



Sentiment and Digital Discourse Analysis of Sukuk on X: Text Mining of Dominant Themes and Public Perception

Rida Rizkiani¹, Muhamad Subhi Apriantoro^{2*}

^{1,2} Universitas Muhammadiyah Surakarta, Indonesia

Article Info	Abstract
Article history: Received March 10, 2026 Revised April 13, 2026 Accepted June 27, 2026 Available online August 15, 2026 *Corresponding Author Email: msa201@ums.ac.id Keywords: Islamic Finance, Sentiment Analysis, Social Network Analysis, Sukuk, X.	Introduction/Main Objectives: This Study Examines Public Discourse On Sukuk On X (Formerly Twitter) Using Text Mining And Sentiment Analysis To Identify Dominant Themes And Public Perceptions. Research Methods: A Total Of 452 Sukuk-Related Posts Collected From 4 August To 30 September 2025 Were Analyzed Using Orange Data Mining For Preprocessing, Tokenization, Sentiment Classification, Keyword Extraction, And Visualization. Finding/Results: Neutral Sentiment Dominated Sukuk Discourse, Followed By Positive Sentiment, While Negative Sentiment Was Limited. English-Language Posts Were More Positive, Whereas Indonesian Posts Were Mostly Informational And Neutral. Dominant Themes Included Investment, State Financing, Sharia Principles, Green Finance, And Indonesia's Role In Global Islamic Finance. Conclusion: The Study Extends Islamic Finance Research By Applying Sentiment And Digital Discourse Analysis To Sukuk-Related Social Media Discussions.
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INTRODUCTION

One of the Islamic financial instruments that has expanded rapidly over the last few decades is sukuk. Sukuk refers to long-term Sharia-compliant securities issued by an issuer to sukuk holders, under which the issuer is obliged to pay income to the holders in the form of profit sharing, margins, or fees, and to repay the principal at maturity (Delle Foglie & Keshminder, 2024; Ma & Mahomed, 2026). Unlike conventional bonds, which are based on debt and interest, sukuk represents ownership of the underlying assets and operates in accordance with Sharia principles, including prohibitions on unjust enrichment, uncertainty, gambling, and speculation (Kasnelly, 2021).

The rapid growth of the sukuk market has outpaced the growth of Islamic banking (Nastiti & Kasri, 2019). This growth is reflected in the 2021 International Islamic Financial Market (IIFM) Sukuk Report, which recorded a 7.72% increase, reaching USD 188.12 billion. This expansion has been driven by global economic stimulus measures (Naz & Gulzar, 2025; Suhartini, 2025), inflationary pressures (Ustaoğlu & Karabalık, 2025), and rising commodity prices, particularly in the oil sector. As the second-largest subsector of Islamic finance, sukuk has expanded its global influence across both Muslim-majority and non-Muslim countries (Nurhanifah, 2024).

The global Islamic financial market has experienced significant and rapid development, with more than 810 institutions operating across roughly 50 countries and a strong concentration in the Middle East (Fang, 2014; Harrison & Ibrahim, 2016; Arzayeva et al., 2017; Caprio, 2013; Alhammadi, Archer, & Asutay, 2020; Kok & Filomeni, 2021; Wiwik Permatasari & Syamsurianto, 2024). According to Franklin Templeton, global sukuk issuance is estimated to reach approximately USD 170 billion in 2024, indicating stable growth from the previous year and reflecting sustained interest in Sharia-compliant financial instruments (Ayu Ariska & Ulfa Luthfiyah Buhari, 2024). The sukuk market is dominated by Asia and the Far East (67%) and by the Gulf Cooperation Council (GCC) and the Middle East (26%), with Malaysia, Saudi Arabia, and the United Arab Emirates serving as major players. In addition to functioning as an ethical investment instrument, sukuk also supports infrastructure financing (Bakar, Handayani, & Sukmadilaga, 2021), sustainable projects (Salimianrad, Borimnejad, & Dehyuori, 2021), and fiscal stability. However, structural challenges remain, including limited standardization of Sharia structures across jurisdictions, unfavorable tax frameworks, and constrained liquidity in secondary markets. These conditions require multinational collaboration to create a more integrated and transparent sukuk market (Yıldırım Seda & Durmus Cagri Yıldırım, 2025).

Islamic finance plays an important role in supporting global economic growth, particularly in Southeast Asian countries. Its development is not limited to commercial financial activities but also aims to support the Sustainable Development Goals (SDGs). Various Islamic social and financial instruments have been used to address poverty, hunger, and unequal wealth distribution. Nevertheless, the role and development of Islamic finance in supporting these objectives continue to require further investigation. A critical analysis of previous studies is

therefore needed to identify future research directions and areas requiring broader development. In this context, bibliometric analysis of Scopus-indexed Islamic finance publications from 1979 to 2022 has been used to trace research trends, scope, and prospects (Apriantoro, Muthoifin, & Athief, 2023).

In Indonesia, the potential for sukuk development is substantial, yet several constraints must be addressed to accelerate its growth as a financing and investment instrument. Barriers include inadequate legal infrastructure for sukuk issuance, limited quantity and quality of human resources with sufficient knowledge of sukuk instruments, and low public trust in Islamic financial products and services (Abubakar & Handayani, 2017). Sukuk is an important project-financing instrument in Islamic economics. As of 21 December 2018, project financing using sukuk had reached IDR 22.52 trillion. The Ministry of Finance reported that this amount increased by approximately 34.36% from IDR 16.76 trillion in the previous year. Financing increased from IDR 800 billion in 2013 to IDR 1.57 trillion in 2014, IDR 7.17 trillion in 2015, and IDR 13.67 trillion in 2016 (Fadzlurrahman & Abubakar, 2019). Weak coordination among stakeholders and limited governmental support for the Islamic financial industry have also been noted. The development of sukuk has shown significant progress since the enactment of Law No. 19 of 2008 concerning State Sharia Securities (SBSN) (Mahomed & Mahbot, 2024; Naz, Gulzar, & Hassan, 2026).

