

A LESSON LEARNED FROM BSI ERROR SERVICE: A TWITTER TEXT MINING DATA APPROACH USING NVIVO

Nadia Nurul Izza^{1*}, Evania Herindar², Nashr Akbar³

^{1,3}Tazkia Islamic University, Bogor

² Value Activation Consultant

✉ nadian.izza31@gmail.com

Abstract : This research extensively examines Twitter trend data related to BSI (Bank Syariah Indonesia) error services, collecting 1,014 tweets in real-time using NCapture from NVivo 12 Plus within the timeframe of May 8-16, 2023. The key findings highlight that 81% of conversations regarding BSI error services carry a negative sentiment. Additionally, a word cloud identifies key terms such as "services" (2.21%), "transactions" (0.87%), "ransomware" (0.74%), and "trust" (0.42%). As a concrete solution, the research recommends enhancing the transparency of BSI management to the public and fostering close collaboration with relevant authorities such as OJK, BI, and LPS. Furthermore, the strengthening of BSI's cybersecurity is emphasized to mitigate risks. These findings not only provide in-depth insights but also present practical steps that can be implemented to protect consumers and restore public trust in the Islamic banking sector. As a valuable contribution to the literature, this research not only offers a snapshot of the current situation but also identifies relevant directions for future research. Overall, the study integrates comprehensive data analysis with impactful recommendations, establishing a robust foundation for understanding and continuous improvement in the management of BSI error services. Notably, this research is the first to use NVivo in collecting Twitter data related to BSI error services.

Keywords : *BSI; Service; Error; Twitter*

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1. INTRODUCTION

Proven through the competition in product quality, service provision, and extensive promotion, the evolution of the banking sector in Indonesia has captured the public's attention, with companies vying to offer the best services and customer satisfaction to attract attention (Syapsan, 2019). The primary goal of banks is to collect funds and facilitate transactions. The banking industry in Indonesia is currently adapting to technological advancements, driving the growth of Mobile Banking, a service provided by banks for online transactions (Purwanto et al., 2020). The capabilities of Mobile Banking include fund transfers, balance inquiries, account transfers, electricity bill payments, and prepaid credit top-ups, making it a crucial and frequently used service (Mohamed, 2019).

In tandem with the development of conventional banking, Islamic banking in Indonesia has also experienced rapid growth. Evidenced by the increasing market share of Islamic banking, reaching 6.51% at the end of 2020 and further advancing to 6.55% at the beginning of 2021. Additionally, the intermediation function of Islamic banking is performing well, with Positive Financing (PYD) and Third Party Funds (DPK) growing positively by 8.08% (yoy) and 11.98% (yoy), respectively. Thus, the growth of Islamic banking assets during that period reached 13.11% (yoy). By the end of 2020, the total assets, PYD, and DPK of Islamic banking reached Rp608.90 trillion, Rp394.63 trillion, and Rp475.80 trillion, respectively (OJK, 2020). On the other hand, Indonesia, as the country with the largest Muslim population globally, has witnessed sustained growth in the Islamic banking sector. Moreover, there is an increasing awareness among the population regarding the importance of conducting financial transactions in accordance with Sharia principles (Rahmayati, 2021). This phenomenon can be explained by the fact that Islamic banking operates based on principles such as justice, transparency, and the prohibition of usury, making it a financial system that is increasingly trusted and favored by those who want to manage their finances in a way that is not only halal but also in line with Islamic values (Fakhrunnas & Bekti Hendrie Anto, 2023; Izza, 2022).

Furthermore, Bank Syariah Indonesia (BSI), as the largest Islamic bank in Indonesia, offers various Sharia financial products and services to its clients (Fadli et al., 2023). As a leading Islamic bank, BSI is committed to providing the best services to its customers by offering quality products and services with advanced information technology. BSI is one of the national private banks that provides online and mobile banking services (Tiara, Achmad, & Nasarruddin, 2023). BSI uses a complex and integrated information technology system in its business operations. However, like any other information technology system, BSI faces several challenges, including service errors that can hinder the convenience of consumer transactions. Since Monday, May 8, 2023, Bank Syariah Indonesia's (BSI) services have been disrupted, causing customers to be unable to use mobile banking, ATMs, and branch personnel (CNBC Indonesia, 2023). This disruption is attributed to a cyberattack on BSI's system (CNN, 2023). Service errors at BSI have led to customer dissatisfaction and a lack of trust in BSI's services. In light of this service disruption at BSI, it is important to understand public opinions. Using the Twitter social media platform to analyze sentiment is one method that can be employed to gauge public opinion.

