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OPTIMIZING BSI MOBILE BANKING SERVICE THROUGH A THREE-DIMENSIONAL ANALYSIS : SOCIAL MEDIA, EXTERNAL AND INTERNAL

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ABSTRACT

The rise of mobile banking in Indonesia underscores the strategic role of platforms like BSI Mobile in meeting customer expectations. This study examines user perceptions of BSI Mobile services using big data from X (formerly Twitter) as a real-time source of public opinion. Sentiment data from X was analyzed using the CRISP-DM framework, employing the Naive Bayes method for category and sentiment classification, which was then mapped onto the Importance-Performance Matrix (IPM). External analysis, using PESTEL, Porter's Five Forces, and competitor analysis, highlighting general, industry and competitor challenges. Internally, resource evaluations conducted through value chain analysis and the VRIO framework revealed that transitioning from BSI Mobile to the BYOND platform is a strategic step to strengthen technical and operational capabilities. The findings indicate an urgent need to enhance the app's features and functionalities, followed by improvements in speed, reliability, security, and UI/UX. The study underscores the importance of strengthening both offline and online marketing strategies to promote BYOND's features and functionalities, leveraging its Unique Selling Proposition (USP) as a sustained competitive advantage to drive digital adoption among both existing and new customers. Big data analytics helps identify improvements and track service performance.

Keywords : BSI Mobile; Twitter; CRISP-DM Framework; VRIO Analysis; BYOND

ABSTRAK

Peningkatan penggunaan perbankan mobile di Indonesia menyoroti peran strategis platform seperti BSI Mobile dalam memenuhi ekspektasi pelanggan. Studi ini menganalisis persepsi pengguna terhadap layanan BSI Mobile dengan menggunakan big data dari X (sebelumnya Twitter) sebagai sumber opini publik secara real-time. Data sentimen dari X dianalisis menggunakan kerangka kerja CRISP-DM, dengan metode Naive Bayes untuk klasifikasi kategori dan sentimen, yang kemudian dipetakan ke dalam Importance-Performance Matrix (IPM). Analisis eksternal dilakukan dengan pendekatan PESTEL, Five Forces Porter, dan analisis pesaing untuk mengidentifikasi tantangan umum, industri, dan kompetitor. Analisis internal melalui evaluasi sumber daya menggunakan value chain analysis dan kerangka VRIO mengungkap bahwa transisi dari BSI Mobile ke platform BYOND adalah langkah strategis untuk memperkuat kapabilitas teknis dan operasional. Hasil studi menunjukkan perlunya peningkatan fitur dan fungsionalitas aplikasi secara mendesak, diikuti dengan peningkatan kecepatan, keandalan, keamanan, dan UI/UX. Studi ini juga menegaskan pentingnya memperkuat strategi pemasaran baik offline maupun online untuk mempromosikan fitur dan fungsionalitas BYOND, dengan memanfaatkan Unique Selling Proposition (USP) sebagai keunggulan kompetitif berkelanjutan untuk

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mendorong adopsi digital di kalangan pelanggan lama maupun baru. Analisis big data membantu mengidentifikasi area perbaikan dan melacak kinerja layanan.

Kata Kunci : BSI Mobile; Twitter; Kerangka CRISP-DM; Analisis VRIO; BYOND

INTRODUCTION

Digital transformation in Indonesia's banking sector has improved financial access and operational efficiency, driven by fintech innovations, mobile banking, and the use of big data and AI. While this process offers significant opportunities, it also brings challenges, such as cybersecurity risks and the need for talent development (Hermiyetti, 2024) . Previously, customers were required to visit branches to conduct transactions, but now services like money transfers and bill payments can be easily accessed through digital applications. This transformation can be explained through the 7P Marketing Mix for banking services consisting of product, price, place, promotion, people, process, and physical evidence (King, 2018).

As the largest Islamic bank in Indonesia, PT Bank Syariah Indonesia Tbk (BSI) holds a strategic position in the financial market with its asset worth more than IDR 354 trillion and millions of customers across Indonesia (BSI, 2023). BSI Mobile, the mobile banking app of Bank Syariah Indonesia (BSI), is a crucial tool in addressing these challenges and driving its digital transformation efforts.BSI Mobile must optimally leverage big data to strengthen its competitiveness and relevance. Effective use of big data enables BSI to better understand customer behavior, predict future trends, and provide personalized services tailored to customer needs.

Big Data analytics involves processing and analyzing large, complex datasets to uncover insights that support better decision-making and drive innovation. Despite its potential to enhance business operations and customer experience, it presents challenges related to data volume, speed, quality, privacy, and security. Addressing issues such as scalability and the need for skilled personnel is crucial for harnessing Big Data's full potential and gaining a competitive advantage across industries (Kumar, 2023).

External and internal factors are crucial for the success of BSI Mobile's digital transformation. Externally, BSI must keep up with the ever-evolving digital banking landscape. Internally, BSI's resources and capabilities must be prepared to adapt to these changes. BSI faces challenges in the digital era, such as data security, technology integration, and regulatory adaptation. However, digitalization also opens opportunities

to enhance financial access, develop innovative products, and strengthen customer relationships through digital platforms. By understanding these challenges and opportunities, Islamic banking can devise strategies to leverage digitalization to expand reach and ensure sustainability (Hapiyah et al., 2024).

Previous research on Bank Syariah Indonesia's (BSI) IT systems highlighted issues such as service disruptions, security concerns, and management quality that impact customer perceptions of BSI Mobile. Sentiment analysis of data from X (formerly Twitter), particularly during the ransomware incident, revealed customer dissatisfaction with the app, especially regarding e-wallet top-ups, payments, and security breaches (Sururi et al., 2024. However, the study's main limitation is its focus on general sentiment rather than detailed analysis of specific digital services or issues faced by BSI, like key factors affecting BSI's mobile banking services. Additionally, the data was sourced from Kaggle, a platform specializing in ransomware incidents, which may not fully reflect the overall sentiment of BSI's customer base over time. The study also lacks concrete strategies to address these issues, limiting its practical application for improving digital services in the future.

This research aims to develop a three-dimensional data analysis model starting with social media data analysis model to prioritize service shortcomings in BSI Mobile based on customer feedback from X. It also explores the external trends that influence BSI Mobile's position and strategy in digital banking, while evaluating the internal resources and capabilities that can support the implementation of an effective service improvement plan.