Sukuk is used not only to cover the state budget deficit but also to finance infrastructure, agriculture, maritime development, and regional empowerment (Aliyu & Ibrahim, 2025; Uluyol, Azizoglu, & Yumuşak, 2026). By 2021, the allocation of SBSN financing had reached IDR 27.58 trillion for 847 projects across Indonesian provinces (Selim et al., 2023; Naz, Gulzar, & Hassan, 2026). In the corporate sector, although sukuk accounted for only 3.99% of total corporate bonds up to 2016, outstanding sukuk continued to grow, reaching IDR 30.25 trillion in 2021, with the *ijarah* contract structure remaining dominant due to its relative stability.

As of February 2025, the number of Indonesian capital-market investors reached 15.50 million, with mutual-fund investors dominating and increasing by 2.24% to 14.63 million (Kim & Kim, 2020; Mercado, Rubio, & Scapin, 2025). The number of investors in stocks and other securities also increased to 6.60 million (Yang, 2002; Kim & Kim, 2020). However, investors in government securities (SBN) decreased by 0.32% to 1.20 million, indicating unequal interest across investment instruments (Murgor & Saxunova, 2022). Recent data also show a decline in the number of new retail sukuk investors, from 44,331 in 2022 to 30,817 in 2024. In contrast, sukuk tabungan showed an upward trend, reaching 36,699 new investors in the same year. This suggests that growth in retail sukuk investors is driven mainly by repeat investors, while interest among new potential investors tends to decline (Supyadillah & Arif, 2025). Retail sukuk nevertheless offers several advantages, including fixed returns, flexible tenors, tradability in secondary markets, and state guarantees (Oktavia et al., 2025).

Indonesia's Islamic capital market has grown rapidly over recent decades, driven by increasing public awareness of Islamic economic principles. As one of the countries with the

largest Muslim populations in the world, Indonesia has substantial potential to become a global center for Islamic capital markets. However, data from the Financial Services Authority (OJK, 2023) show that Islamic financial literacy in Indonesia was only 8.93% in 2023. This figure reveals a wide gap between the potential of the Islamic capital market and its actual use by the public. Such a gap limits the Islamic capital market's contribution to national economic stability, particularly in promoting sustainable financial inclusion (Madi, 2025).

The Islamic financial industry in Indonesia has become a major driver of inclusive national economic growth. Institutions such as Islamic banks, takaful companies, Islamic capital markets, and Islamic microfinance institutions have advanced the development of economic instruments grounded in justice and profit-sharing principles. Although asset values have increased steadily, the sector still faces structural challenges that limit its ability to optimize its contribution. According to the OJK Islamic Banking Snapshot for March 2026, total Islamic banking assets exceeded IDR 1,050 trillion. Despite this increase, the market share of Islamic banks in the national banking sector remains between 7.5% and 8% (Suharti et al., 2026). Governments and corporations in OIC countries use sukuk to finance infrastructure projects and state budgets. Nationally, sukuk tabungan and retail sukuk have become increasingly popular as relatively safe alternative investments. Fitch Ratings estimates that the sukuk market will maintain strong fundamentals, with the sukuk share in emerging markets projected at approximately 41% in GCC countries, 16% in ASEAN, and 8% in Türkiye. Fitch also monitors the Maldives (CC), whose sukuk payment in April 2026 will pose challenges based on debt capital market issuance (Fitch, 2026).

Green economic practices are strongly aligned with *maqasid al-sharia*. This relationship is reflected in efforts to preserve religion, life, wealth, and lineage, particularly through support for food security. Therefore, the objectives of Sharia can serve as a foundation for developing future sustainable economic models. *Maqasid al-sharia* also shows that economic activity should not be driven solely by profit but should be guided by religious values to remain just, responsible, and oriented toward human welfare (Apriantoro, Rahayuningsih, & Sarwanto, 2022).

Alongside this growth, social media has become a virtual public sphere that allows society, especially Millennials and Generation Z, to express opinions, articulate social concerns, and participate in political and economic discourse in a more inclusive and egalitarian manner. This space functions not only as a medium for information exchange and public opinion formation but also as a medium for critiquing power relations. However, social media is also vulnerable to misinformation, hoaxes, and symbolic violence, which may disrupt the quality of public discourse (Kadir, 2022). Platforms such as X enable users to express their opinions, experiences, and perceptions about investments, including sukuk. These public perceptions may shape the image of sukuk and influence investment interest, either positively or negatively. For example, one X account, @jihadzid, stated in response to @tanyakanrl that sukuk is among the safest investments because it carries lower risk than stocks or mutual funds (CSV Sukuk).

At the same time, social media often fails to maintain rational deliberation in the public sphere because it is frequently dominated by emotional comments, sarcasm, hate speech, and disinformation that disregard Habermasian principles of deliberative communication, namely sincerity, truthfulness, normative appropriateness, and comprehensibility. Instead of becoming a rational arena that builds social solidarity and promotes consensus based on shared interests, social media may become an anarchic public space vulnerable to cyberbullying, polarization, and discursive fragmentation. Although it has the potential to serve as a democratic and inclusive resource for public opinion, its actual use often fails to fulfill its ideal role as a constructive arena for rational dialogue.

Sentiment analysis can provide an overview of public opinion by classifying views as supportive, opposing, or neutral. As a computational method, sentiment analysis identifies opinions and emotions toward an object, event, or topic by analyzing text in the form of documents or sentences and classifying the opinions into positive, negative, and neutral categories. It can also detect emotional nuances, such as sadness, happiness, or anger, based on textual evidence. For these reasons, the issue warrants further investigation.

Research Significance

As sukuk develops into a leading Islamic financial instrument, public interest continues to increase due to both internal and external factors. Sukuk offers halal investment, freedom from *riba*, *gharar*, and *maysir*, and a sense of security. Strong governmental support can strengthen public trust, while innovations such as green sukuk, active participation by financial institutions, stable sukuk performance, and transparency further enhance its appeal, particularly among younger generations such as Generation Z. Nevertheless, sukuk development is still constrained by low public understanding of the instrument, its underlying Sharia principles, and its social and economic impacts. These constraints may reduce public participation.