In the current era of Industry 4.0, Big Data has become an incredibly important element. Data generated from various applications, including social media, has reached impressive volumes. Up to 80% of all generated data is unstructured, including data originating from social media (Taleb, Serhani & Dssouli, 2018). In this context, social media data, especially from Twitter, becomes an extremely valuable source. Twitter allows access to large-scale public conversations in real-time, facilitating the analysis of current societal attitudes and opinions (Das & Kumar, 2013). Twitter's advantages as a data source include public access, informative metadata, and affordable data retrieval costs (He, Zha & Li, 2013), which are then used in various analyses such as descriptive analysis, network/cluster analysis, and sentiment analysis (Sinha et al., 2020). In Indonesia, Twitter plays a central role as a social media platform that enables individuals to share ideas, opinions, and thoughts across geographical and cultural boundaries (Aleisa, 2022). Social media has also

become the primary channel for expressing opinions, emotions, and information, including both fact-based and non-fact-based news (Zhang et al., 2018). In 2022, the number of Twitter users in Indonesia reached 18.45 million, equivalent to 4.23% of the global user base (Hootsuite, 2022).

This development has also entered the realm of research. Twitter data analysis is one of the most active research areas, and researchers in various fields acknowledge that this methodology has advantages and facilitates the identification of public sentiments or opinions. Several studies have been conducted to examine perceptions and growth in Islamic banking through social media. Based on publication data using Publish and Perish (PoP) with the keywords "Sentiment Analysis in Banking," there are only a few studies from 2021 to 2023 that discuss this topic. Among them, Achsani & Kassim (2021) researched social media analysis to investigate consumer sentiments regarding mobile banking. Rahul et al., (2021) investigated multi-strategy sentiment analysis based on semantic ambiguity in banking evaluations. Andrian et al., (2022) conducted sentiment analysis on the satisfaction of digital banking customers in Indonesia. Kurniawan et al., (2022) conducted sentiment analysis on the satisfaction of users of mobile banking applications in Malaysia. Ghobakhloo (2022) conducted research on the design of a personalized recommendation banking system using social media sentiment analysis. Through sentiment and thematic analysis of user reviews. On the other hand, sentiment research using the keywords "Sentiment" and "Islamic Banking" is still limited. In a literature review, only three studies were found, including Alotaibi, (2013) analyzing Twitter messages in the Saudi financial sector. Between 2007 and 2018, Cahyono et al., (2020) analyzed social media marketing efforts of Islamic institutions in Indonesia. Using SentiStrength, Haidar et al., (2022) tested perceptions of digital Islamic banking. Research by Izza et al., (2023) examined identifying and collecting issues discussed about Islamic banking from user activities, sentiments, and content on Twitter. This research used a qualitative approach by collecting data from 145,475 Twitter conversations using the Twitter Crawling technique with Drone Emprit Academy (DEA). From these observations, no research was found that specifically addressed sentiment regarding the service errors of Bank Syariah Indonesia using Twitter social media data and NVivo.

This research seeks to fill the literature gap by analyzing public sentiment on Twitter social media regarding Islamic banking, especially Bank Syariah Indonesia (BSI), using various approaches and data processing with NVivo for service errors. The purpose of this research is to examine, identify, and organize topics related to Islamic banking frequently discussed based on the activities, sentiments, and content of Twitter users. The goal of this analysis is to demonstrate to the general public and policymakers that there are diverse perspectives on BSI's service errors. Thus, it is expected to serve as a foundation for improvement for relevant parties regarding existing public sentiments, especially negative sentiments.

2. LITERATURE REVIEW

2.1 Islamic Banking

The trajectory of Islamic banking's evolution in Indonesia is intricately interwoven with the country's financial deregulation laws. As the nation's economic system surged forward, financial institutions, acting as intermediaries, experienced notable growth. The introduction of the dual banking system, encompassing both conventional and Islamic banks, unfolded with the enactment of Law No. 19 of 1998, a transformative amendment to Law No. 7 of 1992 on banking. Presently, the banking sector maintains its dominance within Indonesia's financial landscape, evident in the total assets of the financial system (Rahmatika, 2014; Zahra et al., 2018).

The emergence of Islamic financial institutions in Indonesia traces back to the early 1980s with the establishment of Baitut Tamwil-Salman in Bandung and Koperasi Ridho Gusti in Jakarta. This development gained further momentum in 1992 with the founding of the inaugural Islamic bank, Bank Muamalat Indonesia (Zulkhibri & Sukmana, 2017). A significant acceleration in the development of Islamic banking occurred when Bank Indonesia, the country's central bank, sanctioned the establishment of Islamic branches within conventional banks. These dedicated Islamic branches had the autonomy to offer Sharia-compliant banking products and services, boasting separate infrastructures, encompassing both staff and branches (Ascarya & Yumanita, 2008a).