LITERATURE REVIEW

Key Factors of Mobile Banking Service Optimization

Mobile banking adoption has grown significantly, with factors such as perceived usefulness, ease of use, performance expectancy, and security risks influencing customer engagement (Sahu & Deshmukh, 2020). Key aspects that need optimization in mobile banking services include transaction speed, user interface (UI), user experience (UX), features, and security. Performance in terms of speed and reliability plays a critical role in user trust and adoption. If an app is slow or unreliable, users are less likely to trust it (Sijabat, 2024) . Efficiency, fulfillment, reliability, and privacy of

mobile banking services significantly influence customer satisfaction by enhancing positive experiences and facilitating transaction processes (May Shofiah et al., 2022).

Speed and reliability are crucial for customer satisfaction, with delays in transactions leading to dissatisfaction (Latinia, 2024). Additionally, a seamless UI/UX design improves usability and retention, making navigation and transitions smooth and intuitive (Paula Oliveira, 2024). As mobile banking evolves, the range of features and functionalities such as bill payments, fund transfers, and account management becomes essential to maintain customer loyalty and avoid churn (Michal Maliarov, 2024). Security, too, is vital, with customers expecting strong measures like encryption and two-factor authentication to protect their transactions and personal data (Vishnuvardhan et al., 2020). To address these challenges, banks must integrate robust security solutions and educate customers on secure banking practices, ensuring a safe and engaging user experience.

Data Mining X (formerly Twitter) for Sentiment Analysis

Data mining is the process of uncovering hidden patterns or predictive information from large datasets to aid decision-making (Witten et al., 2005). Key techniques include classification, clustering, regression, and association rules. The main stages are data cleaning, transformation, mining for patterns, and applying knowledge to decisions (Han et al., 2011). Big data's Volume, Variety, Velocity, Veracity, and Value significantly influence data mining, especially in social media platforms like X (formerly Twitter). X provides real-time data, ideal for sentiment analysis, though data quality (veracity) must be ensured to avoid false information (Chen et al., 2012). Sentiment analysis on X involves data collection via APIs, text preprocessing, classification using models like Naïve Bayes, and interpreting results to understand public opinion (Juventius et al., 2023). This analysis helps businesses meet customer expectations, improve service delivery, enhance marketing, and manage public relations effectively (Kuhn & Johnson, 2013).

CRISP-DM (Cross-Industry Standard Process for Data Mining)

CRISP-DM (Cross-Industry Standard Process for Data Mining) is a proven framework for analyzing large datasets, especially in complex projects. It has been updated with modern tools like real-time analytics, visualization, and machine learning to handle big data in fields like mobile banking (Sengendo, 2024). These updates, help

businesses keep up with the growing demand for data insights. The CRISP-DM process as can be seen in Figure 1 has six main steps:

1. Business Understanding – Set clear goals for what the analysis aims to solve.
2. Data Understanding – Gather the right data, often from social media platforms.
3. Data Preparation – Clean and organize the data for analysis.
4. Modeling – Use statistical or machine learning models to sort and analyze the data.
5. Evaluation – Check how well the model meets the analysis goals.
6. Deployment – Apply the findings to improve decision-making and strategy.

This approach is ideal for turning large, messy data into valuable insights that can guide business decisions.

Importance-Performance Matrix

The Importance-Performance Matrix (IPM) which can be seen in Figure 2, developed by Martilla and James (1977), is a valuable tool for businesses to evaluate the performance of services or products based on customer expectations. It uses a Cartesian coordinate system to plot the importance and performance of various attributes, helping businesses prioritize areas for improvement.

Performance is calculated using customer feedback or sentiment scores, often aggregated on a 5-point Likert scale or derived from sentiment analysis techniques. Importance, on the other hand, reflects the perceived significance of an attribute, typically quantified through regression analysis or machine learning models like XGBoost, which measure the impact of sentiment on overall satisfaction. Both dimensions are normalized to a common scale, such as 1–5, to ensure comparability. This allows businesses to focus their efforts on areas where performance is lagging but importance is high, thereby aligning improvements with customer expectations and satisfaction trends (Shen et al., 2024).

External Analysis

External analysis enables an organization to understand opportunities and threats that may influence it's performance(Wandebori, 2019). PESTEL is one of the common strategic tools that applies political, economic, social, technological, environmental and legal factors to explain how the business environment influences strategic management (Çitilci & Akbalik, 2019) . Further, the industry analysi s utilises Porter's Five Forces competitive assessment which identifies competition according to the threats posed by

new market entrants, rivalry among existing firms, and the power of suppliers and buyers, and the threat of substitutes (Rashid, 2023) . Competitor analysis takes this knowledge to the next level by considering rivals' goals, plans, and strengths and weaknesses or financial status, and use of technology (Hitt et al., 2011). This analysis is useful especially as a guide in helping the businesses to read their competitive environment well.

Internal Analysis

Internal analysis plays an important role in strategic management because the info collected allows an organization to evaluate its resources and strengths in order to sustain a competitive advantage. If properly exploited, the tangible and intangible resources put the firms in a strategic position to capture opportunities that were hitherto will locked out competitors. Matching resources and capabilities in the value chain increases effectiveness, promotes new product and service development, and enables firms to adapt to markets, these factors help firms to achieve sustainable competitive advantage (Barney, 1991).

The Resource-Based View (RBV) theory emphasizes that a firm's internal resources are critical to achieving long-term success, and its competitive advantage is shaped by the unique resources it possesses. The VRIO framework, helps assess the competitive potential of resources by evaluating four key elements. This framework comprises four elements consists of Valuable, Rare, Imitable, and Organized (Mazikana, 2023) . To be a resource that contributes to a sustainable competitive advantage, the resource has to be valuable, rare, inimitable and ready (supported by the structure in the firm for implementation). This approach is particularly useful for assessing e-business readiness, helping firms, such as those in fintech and traditional banking, leverage their resources strategically for long-term success (Yudiono & Iqbal, 2019).

Conceptual Framework

This framework that can be seen in Figure 3 focuses on addressing the business issue of BSI Mobile by identifying four key factors: Speed and Reliability, UI/UX, Features and Functionality, and Security. These factors are analyzed through big data analysis using social media insights, external analysis evaluating the industry and competitors, and internal analysis focusing on resources and the value chain. The results of these analyses are used to formulate a tri-dimensional strategy, which is then

developed into actionable business solutions and concludes with comprehensive recommendations to effectively address the challenges faced by BSI Mobile.

RESEARCH METHODOLOGY

Method is a method of work that can be used to obtain something. While the research method can be interpreted as a work procedure in the research process, both in searching for data or disclosing existing phenomena (Zulkarnaen, W., et al., 2020:229). This study combines primary and secondary data to evaluate customer perceptions of BSI Mobile services while analyzing internal readiness and external factors influencing strategies for service improvement. This analysis focuses on three main dimensions, namely social media, external environment, and internal capabilities.