Social media platforms such as X serve as virtual public spaces where Millennials and Generation Z can express opinions that may affect trust, investment interest, and financial market stability. However, these spaces often struggle to sustain rational discussion because they are dominated by emotional comments, sarcasm, and hate speech that overlook the principles of deliberative communication, namely sincerity, truthfulness, normative appropriateness, and comprehensibility. Public conversations, comments, and responses spread widely on such platforms and may create either positive or negative perceptions of sukuk.

The urgency of this study lies in the capacity of sentiment analysis to provide a comprehensive picture of public opinion by classifying views as positive, negative, or neutral and by detecting emotional nuances such as sadness, happiness, or anger in textual data. Sentiment analysis can objectively map the level of public acceptance. In addition, the use of Orange Data Mining provides a more applied and visual approach to processing social-media text data. This study is therefore relevant and timely because it addresses the need for data-driven analysis of public perception toward sukuk in the digital era.

Research Gap

Previous studies on sukuk have been dominated by bibliometric and systematic literature review approaches that map publication trends, topic clusters, and academic developments such as green sukuk, SRI sukuk, and innovation in Islamic financial instruments. Although these approaches are useful for understanding the global development of sukuk research, they tend not to address the dynamic public perceptions that emerge on social media. Studies that specifically examine public perceptions of sukuk on social media, particularly on X (Twitter), remain limited compared with studies of other conventional financial instruments.

Social Network Analysis (SNA) has been widely applied in social media research to stock market discourse, public policy, and digital economic issues. These studies have successfully identified key actors, interaction patterns, and communication-network structures in digital financial discourse. However, the focus has mostly remained on conventional instruments such as stocks and crypto assets, while Islamic financial instruments, particularly sukuk, have received relatively little attention. Consequently, actor-network characteristics and discourse dynamics specific to sukuk remain empirically underexplored.

Several studies have begun to combine SNA with sentiment analysis and topic modeling to interpret public opinion on social media. However, these studies generally use conventional text-mining approaches and focus on stocks or crypto assets without engaging with Islamic financial instruments. Moreover, studies specifically analyzing sukuk sentiment using Orange Data Mining have not been widely identified, even though this tool has been used for sentiment analysis of stock markets and crypto assets due to its strengths in workflow visualization and text classification integration.

The research gap becomes clearer because no study has yet integrated dominant discourse themes and public sentiment toward sukuk using visual workflow-based text mining within a single social media data framework. Previous studies have tended to separate thematic analysis and sentiment measurement, or focused heavily on conventional assets like crypto and stocks. Based on these gaps, this study offers a comprehensive approach by combining thematic discourse mapping with automated sentiment analysis using Orange Data Mining on X.

Based on these gaps, this study offers a more comprehensive approach by examining sukuk discourse through a combination of thematic discourse mapping and sentiment analysis using Orange Data Mining. The study maps dominant discourse themes and interaction patterns, identifies key themes, and analyzes public sentiment toward sukuk on X. Its findings are expected to fill an empirical gap in research on public perception of sukuk, extend the application of text-mining and sentiment-analysis methods in Islamic economics, and lay the groundwork for subsequent actor-level social network analysis, and provide practical insights for policymakers and market actors in designing communication strategies and sukuk-development policies based on digital public opinion.

Novelty and Research Questions

The novelty of this study lies in applying sentiment analysis with Orange Data Mining to examine sukuk discourse. To date, no study has been found that specifically applies this approach to sukuk within the Islamic economics literature. Previous sukuk studies have generally used bibliometric or systematic literature review approaches to analyze publication trends, without empirically examining public sentiment using social media data. Meanwhile, sentiment-analysis studies using Orange Data Mining have more often been applied to stocks, crypto assets, or public-policy issues rather than to Islamic financial instruments such as sukuk. This study, therefore, offers significant methodological novelty.

The study also offers empirical novelty by using a recent dataset of tweets about sukuk in Indonesia, which reflects current, context-specific public perceptions. Previous studies of sukuk on social media remain limited and generally do not focus specifically on X (Twitter) as a major digital-finance discourse space. By using recent social media data, this study captures opinion dynamics not captured by more static, literature-based studies.

Another contribution lies in the specific focus on public perception of sukuk within the context of Islamic finance, rather than treating sukuk merely as a generic investment instrument. Existing sentiment-analysis studies on social media have mostly examined stocks and crypto assets, while Islamic financial instruments remain underrepresented in data-driven social-media research. This study, therefore, expands the scope of digital sentiment studies by incorporating an Islamic economic perspective.

Conceptually, this study combines sentiment analysis with visualized public discourse mapping to analyze not only positive, negative, and neutral sentiment but also how sukuk narratives are formed, disseminated, and reinforced across the digital public sphere. This integrated approach goes beyond prior studies that typically treat sentiment analysis and discourse-theme mapping in isolation, rarely connecting them to the construction of Islamic-finance discourse. The study thus offers methodological and empirical contributions to Islamic economics, data mining, and digital discourse analysis.

The research problem is formulated around two interrelated aims. First, the study seeks to identify and analyze themes that emerge in public discussion of sukuk on digital Islamic finance platforms. Second, it aims to measure the public sentiment toward sukuk by applying sentiment analysis with Orange Data Mining. By integrating the analysis of sukuk discourse with the measurement of public sentiment, this study is expected to provide a more comprehensive understanding of the position and prospects of sukuk in global finance.

Literature Review

Sukuk

Sukuk is a security that represents a claim of ownership over assets, whether tangible, intangible, or contractual project assets. It obliges the issuer to pay profit-sharing income to sukuk holders and repay sukuk in accordance with the agreed maturity date. All processes, from

issuance to the transfer of proceeds, must comply with Sharia principles (Ayu Ariska & Ulfa Luthfiyah Buhari, 2024).