The impetus for the establishment of Islamic banking stemmed from the dominance of conventional banks engaged in interest-based transactions. This prompted Muslim scholars to channel their efforts towards harnessing Sharia law to address these concerns (Achsani & Kassim, 2021). In a recent development, Indonesia not only successfully implemented the dual banking system but also introduced a comprehensive Islamic banking system operating concurrently with the conventional banking system, known as the Indonesian Islamic Banking (IIB) system, founded on Sharia principles (Junaidi et al., 2021). The inception of Islamic banking aimed to meet the burgeoning demand for Sharia-compliant financial services while steering clear of prohibited practices such as usury, gambling, and uncertainty. It also responded to societal demands for economic and financial activities aligned with Islamic teachings and principles (OJK, 2020).

Despite its relatively modest market share of 6.51% in 2020, Islamic banking's prominence expanded in tandem with the growth of assets, financing, and third-party funds (DPK) within the sector (OJK, 2022). Subsequently, Minister of State-Owned Enterprises Erick Thohir orchestrated the merger of state-owned Islamic banks, including BRI Syariah, BNI Syariah, and Bank Syariah Mandiri, culminating in the formation of Bank Syariah Indonesia (BSI). The establishment of BSI aims to serve as a new cornerstone for the nation's economic strength and propel Indonesia into a global leader in Islamic economics and finance (Puspaningtyas, 2020; Ulfa, 2021). This vision was fortified by the post-merger ascent of BSI to the 7th position among national banks, boasting total assets of Rp240 trillion, financing of Rp157 trillion, third-party funds amounting to approximately Rp210 trillion, and a core capital of Rp22.6 trillion (Sulistiyarningsih & Azkar, 2021).

2.2 Sentiment Analysis & Text Mining

Text data is pervasive across diverse domains, encompassing the web, social media platforms, news services, and extensive library repositories. The surge in the volume of unstructured textual data is notably influenced by the escalating ease in archiving human speech and expressions, aligning with the ongoing digitization of libraries and the omnipresence of the web and social networks (Aggarwal, 2015). At the forefront of harnessing the insights from this vast textual landscape is text mining, a multidisciplinary approach that amalgamates methodologies from data mining, machine learning, natural language processing, information retrieval, and knowledge management (Fahmi, 2018).

In the scientific realm, Twitter stands out as a positively acknowledged networking tool accessible to netizens globally, fostering accessibility and inclusion in scientific discourse through the integration of rich image content and alternative text (Power, 2022). This microblogging platform assumes a pivotal role in sentiment analysis, enabling the identification and categorization of text polarity to discern whether specific documents hold positive or negative values, as per predetermined categorizations (Wariantos et al., 2022). Notably, the open nature of Twitter encourages users to freely express their viewpoints on diverse topics, presenting an invaluable resource for comprehending public responses. This potential extends to aiding nations in shaping and influencing public behavioral responses, underscoring the platform's societal impact (Rahmanti et al., 2022).

The applications of text mining encompass various branches, with sentiment analysis occupying a significant position. According to Liu (2015), sentiment analysis, or opinion mining, involves the computational examination of opinions, sentiments, emotions, evaluations, and attitudes expressed by individuals toward entities such as products, services, organizations, individuals, issues, events, topics, and their attributes. This analytical approach is frequently employed to gauge public sentiments on specific matters. The primary objective of sentiment analysis is to classify the polarity of text, ranging from the document level to phrases, features, and aspects, elucidating whether the opinions conveyed are positive, negative, or neutral (Rusydiana & Izza, 2022).

The evolution of sentiment analysis has positioned it as a vibrant and dynamic research area within natural language processing (NLP) since the early 2000s. Beyond computer science, sentiment analysis has transcended disciplinary boundaries, influencing research in management and various social sciences, including marketing, finance, political science, communication, health sciences, and even history. This cross-disciplinary proliferation underscores the critical role sentiment analysis plays in informing decision-making processes. Opinions, as the essence of human activities, exert a profound influence on our beliefs, perceptions, and choices. Consequently, when making decisions, individuals often seek the opinions of others as valuable references (Zhang et al., 2018). This dynamic interplay

between technology, human expression, and societal influence continues to shape the trajectory of sentiment analysis, positioning it as a cutting-edge field at the forefront of advancing our understanding of human behavior in the digital age.