Social Media Analysis

This analysis, as can be seen in Figure 4, examines public perceptions of BSI Mobile using secondary data collected through web scraping from Twitter (X), focusing on key service aspects such as speed/reliability, user interface/user experience (UI/UX), features/functionality, and security. Tools like Tweet Harvest were used to gather the data, which was then cleaned, processed, and analyzed using the CRISP-DM approach and the Naive Bayes model for classification, facilitated by RapidMiner. For Twitter data, sentiment analysis involves the use of NRPs such as Naïve Bayes or Support Vector Machine (SVM) to measure the publicity of a certain topic, product or service. Naive Bayes is one of the easiest classification models used even in text classification because it has high accuracy, especially when working with text with specific characteristics, such as Twitter text (Witten et al., 2005) .This two-step process categorizes feedback into relevant areas and assigns sentiment labels (positive, neutral, negative). Performance metrics like accuracy, precision, and recall were used to evaluate the model's effectiveness. The results of the sentiment analysis are visualized in the Importance-Performance Matrix (IPM), helping to identify priority areas for improvement, guiding BSI in enhancing customer experience and aligning with their strategic goals.

External Analysis

The external analysis uses the PESTEL framework to assess political, economic, social, technological, environmental, and legal factors impacting the digital banking industry. Additionally, Porter's Five Forces is applied to evaluate market competition,

including threats from new entrants and substitutes, bargaining power of customers and suppliers, and industry rivalry. A competitor analysis focuses on benchmarking BSI Mobile against key players in the market, evaluating critical factors such as transaction speed, interface design, innovative features, security, and ecosystem integration. This analysis leverages secondary data from industry reports and market studies.

Internal Analysis

The internal analysis evaluates BSI's capabilities using the VRIO framework, determining whether its resources and strengths provide a sustainable competitive advantage. Furthermore, a value chain analysis identifies key activities and supporting processes that create value in BSI Mobile's services, from technology development to customer support. Primary data is collected through interviews with BSI stakeholders, providing insights into organizational capabilities and challenges. Secondary data from internal documents and reports complements this analysis, highlighting areas of strength and opportunities for improvement.

RESULT AND DISCUSSION

Social Media Analysis Result

The analysis was conducted using RapidMiner, a tool designed to simplify the steps of loading, processing, modeling, and evaluating data. It provides an intuitive way to integrate machine learning algorithms like Naive Bayes and offers powerful text mining capabilities. These features were crucial for sorting tweets into specific categories and analyzing their sentiment.

1. Business Understanding

   The goal of this phase was to align the analysis with the business objectives, focusing on social media sentiment and the public's perception of BSI Mobile. The objective was to understand customer opinions regarding four key aspects of the service: Speed and Reliability, Features and Functionality, UI/UX, and Security.

2. Data Understanding

   At this stage, the data is collected and analyzed to understand its characteristics. A total of 12,911 tweets have been gathered, containing comments, feedback, and user reactions to BSI Mobile. To collect this data, Tweet Harvest, a tool that extracts tweets from Twitter based on search keywords, date ranges, and language, was used,

with Python enabling the automation of data extraction and processing. The process flow above can be seen in Figure 5.

The data was then stored in CSV format for further analysis. The data was collected using the search term "BSI Mobile" to ensure that only relevant tweets about the service were included. Additionly, the data was gathered on a monthly basis, from February 2021 to October 2024, and filtered to include only tweets in Indonesian. Example query for data collection:

search_keyword = 'BSI Mobile since:2024-09-01 until:2024-09-30 lang:id'

3. Data Preparation
   a. Data Cleaning: The collected data was cleaned to remove unnecessary elements such as duplicate entries, mentions, hashtags, URLs, and punctuation, ensuring the dataset was accurate and ready for analysis. After cleaning, 2,105 relevant tweets remained, suitable for classification and further analysis. The process flow using RapidMiner can be seen in Figure 6,7 and an example of the results can be seen in Table 1.
   b. TF-IDF Transformation: After cleaning the data, the text was transformed into a numerical format using TF-IDF (Term Frequency-Inverse Document Frequency). This method highlights the most important words by considering their frequency in a tweet and their rarity across all tweets. Both cleaning and transformation processes were performed using RapidMiner, simplifying data manipulation and preprocessing tasks. The process flow and process in RapidMiner can be seen in Figures 8 and 9.
4. Modeling

   To train the Naive Bayes model, labeled data was required. The training data consisted of tweets that were already categorized into four service aspects and had sentiment labels assigned. This enabled the model to learn patterns and make predictions for new tweets. Naive Bayes is a probabilistic classifier that assumes attributes are independent given the class label. It requires only a small amount of training data to estimate parameters and often performs well even with limited data (Saleh, 2015). In this process from 2,105 data almost 20% of the amount is used as training data by being labelled. The flow of the process in RapidMiner can be seen in Figure 10 and examples of training data can be seen in Table 2.

In this stage, the cleaned and transformed data were classified into four key service categories: Speed and Reliability, Features and Functionality, UI/UX, and Security. The Naive Bayes algorithm, a machine learning technique that classifies text based on probability, was used to categorize the tweets. Additionally, sentiment analysis was performed within each category, with tweets labeled as either positive, neutral, or negative. The flow of the classification process in RapidMiner can be seen in Figure 11 and the results can be seen in Graphic 1.

5. Evaluation

After completing the classification, the model's accuracy was evaluated using various metrics. The results were then analyzed to identify patterns in customer sentiment for each service aspect, uncovering areas where BSI Mobile excels and areas with potential for improvement. The flow of the performance evaluation process in RapidMiner can be seen in Figure 12.

a. Category Classification Evaluation

This classification model has 97.99% accuracy as can be seen in Table 3, with perfect predictions for security and interface (100% precision and recall). Speed & reliability achieved 97.89% precision and 96.53% recall, while features & functionality had 97.24% precision and 98.32% recall. Only minor misclassifications occurred, indicating high reliability with little room for improvement.

b. Sentiment Classification Evaluation

The model shows excellent performance with 99.75% accuracy as can be seen in Table 4, achieving 100% precision and recall in both negative and positive categories. In the neutral category, it reached 98.80% precision and 100% recall, with one misclassified instance. These results indicate high reliability with minimal misclassification, mostly in the neutral category.