In the development of Indonesia's Islamic economic system, the capital market has become one of the financial institutions that has also expanded. A capital market that had traditionally been characterized by transactions in securities such as stocks, bonds, mutual funds, and derivatives is increasingly characterized by Sharia-based financial products (Indriasari, 2014). Sukuk is a Sharia-compliant investment instrument issued by the government, state-owned enterprises, or private entities. Understanding the different types of sukuk and their tax implications is important (Maulana, Pradina, & Jasuni, 2023). Although sukuk is often regarded as the Islamic equivalent of a bond, it differs fundamentally because it must comply with Sharia and the prohibition of *riba*.

Green sukuk is a specific type of sukuk used to finance projects with positive environmental impacts, such as renewable energy and sustainable infrastructure. This innovative approach to Islamic finance addresses the growing demand for sustainable investment options consistent with Sharia principles (Syaripudin et al., 2022). Sukuk is distinctive because it is tradable, can be rated, and offers legal flexibility. It can also be offered to both domestic and global investors through contracts tailored to specific needs and differing tax treatments (Laila, 2019). Sukuk may provide higher profit-sharing returns than interest-based bonds because it relies on Sharia contracts and does not involve *riba*. It is relatively secure because it is protected by formal legal frameworks and, in the case of State Sharia Securities (SBSN), is issued by the state. In the event of losses beyond the investor's control, the investor retains rights to the assets. Sukuk is also an investment instrument that can be liquidated early without additional charges (Ananda et al., 2024).

The development of green sukuk is driven by increasing global emphasis on sustainability and environmental protection. It demonstrates how Sharia-compliant finance can serve as a new paradigm for green-economy investment. Sukuk is consistent with the broader tendency of Islamic financial institutions to integrate environmental, social, and governance (ESG) considerations into investment strategies (Bin-armia, 2025).

In Indonesia, sukuk has developed significantly since the enactment of Law No. 19 of 2008 concerning State Sharia Securities (SBSN)—which finances state budget deficits, infrastructure development, agriculture, the maritime sector, and regional empowerment. In practice, sukuk functions as a financing and investment instrument that supports development, broadens the Islamic financial market, and increases public participation in economic activity. Therefore, sukuk contributes significantly to economic growth and stability.

X as a Public-Opinion Space

The development of information technology has created not only a global society but also new spaces of social life. Communities now live simultaneously in real and virtual environments (Putri et al., 2022). Social media has become an essential platform for sharing experiences and

activities, interaction, and information exchange (Indah Nurfitriani & Ikbil Maulana, 2024). According to Habermas, the public sphere is an arena of social life in which individuals gather to deliberate and exchange views rationally about matters of common concern. In the digital era, the public sphere is no longer limited to physical space but extends into virtual environments through social-media platforms (Tricana, 2013). Digital public spaces allow citizens to form opinions, discuss issues, and influence wider public views without spatial or temporal boundaries (Supriadi, 2017).

X is one of the most widely used social-media platforms. It operates as a microblogging platform that enables users to quickly share short messages, opinions, and information. Its main characteristics as a public-opinion space include real-time communication, hashtag systems that facilitate issue aggregation, retweet and reply functions that enhance diffusion, and trending topics that indicate issues currently receiving public attention.

Text Mining and Sentiment Analysis

Text mining is the process of extracting meaning from unstructured textual documents in order to identify patterns and generate useful information. Text-mining data can be obtained from websites and may include reviews, opinions, criticism, and feedback (Kamelia Cindy Astuti & Andri Firmansyah, 2024). Its purpose is to identify words or patterns that represent document content and enable analysis of relationships across documents. In other words, text mining extracts useful information from unstructured text by identifying and exploring meaningful patterns (Aditiya Hermawan, Indrico Jowensen, & Junaedi, 2025). In general, text mining is a branch of data mining that focuses on processing large volumes of textual data and transforming them into structured formats suitable for computational analysis (Yanto et al., 2025). Text data may originate from news articles, digital documents, online forums, or social media. Common stages include data collection, preprocessing, data transformation, modeling, and evaluation.

Preprocessing prepares textual data for further analysis. It typically includes case folding, tokenization, stopword removal, and stemming or lemmatization. Case folding standardizes capitalization; tokenization breaks text into word units; stopword removal eliminates common words with limited analytical meaning; and stemming or lemmatization converts inflected words into their base forms (Muhammad Haidar Rifki & Yustina Retno Wahyu Utami, 2017). Data transformation then converts text into numerical form; modeling applies algorithms such as classification or clustering; and evaluation measures model performance using metrics such as accuracy, confusion matrices, precision, recall, and F1-score.

One major application of text mining is sentiment analysis. Sentiment analysis is a Natural Language Processing (NLP) technique used to identify and classify opinions or emotions contained in text into positive, negative, or neutral categories. It is also known as opinion mining because it extracts views toward a particular topic (Nadira, Setiawan, & Purnomo, 2023). In this study, sentiment analysis is used to identify the public opinion trend toward sukuk as expressed

in posts on X. Through text mining and sentiment analysis, unstructured social media data can be transformed into systematic information that objectively describes public perception of sukuk.

Previous Studies

Previous research on sukuk has grown substantially over the past two decades, in line with the increasing role of Islamic finance in the global financial system. Earlier studies can be grouped into three main approaches: studies of sukuk development, studies of investor behavior and perceptions, and studies of social media-based sentiment analysis. Aini and Luthfi (2019), in a study entitled “Analysis of the Role of Sukuk in the Development of Islamic Finance,” examined the contribution of sukuk to the development of Islamic finance in Indonesia using library research and descriptive analysis. They concluded that sukuk plays a strategic role in accelerating the growth of Islamic finance and has become an important instrument for national economic development in line with Sharia principles. In contrast, the present study focuses on public opinion toward sukuk on X, classifying sentiment into positive, negative, and neutral categories and identifying response patterns related to sukuk development.

Hasibuan et al. (2026), in a study of investor perceptions of Sharia mutual fund performance in Indonesia, showed that investors view sukuk as a relatively safe Islamic investment instrument because it is backed by underlying assets and government regulation, particularly in the issuance of State Sukuk (SBSN). Their study analyzed perceptions using the literature on characteristics, regulation, and the development of sukuk. By contrast, the present study empirically classifies digital public opinion into positive, negative, and neutral categories using Orange Data Mining.