2.3 Previous Study

The field of Twitter data analysis has burgeoned into one of the most dynamic areas of research in natural language processing (NLP). Researchers across various disciplines recognize the advantages of this methodology, particularly in identifying sentiments or opinions within specific issues, notably those related to Islamic banking on social media. Mishan S. Alotaibi (2013) conducted a study analyzing Twitter messages in the Saudi banking sector using a simple content analysis to code each of the 140 characters in an Excel sheet. The results revealed a strong correlation between Twitter messages and widely disseminated information, leading Alotaibi to believe that Twitter data can serve as a valuable resource for promotion, conversations, and news dissemination among potential bank clients, ultimately promoting business.

A similar study by Cahyono et al. (2020) aimed to analyze social media users' perceptions, particularly Twitter users, regarding social media marketing efforts by Islamic banks in Indonesia. Employing a quantitative approach, the researchers calculated tweet frequencies based on the 7P marketing categories and collected over 500,000 tweets by Twitter users in Indonesia containing the phrase 'Bank Islam' between 2007 and 2018. Data were analyzed using R software and managed using R-Python software. The findings indicated that the 'community' factor received the most responses from social media users, primarily Islamic bank customers, garnering both positive and negative sentiments. These findings offer crucial insights for effective marketing strategies by Islamic banks.

Finally, research by Haidar et al. (2022) examined perceptions of digital Islamic banking within the scope of Islamic economics from a scholarly perspective. The published journal article discussed the development of digital Islamic banking with sentiment analysis based on secondary data, consisting of 70 articles processed using MS Excel 2019 and SentiStrength. The study revealed an increasing quantity of research on digital Islamic banking in academic literature each year. Sentiment analysis results indicated diverse expert opinions, with a positive sentiment at 36%, negative sentiment at 18%, and neutral-negative sentiment at 46%.

As highlighted in the literature, the researchers observed limited studies related to sentiment analysis using Twitter social media, and no study was found that specifically examined sentiment analysis of BSI error services using Nvivo 12 Plus. Thus, this research emerges as a pioneering effort, being the first to delve into this topic with distinct platforms and keywords, generating novel visualizations in the process.

3. METHODOLOGY

The research methodology explores the steps used in the qualitative analysis of tweets related to the BSI error case on Twitter social media. Initially, data was collected using NCapture, a utility provided by NVivo, with predefined keywords such as "BSI", "Bank Syariah Indonesia", "error", "LockBit", "cyber", "layanan", "transaksi", "ransomware," and "down". A total of 1,014 tweets were gathered from May 8 to May 16, 2023, selected based on the trending topic related to the cyber ransomware attack experienced by PT Bank Syariah Indonesia (BSI) and service disruptions (Kompas, 2023). The collected data included user profile information (user id, username, number of followers) and tweet details (user, timestamp, geolocation, number of retweets, number of replies, and tweet content). The data in nvcx and excel formats were processed and analyzed using NVivo 12 Plus software to automatically utilize and separate data into sentences, paragraphs, or unique text strings using the autocode wizard. The Auto Code Wizard was then used to derive results from the analyzed sources. After creating the node matrix, the content was coded into sentiment nodes.

The next steps in this research also involve a flexible thematic analysis method, allowing adjustments according to research needs and contributing to detailed and reliable data (Nowell, et al., 2017; Braun & Clarke, 2006). Thematic analysis helps identify, examine, and report patterns in detailed data, facilitating the interpretation of various aspects of the research topic (Alhojailan, 2012). To enhance accuracy and efficiency in extracting research findings, this process relies on NVivo software, specifically NVivo 12 Plus, enabling the collection, categorization, mapping, analysis, and visualization of qualitative data (Kaurav et al., 2020; Izza & Rusydiana, 2022). The process begins by importing tweet data using NVivo 12 Plus, followed by using word frequency query tools to analyze text based on frequently occurring words or concepts related to the BSI error case, allowing the revelation of main themes through automatic coding. Additionally, various visualization tools such as word clouds, hierarchy diagrams, and project maps are employed to better understand the collected and categorized data (Izza & Rusydiana, 2023). Overall, by automating the text analysis process, this research aims to uncover trends in research related to the use of words and texts in discussions about the BSI error case on Twitter.