6. Deployment

In the deployment phase, the Importance-Performance Matrix (IPM) is used to visualize sentiment analysis results, mapping user perceptions on a 1-5 scale. The X-axis represents feature importance, while the Y-axis shows performance based on user sentiment as can be seen in Graphic 2. This helps prioritize improvements according to user expectations.

a. Features and Functionality (Importance: 5, Performance: 2.56): This is crucial for users but underperforms. It needs immediate improvement as it significantly affects user experience as can be seen in Figure 13.
b. Speed and Reliability (Importance: 4.2, Performance: 1.78): Important but fails to meet expectations. Users frequently complain on social media, indicating a need for enhancements in this area as can be seen in Figure 14.
c. Security (Importance: 1.22, Performance: 1.64): While not a major concern, security issues often relate to speed and reliability, particularly during activation and verification processes as can be seen in Figure 15.
d. User Interface and User Experience (UI/UX) (Importance: 1, Performance: 1.71): UI/UX is less frequently mentioned, but improvements in features and functionality likely reflect better UI/UX performance as can be seen in Figure 16.

External Analysis Result

The external analysis conducted through PESTEL, Porter's Five Forces, and competitor analysis reveals several key insights that shape BSI's strategy. From a political perspective, regulations like POJK No. 12/POJK.03/2021 ensure secure digital systems while fostering innovation, particularly in Sharia-compliant financial services, and the Personal Data Protection Law (UU PDP, 2022) enhances trust through stricter data protection requirements. Economically, stable growth and an expanding middle class, along with increasing internet penetration, create a favorable environment for digital banking adoption, but challenges such as talent gaps and the high cost of AI technology highlight the need for efficient resource management. Socially, the demand for personalized, digital-first services from Millennials and Gen Z presents an opportunity for differentiation, while the growing role of social media in customer engagement offers further chances to connect with users. Technological advancements, such as AI, blockchain, and cloud infrastructure, enable improved fraud detection, operational scalability, and enhanced cybersecurity, all of which are crucial for maintaining competitiveness. Environmentally, sustainability practices like green banking appeal to eco-conscious customers and contribute to BSI's reputation as a socially responsible institution. Legally, compliance with data protection laws bolsters customer trust, while intellectual property protection supports innovation and a competitive edge.

In terms of Porter's Five Forces, the threat of new entrants is minimized due to high regulatory barriers, large capital requirements, and BSI's strong brand loyalty. However, the rise of AI and technology adoption creates disruption opportunities. The bargaining power of suppliers is heightened by the reliance on technology vendors, but strategic partnerships, such as with e-wallet providers like GoPay, enhance integration while increasing dependence. Customers demand seamless and personalized experiences, making the bargaining power of buyers significant, while high switching costs strengthen customer retention. The threat of substitutes is intensified by fintech platforms like GoPay and ShopeePay, which offer alternatives to traditional banking, and digital-first banks must innovate continuously to remain relevant. Lastly, intense industry rivalry among major players like BCA, BRI, Mandiri, and BNI, who are investing heavily in innovation and loyalty programs, underscores the need for continuous differentiation. BSI's unique position in Islamic banking gives it a competitive edge in the crowded digital banking space. Competitor analysis reveals that BCA Mobile, BRImo, Livin' by Mandiri, and Wondr by BNI are setting the bar high with advanced features like cross-border payments, AI integration, gamified rewards, and comprehensive service offerings. To stay competitive, BSI must not only enhance its current features but also innovate continuously with a focus on Sharia-compliant products and services, ensuring it remains a unique and attractive option in the digital banking landscape.

Internal Analysis Result

The internal analysis follows the ongoing transformation from BSI Mobile to BYOND. With the launch of BYOND on November 9, 2024, BSI aims to address the challenges faced by BSI Mobile, such as slow transaction speeds, limited integration with other digital ecosystems, and issues with the user interface (UI) and user experience (UX). This transition allows BSI to offer a more advanced, integrated solution through BYOND, which not only provides faster, more secure digital banking services but also integrates financial, social, and spiritual services into one platform. With improved features, security, and user experience, BYOND is expected to overcome the weaknesses of BSI Mobile and strengthen BSI's competitiveness in the digital banking market. Following BSI's 2024-2025 *House of Strategy Framework*, this

analysis reflects the strategic steps BSI is taking to position itself as a leader in digital Islamic banking services in Indonesia.

BYOND's competitive advantage comes from its ability to leverage an agile operational framework, market leadership in Sharia-based innovation, and a comprehensive functional ecosystem as can be seen in VRIO Analysis Table 5. These strengths allow BYOND to quickly develop and launch new features, integrate over 130 services, and offer unique products like zakat payments and halal lifestyle tools. While BYOND excels in these areas, it also faces competitive parity in financial capacity for innovation, security architecture, speed, reliability, and user interface (UI/UX), which are important but not unique, as competitors can replicate them.

The internal value chain as can be seen in Table 6 analysis of BYOND highlights key activities that contribute to its competitive advantage. These primary activities include inbound logistics (ensuring access to necessary technology components such as UI/UX tools and security features), operations (developing and maintaining the digital platform), outbound logistics (ensuring the app's availability through various app stores), and marketing & sales (using both digital and non-digital strategies to attract new and existing customers). In terms of supporting activities, BYOND relies on strong strategic partnerships, technological development, human resource management, and tech infrastructure to ensure operational efficiency and ongoing service improvement.

Business Strategy and Solution

BSI has a mission to provide access to Islamic financial solutions and a goal to serve more than 20 million customers, become a top 5 bank by assets (500+ trillion rupiah), and achieve a book value of 50 trillion rupiah by 2025. According to the House of Strategy Framework to enhance digital transformation, BSI should position itself as a respected competitor in the league of top digital players by 2024-2025, therefore its business strategy should focus on Differentiation. Internal analysis highlights a Sustained Competitive Advantage in key areas, such as the Agile Operational Framework, Sharia-Compliant Innovation, and a Comprehensive Features and Functional Ecosystem. This strategy will help BSI offer unique Islamic financial products and services, such as sharia-compliant investments, personalized tools, and services aligned with Islamic principles, thus creating a strong market position and

attracting customers. However, based on social media analysis, users expect better functionality, personalized features, and improved ease of transactions. With growing competition from BCA, Livin' by Mandiri, and BRImo, BSI's BYOND platform offers unique services like gold installment, sukuk, and Islamic lifestyle tools, which strengthens its differentiation. Additionally, BSI must enhance speed, reliability, security, and UI/UX to remain competitive. Improved marketing, communication, and analytics will further support this strategy by promoting BYOND's unique offerings and driving digital adoption. The recommended business solution for BSI is as follows:

1. Optimization of Features and Functionality

   BSI must focus on improving the functionality of BSI Mobile by enhancing features like fund transfers, bill payments, and personalized tools, which are currently lacking. With growing competition from BCA, Mandiri, and others, offering unique Sharia-compliant services like dynamic sukuk portfolios, gold installment, and halal travel packages will differentiate BSI. It even provides a marketplace for people to invest in SMEs under the mudharabah muqayyadah principle. Integrating advanced AI tools and collaborating with fintech platforms can further strengthen these features. A targeted marketing campaign will help highlight these features, driving digital adoption and customer engagement.