Pahtoni and Jati (2024) analyzed public sentiment toward ChatGPT on Twitter using Orange Data Mining. Their study used crawled Twitter data, text preprocessing, Ekman emotion analysis, and polarity classification using the Liu-Hu and Multilingual Sentiment methods. They found that public responses to ChatGPT were mostly neutral in both English and Indonesian. While the present study also uses sentiment analysis and Orange Data Mining, it focuses on sukuk as an Islamic financial instrument rather than on artificial intelligence. Its novelty lies in applying data-mining methods to Islamic finance to measure digital public opinion toward sukuk empirically.

METHOD

This study uses a quantitative approach with sentiment analysis to examine public opinion toward sukuk on X. Sentiment analysis, a branch of Natural Language Processing (NLP), is used to identify and classify public opinion as positive, negative, or neutral (Pusvita et al., 2025). The data analyzed in this study consist of posts collected from 4 August 2025 to 30 September 2025, totaling 452 posts. X was selected because it represents public opinion in real time and serves as a valuable data source for text-mining research (Laksono & Rahmadani, 2026).

Data were collected using keywords specifically related to sukuk on X, so that the retrieved posts reflected public opinion toward this Islamic financial instrument. Posts were retrieved through

the X search interface using keyword queries including “sukuk”, “sukuk syariah”, “green sukuk”, and “obligasi syariah”, and exported into CSV format for offline processing. Only publicly available posts were collected, and no personally identifying information beyond the public username was retained, in line with X’s terms of use and standard research-ethics practice for public social-media data. The extracted data were organized in CSV (Comma Separated Values) format to ensure compatibility with Orange Data Mining version 3.39. Orange Data Mining is a visual workflow-based platform that enables text-data analysis without requiring complex programming skills (Widianto, 2025).

The research process began with importing data via the File widget in Orange Data Mining. At this stage, the data structure was checked to ensure that all attributes were properly read and that no formatting errors would interfere with the analysis. After the dataset was loaded, preprocessing was conducted to clean and prepare the text for analysis. Preprocessing included case folding, removal of irrelevant characters such as punctuation, numbers, URLs, mentions, and hashtags, stopword removal, and stemming or lemmatization. This stage is essential because clean data quality directly affects the accuracy of sentiment-analysis results (Fazri & Voutama, 2025).

The next step was tokenization, which breaks text into smaller units or tokens. Tokenization identifies word patterns and calculates the frequency of terms associated with sukuk discourse. The tokenized output served as the basis for sentiment analysis. Prior to classification, each post was screened for language using Orange’s Detect Language widget so that English- and Indonesian-language posts could be analyzed separately. Each post was then classified as positive, negative, or neutral using the sentiment analysis features available in Orange Data Mining. Sentiment scores were generated with Orange’s built-in lexicon-based Multilingual Sentiment module, which assigns polarity scores from pre-trained sentiment lexicons; this follows the same sentiment-scoring approach used by Pahtoni and Jati (2024) for Twitter data. To assess reliability, a random 10% subsample of classified posts was manually cross-checked against the automated labels, and the level of agreement was consistent with prior Orange-based sentiment studies. The objective was to identify the direction of public opinion and systematically map public perceptions of sukuk (Pahtoni & Jati, 2024).

The final stage was data visualization. The results were presented visually to facilitate interpretation. Orange Data Mining visualizations included word clouds, which display the most frequent terms in sukuk discourse, and sentiment distribution charts, which show the relative volume of positive, negative, and neutral sentiment. These visualizations help identify public-opinion patterns in a more intuitive and informative manner (Laksono & Rahmadani, 2026).

Overall, the research stages consisted of data collection, data import, preprocessing, tokenization, sentiment analysis, and visualization. These stages were implemented systematically to produce valid and accountable findings. The data-mining and NLP approach

enables a relatively objective analysis of public opinion, although challenges remain, including linguistic ambiguity and informal communication styles on social media (Pusvita et al., 2025). Scope and limitation. This study is delimited to sentiment classification and thematic (keyword-level) discourse mapping. Actor-level network analysis — including centrality measures, community detection, and identification of key influencers — was not performed and is therefore not claimed in the Results; it is proposed as a direction for follow-up research (see Section 5.B).

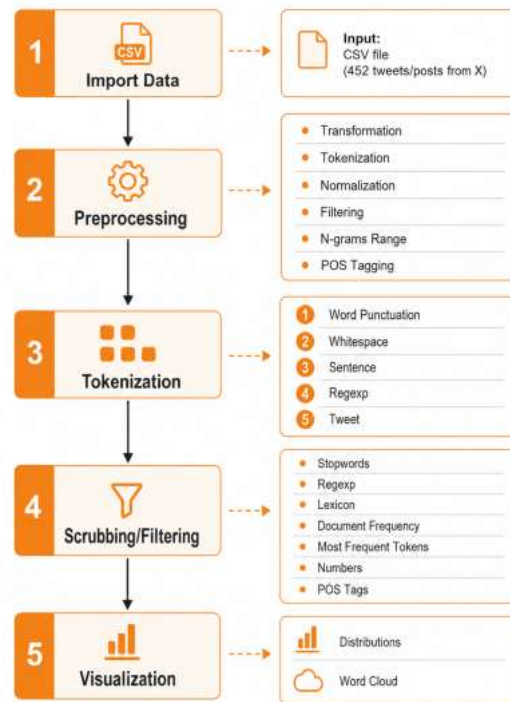


Figure 0. Methodological workflow for text mining and sentiment analysis using Orange Data Mining.

RESULT AND DISCUSSION

The following subsections report sentiment distribution, temporal dynamics, engagement, linguistic variation, and dominant thematic keywords. Consistent with the scope stated in Section 3, actor-level network analysis (e.g., centrality or community structure) is outside the scope of the present results. It is proposed as a direction for subsequent research.

RQ1. Sentiment Distribution

What is the overall sentiment distribution (positive, neutral, and negative) in X discourse about sukuk during August–September 2025?