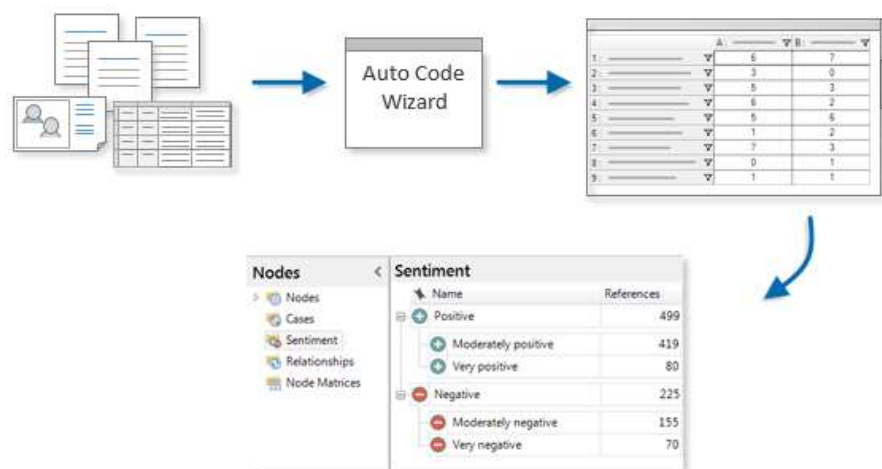


Figure 1. Research Process (QSR International, 2011)

4. RESULT AND DISCUSSION



Figure 2. Wordcloud of BSI Error Service Tweet

The results of the WordCloud analysis on Twitter related to the Bank Syariah Indonesia service error incident in May 2023 reveal several prominent conversation patterns. Significantly, the keyword "Service" appears with the highest percentage, reaching 2.21%. This indicates that many Twitter users are discussing issues related to the services provided by the bank, both as complaints and criticisms of handling errors. Additionally, "Transactions" appear with a percentage of 0.87%, indicating that a significant portion of the conversation is related to disruptions in banking transactions during that period. This raises concerns and questions about its impact on customers. Furthermore, the word "Ransomware" appears at a rate of 0.74%, suggesting suspicions of a ransomware attack or potential security breaches that could be the cause of the error. Lastly, "Trust," with a percentage of 0.42%, indicates that public trust in Bank Syariah Indonesia is a concern, and the occurrence of the error may affect the level of trust. In addition to these words, the results of automatic coding also reveal other interesting terms that may be worth further exploration. Terms such as dark web, system, communication, customers, ATM, employees, disruptions, mobile, protection, and customer data reflect various issues related to the incident of errors in BSI, which are the focus of the research.

Next are semantically shaped words that are then categorized in the form of a hierarchical diagram showing how the data parts are interconnected hierarchically. Having a hierarchical diagram will help us see how related themes are to each other and how data is grouped into larger and smaller parts. This diagram helps us clearly see how the structure of themes works and how these themes relate to each other.