2. Improving Speed and Reliability

   To address issues with speed and reliability, BSI needs to optimize its infrastructure by integrating predictive infrastructure management and real-time monitoring. Enhancing hybrid cloud technology and improving system performance transparency will ensure faster transactions and reduce downtime. This can be achieved by adopting low-latency processing and ensuring seamless service across all devices, which will enhance user satisfaction and loyalty in a competitive market.

3. Strengthening Digital Security

   To build user trust and ensure compliance with the Personal Data Protection Act, BSI should enhance its security measures by integrating AI-driven fraud detection systems and adopting blockchain technology for transaction transparency. These advanced security features will not only meet industry standards but also reassure customers regarding data privacy and transaction safety, further solidifying BSI's position in the digital banking landscape.

4. Enhancing User Interface (UI) and User Experience (UX)

   The current UI/UX of BYOND needs further optimization to ensure a seamless and responsive experience across both high-end and low-end devices. Focusing on creating intuitive navigation and personalized dashboards will meet the expectations of Millennials and Gen Z users who prioritize engaging and user-friendly experiences. AI-driven personalization and gamification features will help attract younger audiences, creating a modern and competitive digital banking experience.

5. Marketing, Communication, and Loyalty Campaigns

   BSI should improve its marketing and communication efforts to increase awareness of BYOND's unique features and sharia-compliant services. A multi-channel approach using social media platforms, influencer partnerships, and educational outreach will be key to fostering customer engagement and loyalty. Integrating gamified loyalty solutions and referral bonuses will also enhance user retention and create a stronger community around BSI's digital offerings.

6. Strengthening Analytic Capabilities and Agility

   By leveraging AI and predictive analytics, BSI can better understand customer preferences, predict trends, and adapt to evolving market needs. Real-time sentiment analysis and feedback mechanisms should be utilized to improve decision-making agility, ensuring that BSI remains responsive to customer feedback. This data-driven approach will enhance BSI's competitive edge, allowing for continuous improvement in features, security, and user experience.

CONCLUSION

This research examined the optimization of BSI Mobile services through a comprehensive analysis involving social media insights, external environment evaluation, and internal resource assessment. The study revealed that key areas for improvement include features and functionality, speed and reliability, security, and UI/UX, with social media feedback emphasizing the need for better performance in these aspects. The external analysis highlighted opportunities in sharia-compliant banking and growing digital adoption, but also pointed out the challenges posed by strong competitors in the fintech and banking sectors. Internally, the transition from BSI Mobile to BYOND marks a strategic shift towards agile development, leveraging sharia-compliant innovations and strengthening customer trust. However, BYOND still

faces challenges in security, speed, and UI/UX, which need ongoing improvements to maintain competitiveness. Overall, the transformation from BSI Mobile to BYOND reflects BSI's commitment to enhancing digital banking services and positioning itself as a leading player in the sharia-compliant digital banking market.

To ensure a successful transition from BSI Mobile to BYOND and support BSI's digital transformation, the primary focus should be on enhancing BYOND's features, such as Islamic investment services, social finance, and Sharia-compliant solutions, creating a strong Unique Selling Proposition (USP). Effective marketing strategies, including both online promotions and offline campaigns, along with customer education on these services, are crucial for expanding reach and increasing engagement. Strengthening technological aspects like speed, reliability, and digital security, while ensuring compliance with data protection laws, will improve performance and build customer trust. User experience (UI/UX) should prioritize intuitive designs, easy navigation, and real-time feedback for ongoing improvement. Performance tracking through big data analytics such as social media insights, user feedback, and transaction behavior will help identify areas for development. In the long term, adopting AI and blockchain technologies will support personalized services, risk management, and enhanced security. By integrating innovative features, strong technology, effective marketing, and customer-centric UI/UX, BYOND can solidify its position as a leading Sharia-based digital finance platform, driving higher digital adoption and expanding its user base.

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PICTURES, GRAPHICS AND TABLES

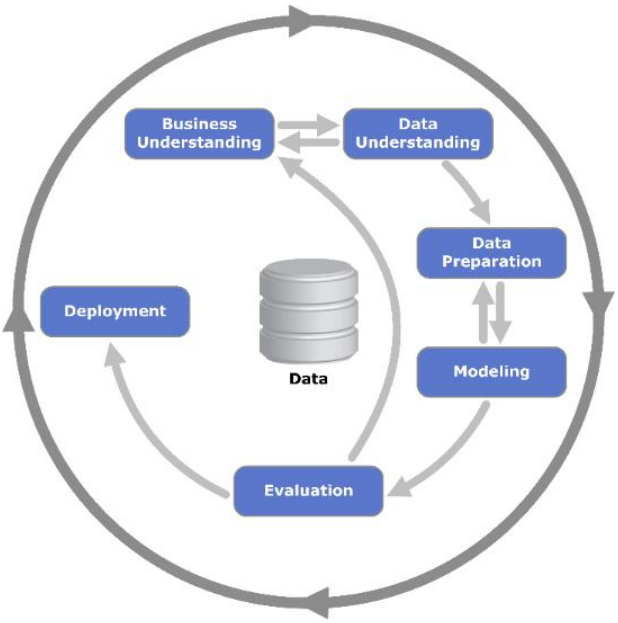


Figure 1. Crisp DM Process Diagram
Source : https://commons.wikimedia.org/wiki/File:CRISP-DM_Process_Diagram.png

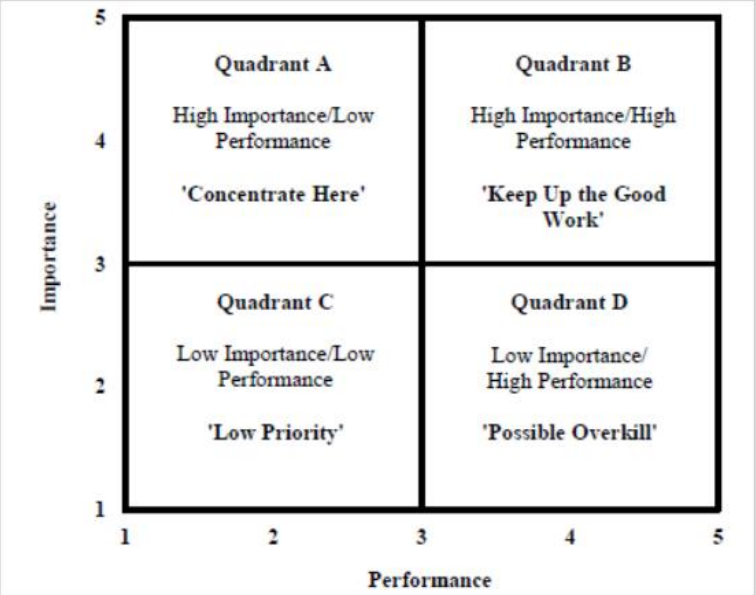


Figure 2. Importance -Performance Matrix
Source : (Martilla & James, 1977)