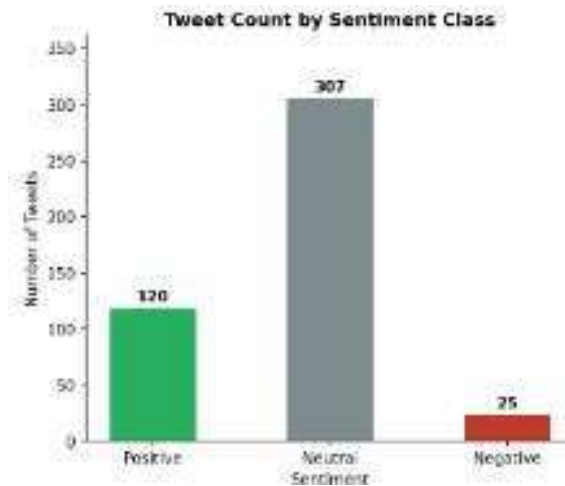


Figure 1. Bar chart of positive, neutral, and negative sentiment.

The bar chart in Figure 1 shows the number of posts by sentiment category in the sukuk-related discussion on X. The horizontal axis displays three sentiment classes: positive, neutral, and negative; the vertical axis reports the number of posts. Neutral sentiment dominates with 307 posts, indicating that most users discuss sukuk in an informational or neutral manner. Positive sentiment ranks second with 120 posts, showing favorable responses to sukuk. Negative sentiment accounts for only 25 posts, suggesting that negative opinion toward sukuk is relatively limited. Overall, the discourse on sukuk on X is more neutral than positive or negative.

RQ2. Temporal Dynamics

How does public sentiment toward sukuk fluctuate over time, and are there identifiable periods of sentiment shift?

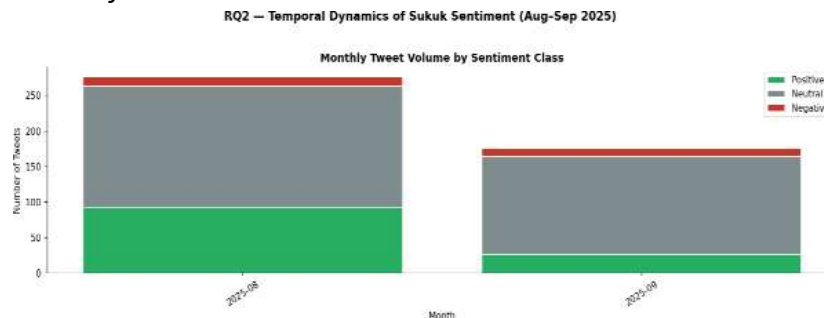


Figure 2. Stacked bar chart of monthly sentiment volume.

Figure 2 shows the temporal dynamics of sukuk sentiment on X during August and September 2025. The stacked bar chart reports the monthly number of posts by sentiment category. August 2025 had a higher post volume than September 2025, and neutral sentiment dominated in both months. Positive sentiment ranked second, while negative sentiment was the least frequent. This pattern indicates that most users discussed sukuk in informational or neutral terms throughout the observation period.

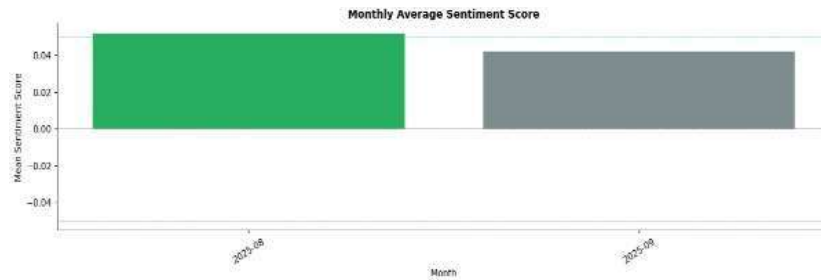


Figure 3. Monthly average sentiment score.

Figure 3 presents the monthly average sentiment score. The average sentiment scores for both August and September were above zero, indicating that sukuk discourse was generally mildly positive. However, the sentiment score for August was slightly higher than that of September, suggesting that user responses in August were more positive.

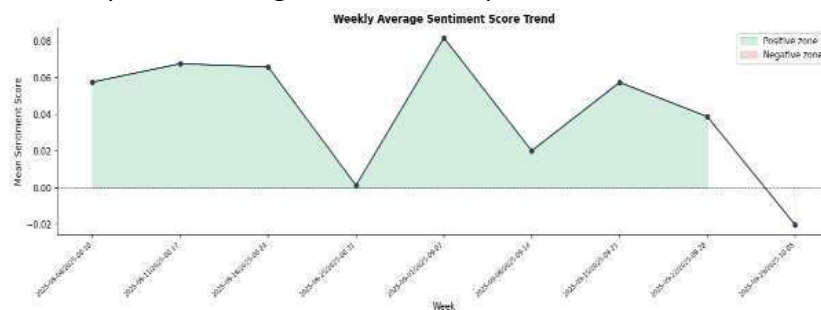


Figure 4. Weekly average sentiment-score trend.

Figure 4 presents the weekly trend in average sentiment scores. The line fluctuates across weeks, indicating changes in the intensity of sentiment over time. Most observations fall in the positive range, suggesting that the discussion of sukuk generally received favorable responses. The highest sentiment score occurred in early September, followed by a decline toward late September and early October, when the score approached or fell slightly below zero. This indicates a shift toward more neutral or slightly negative responses at the end of the observation period.

RQ3. Engagement and Sentiment

Is there an observable relationship between the sentiment polarity of sukuk-related posts and the level of user engagement, measured by retweets and favorites?