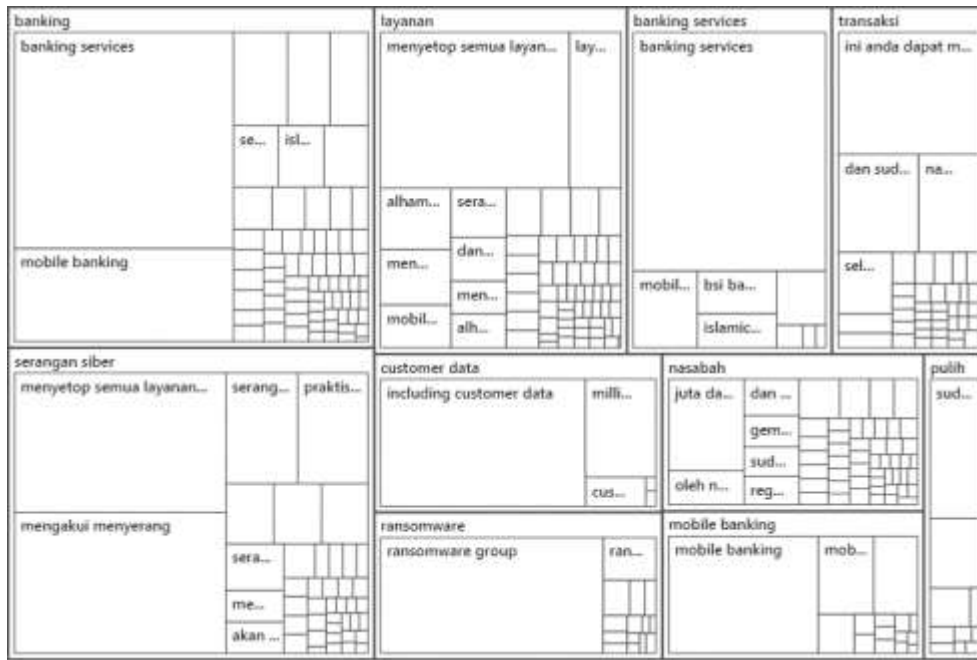


Figure 3. Hierarchy Chart of BSI Error Service Tweet

The results of automatic coding produce a hierarchical chart that provides valuable insights into Twitter discussions about the system service error in Bank Syariah Indonesia in May 2023. In this analysis, several dominant themes consistently emerge in discussions reflecting the public's perception and main concerns regarding various aspects of the incident. Frequently appearing themes include cyber attacks, banking services, customer data, ransomware, banking services, transactions, customers, mobile banking, and recovery efforts. Among these charts, the term "cyber attack" has a larger square size compared to others.

The theme of "cyber attacks" stands out in the hierarchy with a larger box size than other themes. This indicates that cyber attacks are the most talked-about aspect and the main focus in the context of this incident. The community clearly has significant concerns about cybersecurity and the potential risks that can affect banking services and customer data security. This reflects the importance of the role of cybersecurity in the banking industry and the serious impact of such incidents. Additionally, other themes such as banking services, transactions, and customers also play a crucial role in the conversation, showing how the incident affects the daily use of banking services, transactions, and the relationship between the bank and its customers. The "recovery" theme reflects the efforts made by Bank Syariah Indonesia to restore customer trust and improve services post-incident.

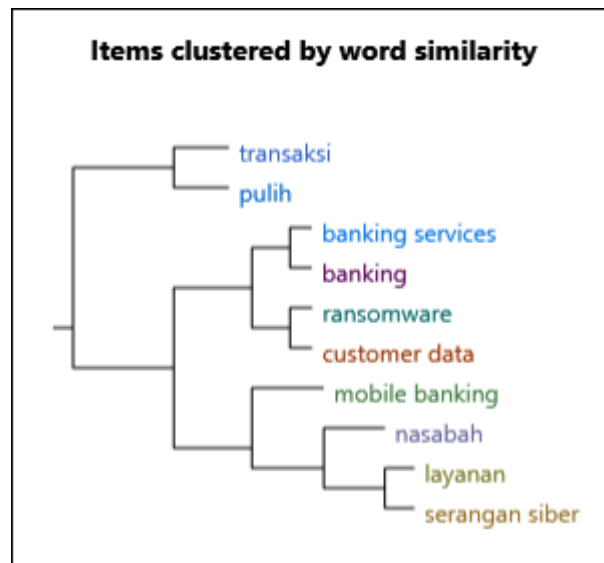


Figure 4. Cluster Analysis of BSI Error Service Tweet

Furthermore, Figure 4 illustrates cluster analysis, a technique used to explore and visualize patterns. This is employed to obtain detailed and comprehensive results, enabling the determination of discussion topics from the BSI service error trends on Twitter. From these results, there are 3 conversation clusters derived from the grouping of words and their relationships.

- **Cluster 1: Cyber Attacks and Their Impacts**

"The cluster of cyber attacks related to services, customers, and mobile banking highlights crucial discussions in the context of events at Bank Syariah Indonesia. This cluster illustrates how cyber attacks have affected various operational aspects of the bank and customer experiences. In this context, service issues emerge as one of the core discussions. Cyber attacks in the digital realm may have disrupted banking services, such as inaccessible online systems or delayed transactions. This has caused frustration among customers who rely on these services for their financial needs. Customers become a significant part of this cluster as the security of customer data may be jeopardized in a cyber attack. This raises concerns among BSI customers about the possible leakage of their personal data or potential misuse of information that may occur due to the attack. Customer trust in the bank can also be affected by the impact of cyber attacks on the security of their data.

Additionally, this cluster also includes mobile banking, which is one of the ways many customers interact with the bank. Cyber attacks involving mobile banking can result in fraud or unauthorized access to customer accounts through mobile devices. Therefore, when a cyber attack related to mobile banking occurs, it can raise additional concerns and require serious attention to protect customer security. Overall, cyber attacks have broad impacts that encompass many operational aspects of the bank and customer experience. Security and trust are the two most prominent aspects in this cluster, and appropriate actions need to be taken to address risks and restore customer confidence."

- **Cluster 2: Ransomware and Banking Services**

The ransomware cluster related to banking services and customer data indicates a significant level of threat to Bank Syariah Indonesia. In this context, ransomware attacks have been the main focus of discussion. This cluster illustrates how ransomware attacks can disrupt the operational banking services, causing inconvenience for customers who rely on these services for their financial needs. Transactions, withdrawals, and access to customer accounts may be disrupted, creating detrimental uncertainty.

