structuring organizational responses rather than directly influencing transactional processes. Previous studies emphasize the importance of SWOT in digital readiness and strategic positioning within Islamic banking (Alfadri & Surya, 2023; Indah et al., 2025). However, the present findings indicate that SWOT's effectiveness increases when grounded in empirical data derived from predictive analytics.

The complementary relationship between Decision Tree analytics and SWOT analysis, illustrated conceptually in Figure 1, demonstrates how predictive outputs inform strategic mapping. Decision Tree classification generates risk segmentation and behavioral profiling, which can then be incorporated into SWOT matrices as internal strengths (e.g., advanced anomaly detection capability), weaknesses (e.g., limited model coverage), opportunities (e.g., digital service expansion), and threats (e.g., cyberattack patterns). This integration addresses a gap in the literature where predictive performance studies and strategic management frameworks have traditionally evolved separately.

In the context of Islamic banking, these findings are particularly relevant. Islamic financial institutions operate within a Sharia-based governance framework that emphasizes trust, transparency, and ethical accountability (Irawan, 2023; Santoso & Astuti, 2019). The interpretability of Decision Tree algorithms supports these principles, as rule-based outputs enhance explainability compared to black-box models. Moreover, improved service reliability and information security directly influence customer trust and decision-making behavior (Yurista et al., 2022). Thus, analytics-driven strategy not only improves operational metrics but also strengthens institutional legitimacy in Sharia-compliant banking environments.

Another important implication concerns digital transformation challenges in Indonesian Islamic banking. As highlighted by Tiara et al. (2023), digitalization introduces both opportunities and vulnerabilities. The high specificity observed in Table 6 indicates robust protection against false alarms, reducing unnecessary customer friction. Meanwhile, sensitivity above 80% suggests effective detection of suspicious transactions. Together, these metrics indicate that predictive analytics can mitigate digital risks while maintaining service efficiency.

Overall, the discussion confirms that predictive modeling enhances tactical decision-making, while SWOT ensures strategic coherence. The synergy between the two produces measurable improvements in service reliability and security perception, bridging the gap between data analytics and strategic governance in Islamic banking institutions.

Policy Implications and Recommendations

Based on the empirical findings, several policy implications and strategic recommendations can be derived:

Institutionalization of Predictive Analytics, Islamic banks should formally embed Decision Tree outputs into standard operating procedures (SOPs) for transaction monitoring, anomaly detection, and customer segmentation. Clear escalation mechanisms should be established for high-risk classifications identified by the model (see Table 5).

Data-Driven SWOT Planning Cycles, SWOT analysis should be conducted using quantitative evidence generated from predictive models rather than relying solely on managerial perception. Risk segmentation results and classification accuracy metrics (see Table 6) should be incorporated into strategic planning documents.

Strengthening Data Governance, Given the reliance on transaction-level analytics, banks must enhance data governance frameworks, including data quality control, cybersecurity infrastructure, and regulatory compliance mechanisms. This is particularly crucial in light of digitalization challenges identified by Tiara et al. (2023).

Enhancing Analytical Literacy, Human resource development programs should focus on improving analytics literacy among managerial and operational staff. Understanding how Decision Tree models function—including metrics such as accuracy, sensitivity, and specificity—will ensure more informed strategic utilization.

Alignment with Sharia Governance, Predictive analytics implementation must remain aligned with Sharia principles of transparency and accountability. The interpretability of Decision Tree rules should be leveraged to maintain trust and compliance within Islamic banking operations (Irawan, 2023).

Continuous Model Evaluation, Periodic recalibration and validation of predictive models are necessary to address potential overfitting and evolving risk patterns, as highlighted in machine learning theory.

6. Conclusion

This study demonstrates that the integration of Decision Tree analytics and SWOT-based strategic planning significantly enhances service quality and information security in Islamic banking. The Decision Tree model exhibits strong predictive performance, as reflected in the classification metrics reported in Table 6, with high levels of accuracy, sensitivity, and specificity derived from the confusion matrix in Table 5. These results confirm that transaction-level predictive modeling provides reliable customer risk segmentation and anomaly detection capabilities.

The regression model,

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \varepsilon_i,$$

indicates that Decision Tree utilization has a positive and statistically significant effect on both service quality and information security. While SWOT implementation also contributes positively, its magnitude of effect is comparatively smaller, suggesting that predictive analytics exerts a stronger operational influence, whereas SWOT provides strategic alignment and governance structuring.

Importantly, the complementary relationship illustrated in Figure 1 confirms that embedding predictive outputs into SWOT planning cycles generates measurable performance improvements. This integration bridges the gap between machine learning applications in banking (Amzile & Amzile, 2022; Sari et al., 2023; Ramadhon et al., 2024) and strategic management frameworks in Islamic financial institutions (Alfadri & Surya, 2023; Indah et al., 2025).

From a theoretical standpoint, the study contributes to the literature by demonstrating that interpretable predictive analytics can function as a strategic input within Sharia-compliant governance structures, reinforcing transparency and trust principles emphasized in Islamic banking (Irawan, 2023; Santoso & Astuti, 2019). From a practical perspective, the findings underscore the importance of institutionalizing analytics-driven decision-making, strengthening data governance, and enhancing analytical literacy to sustain digital transformation efforts (Tiara et al., 2023).

Despite its contributions, this study is limited by its focus on a single Islamic banking institution and reliance on cross-sectional data. Future research is recommended to expand institutional scope, apply longitudinal designs, and incorporate moderating or mediating variables such as digital literacy, organizational culture, or regulatory quality to deepen understanding of analytics–strategy integration in Islamic finance.

Overall, the findings confirm that data-driven predictive modeling, when systematically embedded within structured strategic frameworks, enhances organizational performance and strengthens service and security governance in Islamic banking institutions.

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