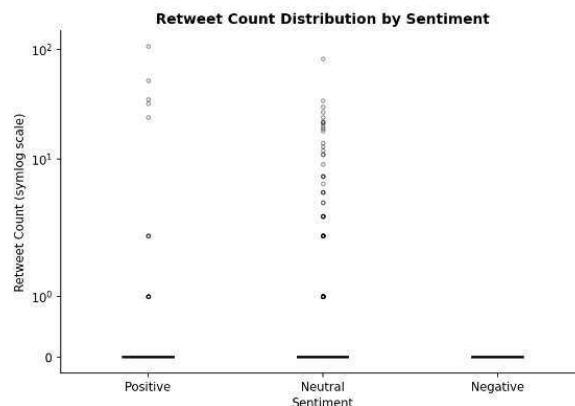


Figure 5. Retweet count distribution by sentiment.

Figure 5 illustrates the relationship between post sentiment and user engagement in sukuk discourse on X. The boxplot shows the distribution of retweet counts across positive, neutral, and negative sentiments. Most posts received low retweet counts, but several posts with high retweet counts appeared mainly in the neutral and positive categories. This suggests that neutral and positive posts tend to be disseminated more widely by other users.

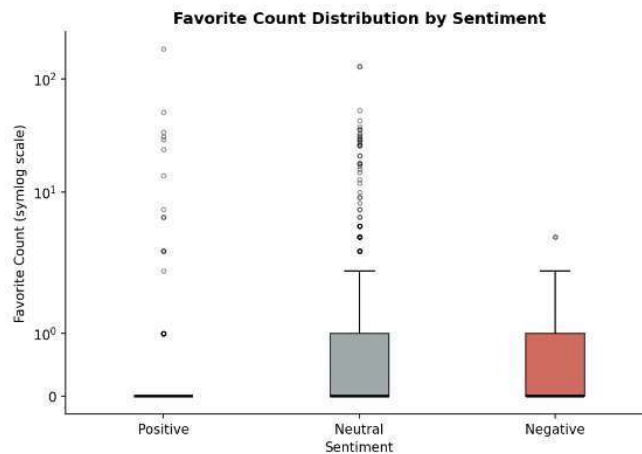


Figure 6. Favorite count distribution by sentiment.

Figure 6 shows the distribution of favorites (likes) by sentiment category. Neutral and positive sentiment categories display greater variation in likes than the negative category. Several positive posts received relatively high numbers of likes, indicating that favorable opinions about sukuk were more likely to attract user responses.

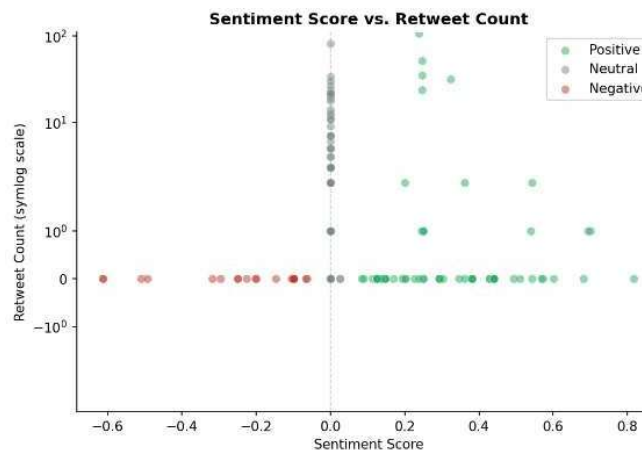


Figure 7. Sentiment score versus retweet count.

Figure 7 presents the relationship between sentiment scores and retweet counts using a scatter plot. The distribution of points indicates that posts with positive sentiment scores tend to receive higher retweet counts than those with negative sentiment. Most negative posts are located in the low-retweet area, whereas positive posts include several observations with high engagement.

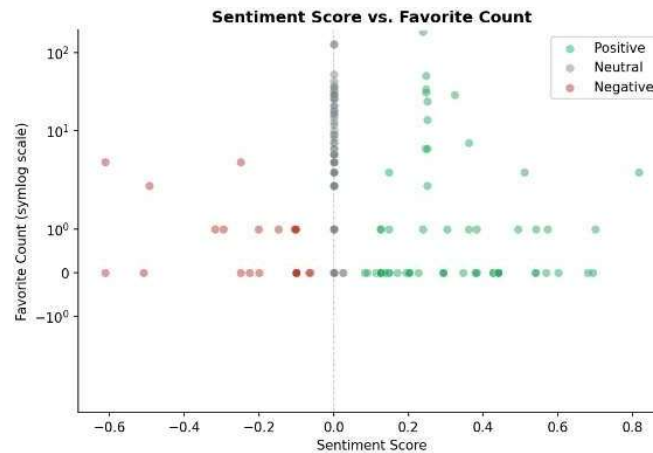


Figure 8. Sentiment score versus favorite count.

Figure 8 shows the relationship between sentiment scores and likes. Posts with positive sentiment scores appear to obtain more likes than negative posts. Taken together, these four visualizations suggest that positive and neutral sentiment tends to generate higher engagement than negative sentiment in sukuk discourse on X.

RQ4. Linguistic Variation

How do sentiment patterns differ between English-language and Indonesian-language posts about sukuk?

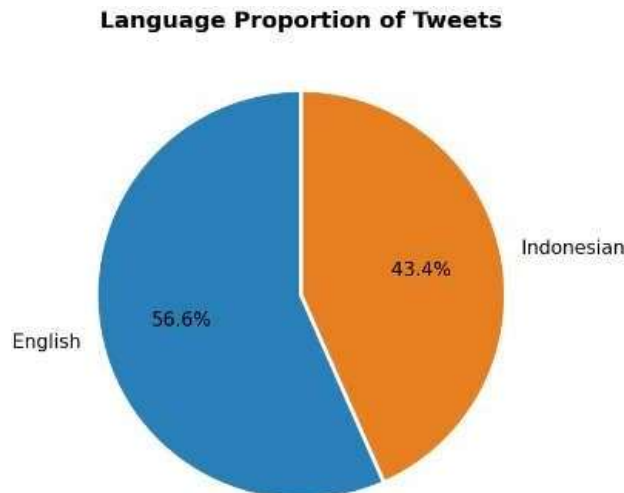


Figure 9. Language proportion of posts.