Furthermore, this cluster also reflects serious concerns about the security of customer data. Ransomware attacks have the potential to threaten the confidentiality and integrity of sensitive data such as identity information, account numbers, and transaction records. This cluster underscores the importance of protecting customer data and the serious impact that can occur if this data falls into the wrong hands. Going forward, Bank Syariah Indonesia should address ransomware attacks with strict security measures and swift recovery efforts to maintain customer trust and secure their data effectively.

- **Cluster 3: Services Recovery**

The recovery service cluster related to the keyword 'recovery transactions' indicates that the main focus of the conversation is the process of restoring banking services after an incident. The keyword 'recovered transactions' illustrates Bank Syariah Indonesia's efforts to restore disrupted transactions during the incident period. This reflects awareness of the significant impact that customers may experience due to such disruptions, such as transaction delays or failures. Discussions in this cluster emphasize that transaction recovery is a top priority in the bank's efforts to restore customer trust and ensure the smooth operation of banking services. In connection with this, Bank Syariah Indonesia has taken active measures to repair and strengthen its infrastructure to be more resilient to similar incidents in the future.

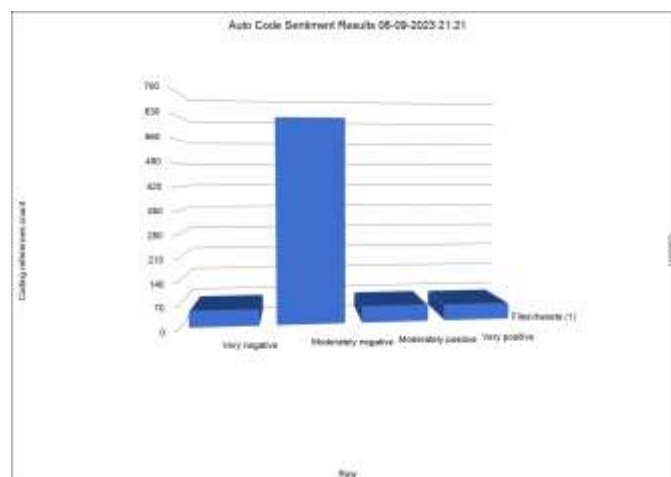


Figure 5. Bar Chart of Sentiment BSI Error on Twitter

Next, the author conducted sentiment analysis using automatic sentiment coding from NVivo 12 Plus to ensure the presented results are objective. In general, sentiments are displayed in Figure 5 in the form of a bar chart. Sentiment analysis will provide an expression of sentiment, allowing us to determine whether the sentiment is positive or negative. Moreover, this process employs a scoring system where each word is assigned a pre-determined score, ranging from very positive to very negative (Pazmiño et al., 2020; Rusydiana & Izza, 2022). Subsequently, the results are used to understand netizens' perceptions of the events at BSI.

The research findings indicate that the majority have a fairly negative attitude. The figures explain that 81% of sentiment-coded references are fairly negative, followed by 7% having a fairly positive sentiment, then references with a very negative sentiment at 6%, and lastly, references with a very positive sentiment at 6%. The implications of these research findings are highly relevant in understanding public views and responses to the incident at Bank Syariah Indonesia (BSI). The discovery that the majority of conversations have a fairly negative sentiment, with 81% of references indicating such sentiment, suggests that this incident has had a significant negative impact on public perception. This implies that many people are worried, disappointed, or dissatisfied with how Bank Syariah Indonesia handled the incident.

Meanwhile, the fact that only a small portion of the conversations contains moderate positive sentiment (7%) indicates a low level of optimism or satisfaction with the bank's response and actions. Additionally, the presence of very negative sentiment (6%) highlights the need for Bank Syariah Indonesia to improve their communication with customers and the public in general during crises like this. Furthermore, the existence of 6% of conversations with very positive sentiment shows that there are also people who appreciate the steps the bank has taken in recovering from the incident. This is a positive aspect that can serve as a foundation for rebuilding public trust and enhancing the bank's reputation. Thus, these research findings suggest that Bank Syariah Indonesia needs to focus on improving communication and implementing more effective recovery efforts to address the prevailing negative sentiments and rebuild customer and public trust."