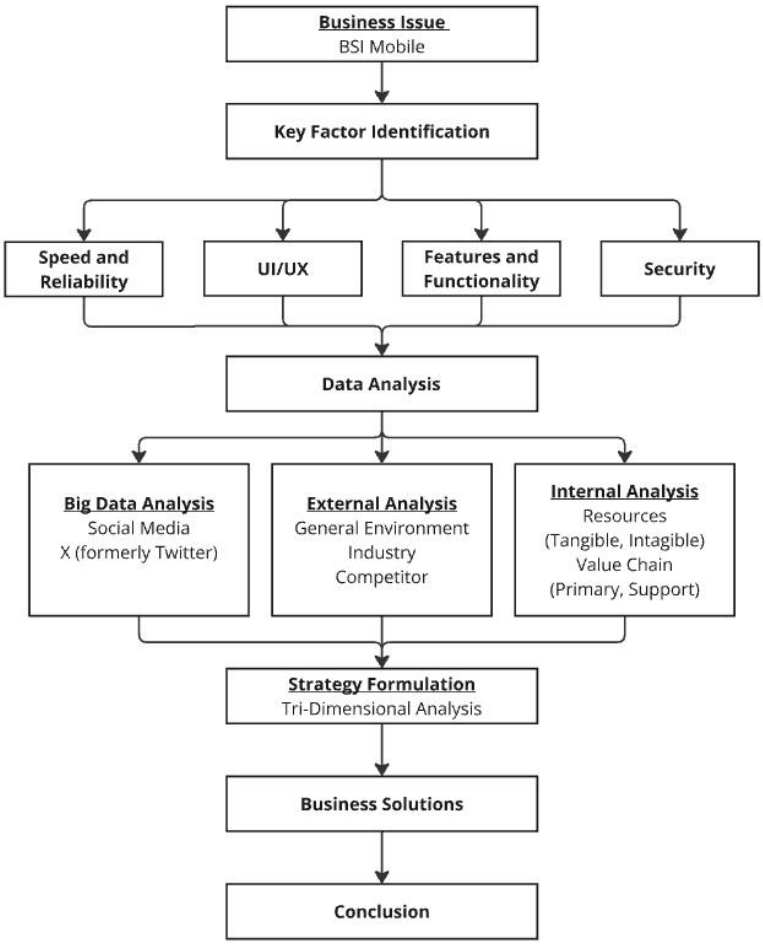


Figure 3. Conceptual Framework

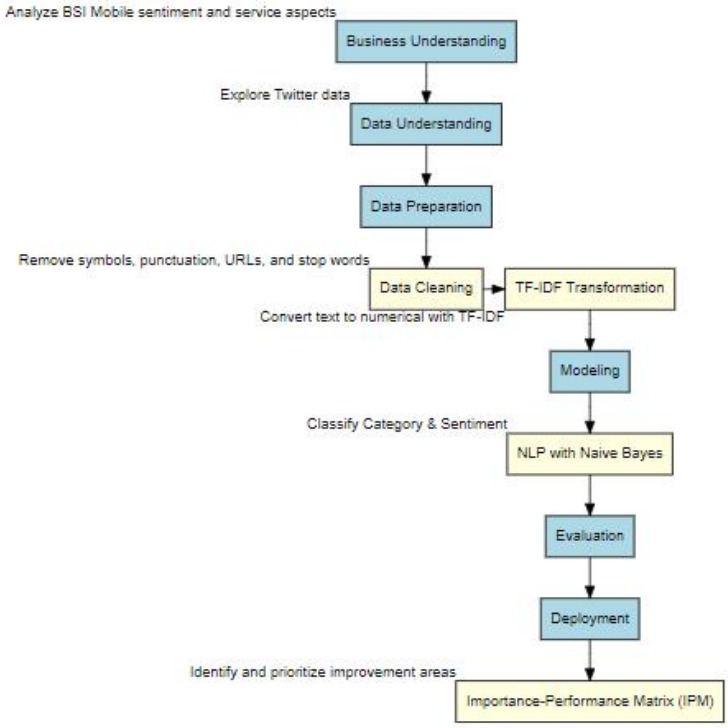


Figure 4. Social Media Analysis

Figure 5. Data Collection Process

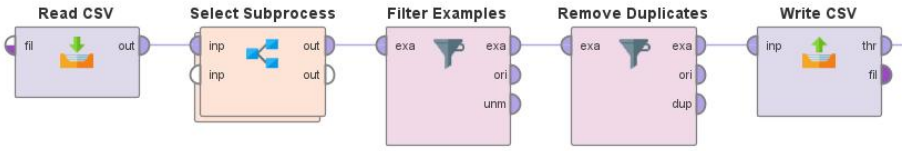


Figure 6. Data Cleaning Flow

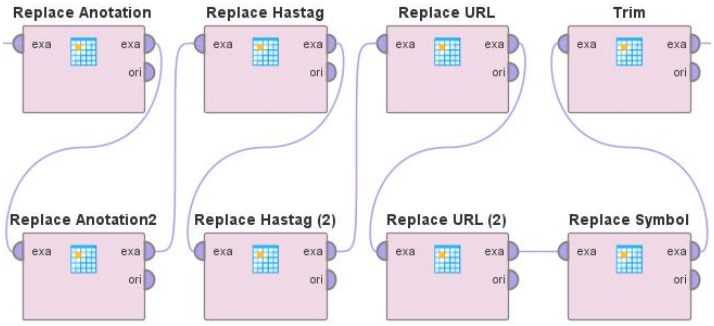


Figure 7. Subprocess Data Cleaning Flow

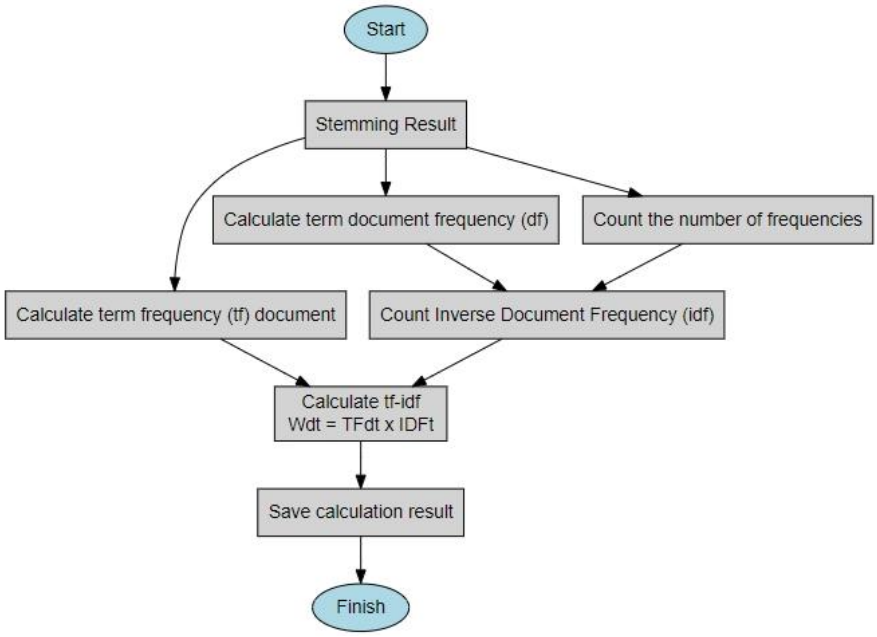


Figure 8. TF-IDF Flowchart

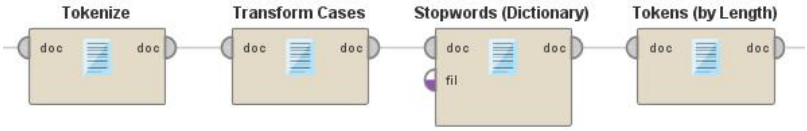


Figure 9. Text Preprocessing TF-IDF

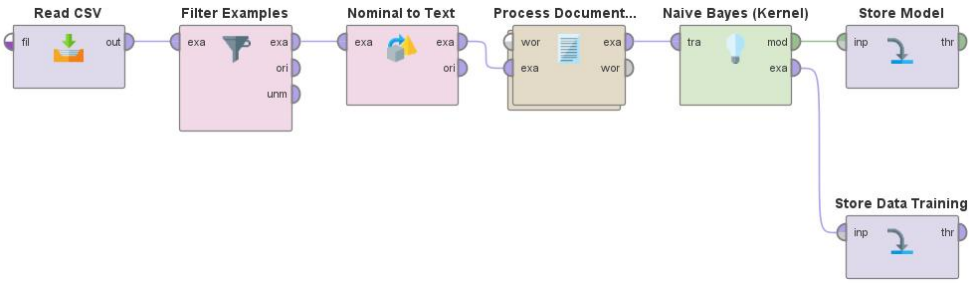


Figure 10. Training Data Processing

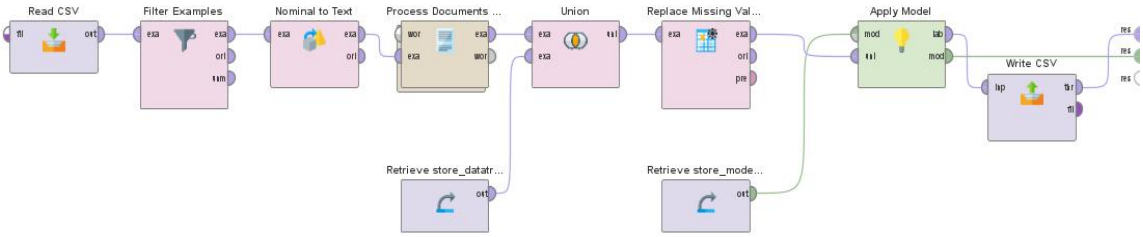


Figure 11. Classification Processing

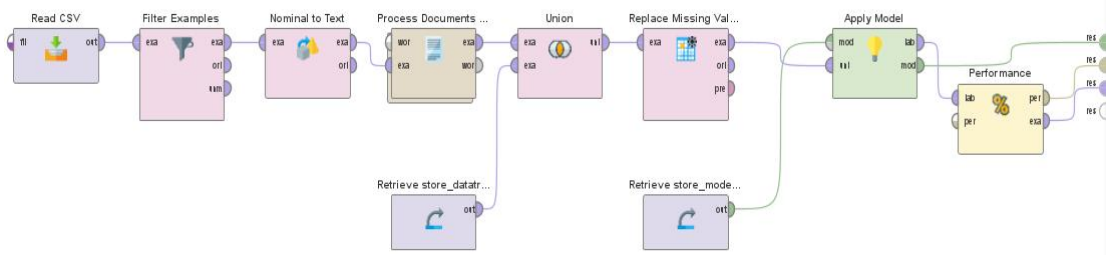


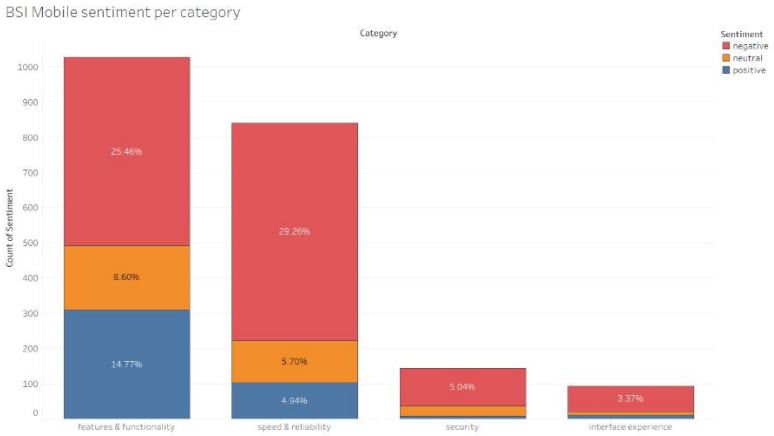
Figure 12 Peformance Analysis Operator

Figure 13. Word Cloud Features/Functionality

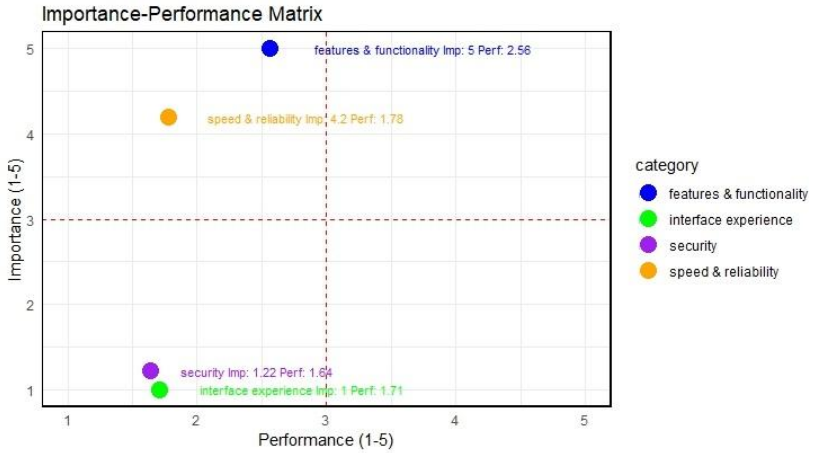
Figure 14. Word Cloud Speed/Reliability

Figure 15. Word Cloud Security

Figure 16. Word Cloud UI/UX



Graphic 1. BSI Mobile Sentiment Per Category



Graphic 2. Importance Peformance Matrix BSI Mobile

Table 1. Text Example Before and After Cleaning

Cleaning Object	Before Cleaning	After Cleaning
Annotations (Mentions)	@bankbsi_id @m4s4g03s @bsihelp Kalau mobile banking BSI bisa online kah?	Kalau mobile banking BSI bisa online kah?
Hashtags	BSI Mobile Banking Error Gangguan Hari Ini Sabtu 6 Juli 2024 Tidak Bisa Dibuka Apa Penyebabnya? Kapan Normal? #BSI #MBanking #error https://t.co/STgPS71xi1	BSI Mobile Banking Error Gangguan Hari Ini Sabtu 6 Juli 2024 Tidak Bisa Dibuka Apa Penyebabnya? Kapan Normal https://t.co/STgPS71xi1
URLs	BSI Mobile Banking Error Gangguan Hari Ini Sabtu 6 Juli 2024 Tidak Bisa Dibuka Apa Penyebabnya? Kapan Normal? https://t.co/STgPS71xi1	BSI Mobile Banking Error Gangguan Hari Ini Sabtu 6 Juli 2024 Tidak Bisa Dibuka Apa Penyebabnya? Kapan Normal?
Punctuation/Symbols	ribet jg bsi mobile banking cek rekening aja pake face id sama diminya pin pula-_-	ribet jg bsi mobile banking cek rekening aja pake face id sama diminya pin pula