FINDINGS

The research results revealed several significant findings regarding the Bank Syariah Indonesia (BSI) service error incident in May 2023. First, through WordClouds analysis, the themes that most dominated the conversation were service, transactions, ransomware and trust. Negative sentiment regarding banking services and transaction problems appeared to be a major concern in Twitter discussions. Additionally, through hierarchical graph analysis, frequently emerging themes were identified, with highlights on cyberattacks, banking services, customer data, ransomware, banking services, transactions, customers, mobile banking, and recovery efforts. "Cyber attacks" emerged as a key focus in these discussions, reflecting concerns over cyber security and its impact on banking services.

Next, conversation cluster analysis identified three main clusters: cyberattacks and their impact, ransomware and banking services, and service recovery. This cluster illustrates the complexity of issues related to the BSI incident, including the threat of cyber attacks, the impact of ransomware on banking services, and the recovery efforts required to restore customer trust and improve services.

Finally, the results of sentiment analysis show that moderate negative sentiment dominated the conversation with 81% of references expressing dissatisfaction and concern with the handling of the BSI incident. This is as shown in the research, research shows that bank service response, communication and error recovery can significantly influence customer sentiment. Nyagadza (2022) mentioned related responses where emotions were found to have a direct positive influence on e-banking customer satisfaction evaluations during e-service failure and e-service recovery. This suggests that a quick and empathetic response to service errors can help improve customer sentiment. Furthermore, Mathew (2020) explains that successful recovery of faulty services can increase assurance and trust among customers. In the banking context, e-service recovery quality was found to be positively related to e-service recovery satisfaction, which was moderated by perceived fairness. This shows that a fair and effective recovery process can help improve customer sentiment. Thus, in overcoming this negative sentiment, in the future BSI needs to provide a fast and empathetic response, effective communication, and a fair and effective recovery process so that it can help increase customer satisfaction and loyalty.

Positive sentiment, both moderate and very positive, was limited, with only 13% of references reflecting a positive response. The implication is that Bank Syariah Indonesia needs to increase response, communication and recovery measures in dealing with similar incidents in the future, as well as maintaining the trust of customers and the general public. From these findings, this research identifies several points related to further research that can be taken by future researchers in the context of the aftermath of the BSI incident so that it can help banks and the banking industry as a whole to learn from this experience.

Table 1. Further Research

Topic	Further Research
Financial and Operational Impact	Conduct a more in-depth analysis of the financial and operational impact experienced by BSI after the incident. This can include recovery costs, lost revenue, and assessing the effectiveness of the recovery plan.
Reputation Impact Analysis	Measure the impact of incidents on BSI's reputation in the long term. This involves understanding how the public's perception of the bank is changing and how this is affecting customer numbers, investment and the company's image.
Cybersecurity Improvements	Evaluate and update BSI's cybersecurity measures to prevent similar incidents. Research can help in identifying security gaps and implementing more effective countermeasures.

Comparative Analysis with Similar Cases	Comparing BSI's response and actions with other banks that also experienced similar incidents. This can help in identifying best practices and effective measures in dealing with such incidents.
Customer Satisfaction Study	Conduct surveys or more in-depth research regarding BSI customer satisfaction after the incident. This can help in understanding the extent to which customers are satisfied with recovery efforts and whether there has been a change in their behavior.
Regulatory and Compliance Review	Examining BSI's compliance with banking regulations and cybersecurity policies and how the incident affected relations with regulatory authorities.
Recovery Plan Development	Improve its emergency recovery plan and routine testing to ensure BSI is prepared for similar incidents in the future.

Source: from various sources (2023)

CONCLUSION

In order to describe the public's views and responses to the service error incident that occurred at Bank Syariah Indonesia (BSI) in May 2023, the results of this research reveal a number of important findings. The main finding was that conversations related to these incidents tended to be negative in sentiment, reflecting society's disappointment, dissatisfaction and concern with how the issue was handled. WordClouds' analysis results highlight keywords that appear frequently in conversations, including "service," "transaction," "ransomware," and "trust." This illustrates the deep concern for these aspects in the BSI incident.

As a recommendation from this research, several steps can be taken to improve response and prevention in dealing with similar incidents in the future. First, BSI's top management should be more transparent in communicating with the public and relevant authorities about the incident. In this regard, BSI cybersecurity improvements are also imperative to prevent similar attacks in the future. Apart from that, there needs to be integration of the relevant authorities, such as the Financial Services Authority (OJK), Bank Indonesia (BI), and the Deposit Insurance Corporation (LPS), to take coordinated action in the context of risk mitigation and consumer protection. This effort will not only help protect customer interests, but also restore public trust in the Islamic banking industry as a whole. It is hoped that this research will make a positive contribution in understanding how society responds to incidents of this kind and how appropriate actions can be taken by financial institutions and authorities to maintain the security and stability of the Islamic banking industry.

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