Whitespace trimming	gatau selama ini gajian pake BSI aman2 aja cepet setelah cetak giro cuman UIUX nya mobile banking BSI ribet bgt ya allah bingung	gatau selama ini gajian pake BSI aman2 aja cepet setelah cetak giro cuman UIUX nya mobile banking BSI ribet bgt ya allah bingung

Table 2. Sample Training Data for Categories and Sentiments

full_text	category	sentiment
BSI keren euy bisa meraih penghargaan sebagai mobile banking terbaik #BSIbertransformasi https://t.co/ckSMatUEic	features & functionality	positive
@worksfess bsi mobila bni mobile banking	features & functionality	neutral
Jelek bngt mobile banking BSI cuma nyimpen riwayat 5 norek terakhir	features & functionality	negative
so far lebih suka tampilan mobile banking nya BRISyariah ketimbang tampilan baru nya di BSI	interface experience	positive
https://t.co/98Rk625m7B Hallo semuanya Kali ini aku coba menulis UI/UX Case Study - PART 2. Tentang Redesign Tampilan halaman utama (Homepage) dari Aplikasi BSI (Bank Syariah Indonesia) Mobile. Masih banyak yang perlu dikembangkan dari tulisan ini. Mohon Supportnya	interface experience	neutral
Di antara smua mobile banking yg pernah dipakai aplikasi BSI paling jelek. Sangat membingungkan..	interface experience	negative
@KediriFess KTP lebih enaknya Download BSI mobile daftar online dulu isi identitas yg sama seperti di KTP kalo uda tinggal dateng ke BSI cabang terdekat	security	positive
@bankbsi_id assalamualaikum bsi mohon bantuannya nih..akun bsi mobile saya terblokir..B13	security	neutral
ribet jg bsi mobile banking cek rekening aja pake face id sama diminya pin pula-_-	security	negative
@sbmptnfess Bsi nder..mobile banking nya enak digunain nya	speed & reliability	positive
@tanyakanrl hallo ini linknya syaratnya pengguna mobile banking / pengguna bsi mobile makasih semuaa https://t.co/kHF8nd0x5n	speed & reliability	neutral
Sistem e BSI ini uda jelek ribet dan mobile banking sering error. Mending tk tutup des	speed & reliability	negative

Table 3. Category Classification Peformance

accuracy: 97.99%

	true security	true speed & reliability	true interface experience	true features & functionality	class precision
pred. security	42	0	0	0	100.00%
pred. speed & reliability	0	139	0	3	97.89%
pred. interface experience	0	0	34	0	100.00%
pred. features & functionality	0	5	0	176	97.24%
class recall	100.00%	96.53%	100.00%	98.32%	

Table 4. Sentiment Classification Peformance

accuracy: 99.75%

	true negative	true neutral	true positive	class precision
pred. negative	219	0	0	100.00%
pred. neutral	0	82	1	98.80%
pred. positive	0	0	98	100.00%
class recall	100.00%	100.00%	98.99%	

Table 5. VRIO Analysis

Capability	V	R	I	O	Result
Financial Capacity for Innovation	Yes	No	No	Yes	Competitive Parity
Agile Operational Framework	Yes	Yes	Yes	Yes	Sustained Competitive Advantage
Human Capital Development	Yes	Yes	No	Yes	Temporary Competitive Advantage
Market Leadership through Sharia-Compliant Innovation	Yes	Yes	Yes	Yes	Sustained Competitive Advantage
Advanced Security Architecture	Yes	No	No	Yes	Competitive Parity
Intuitive User Interface and Experience (UI/UX)	Yes	No	No	Yes	Competitive Parity
Comprehensive Features and Functional Ecosystem	Yes	Yes	Yes	Yes	Sustained Competitive Advantage
Enhanced Speed and Reliability	Yes	No	No	Yes	Competitive Parity

Table 6. Value Chain Analysis

Supporting Activities	Firm Infrastructure					Value
	Strengthening digital infrastructure, rebranding, and implementing risk management frameworks.					
	Human Resource Management					
	Training programs, talent recruitment, and retention strategies with competitive incentives.					
	Procurement					
	Strategic partnerships, technology procurement with a focus on security measures and efficiency.					
	Technological Development					
	Advanced technology, AI-driven features, and collaborations to optimize the digital ecosystem.					
	Inbound Logistics	Operations	Outbound Logistics	Marketing and Sales	Services	
	Acquisition of technological parts and vectors, partnerships with tech suppliers like Figma, Micro Focus, and Checkmarx.	Process optimization for platform functions, including QRIS payments and sharia-compliant services.	Accessibility via Google Play Store, Apple App Store, and Huawei App Gallery, ensures good UI/UX.	Digital campaigns, referral programs, cashback promotions, and offline marketing strategies.	24/7 customer support, branch engagement for app promotion, and proactive customer service.	
	Primary Activities					