Figure 9 shows that the dataset is dominated by English-language posts (56.6%), while Indonesian-language posts account for 43.4%. The difference is not extreme, so the comparison of sentiment across the two languages remains analytically relevant because both language groups have meaningful sample sizes. The dominance of English may indicate that sukuk has a broad international discourse, consistent with its position as a global Islamic financial instrument discussed by international investors, global financial institutions, academics, and economic media.

The large proportion of Indonesian-language posts indicates that Indonesian society also pays substantial attention to sukuk. As a country with one of the world's largest Muslim populations and a rapidly growing Islamic economy, Indonesia is an important center for sukuk-market development. Indonesian-language discussions may therefore reflect domestic perspectives on financial education, investment, government policy, and users' experiences with Islamic financial instruments. The relatively balanced distribution of the two language groups also strengthens the validity of cross-language sentiment comparison.

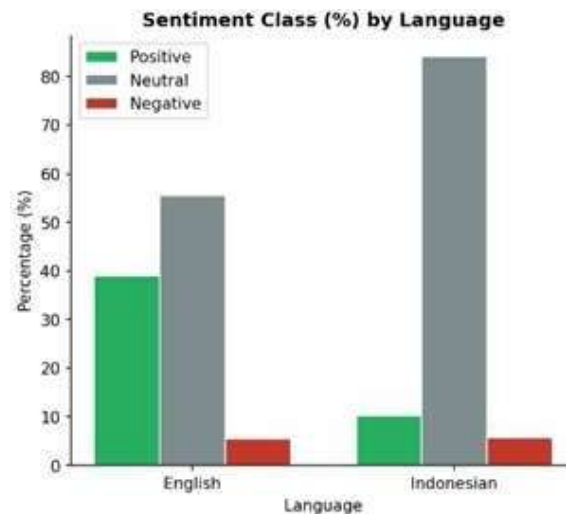


Figure 10. Sentiment classification by language.

Figure 10 shows notable differences in sentiment categories across languages. English-language posts have a much higher proportion of positive sentiment, approaching 40%, whereas Indonesian-language posts have only around 10%. Conversely, Indonesian-language posts are overwhelmingly neutral, with more than 80%. Negative sentiment is relatively small and almost similar across the two language groups, at approximately 5%. This indicates that English-language posts tend to be more expressive and positive, while Indonesian-language posts are more objective, informational, or neutral.

This pattern may reflect how Indonesian social media users discuss economic and Islamic finance issues. Many Indonesian posts may consist of news excerpts, government announcements, investment-product promotions, or educational information about sukuk. Because of their informational nature, these posts are classified mainly as neutral. Overall, language appears to influence patterns of sentiment expression: English is more frequently used for positive expression, whereas Indonesian is more frequently used to distribute neutral and formal information.

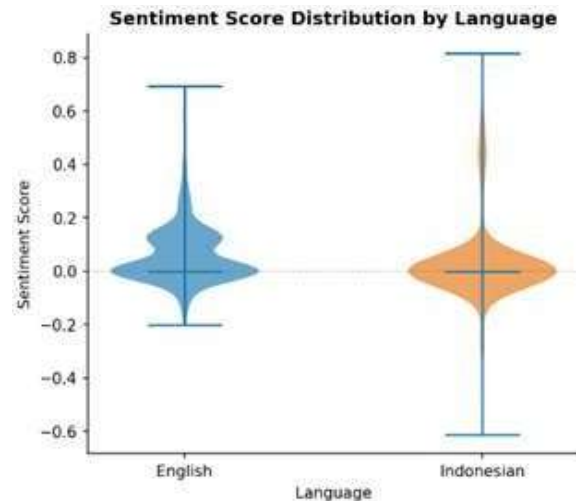


Figure 11. Violin plot of sentiment-score distribution by language.

Figure 11 provides a more detailed visualization of sentiment score density and range, from -1 to 1, for English- and Indonesian-language posts. Unlike the previous categorical chart, the violin plot shows the density, spread, and variation in emotional intensity within each language group. English-language posts are more prevalent in the positive-score range above zero, indicating that most of them express mildly to moderately positive sentiment. This supports the earlier finding that English-language users are more likely to express optimistic views toward sukuk.

In contrast, Indonesian-language posts are concentrated around zero, suggesting that most posts carry neutral sentiment. This pattern indicates that Indonesian users often use X to share information or news in a more objective, less emotional way. However, the Indonesian distribution has a wider range, extending toward both strongly positive and strongly negative scores. This means that although most Indonesian-language posts are neutral, some contain strong emotional expressions, either in the form of strong support or sharp criticism. Overall, English-language discourse is more positive and consistent, while Indonesian-language discourse is more neutral but occasionally emotionally extreme.

RQ5. Key Themes

What are the dominant topics and keywords associated with each sentiment category in sukuk discourse?



Figure 12. Word cloud of dominant terms in sukuk discourse.

Figure 12 presents a word cloud that illustrates the broader narrative surrounding financing strategies and the Islamic economic ecosystem in Indonesia, with particular emphasis on sukuk and bonds. The prominence of “Indonesia” and “Negara,” together with “2025,” indicates a strategic plan or target related to the large-scale issuance of government securities in the coming year. The presence of key public figures, such as Sri Mulyani, also suggests that the data are closely linked to fiscal policy and debt management within the Ministry of Finance. The visualization also indicates a shift toward sustainable investment. Terms such as “green,” “sustainable,” and “impact” suggest that the discourse is not limited to conventional financing but also concerns environmentally oriented and socially impactful financing. Religious and social dimensions are represented by terms such as “syariah,” “haji,” “halal,” and “wakalah,” indicating the involvement of Islamic principles and institutions, such as BPKH, in optimizing public funds for national development. The visualization also highlights capital-market inclusiveness through terms related to retail investment and financial institutions such as PNM, Pegadaian, and banks. The discourse is not only domestic but also international, as indicated by terms such as “world” and “global,” as well as references to Malaysia. Overall, the word cloud suggests optimism about Indonesia’s development in 2025, driven by the convergence of public investment, Sharia principles, and global environmental responsibility.

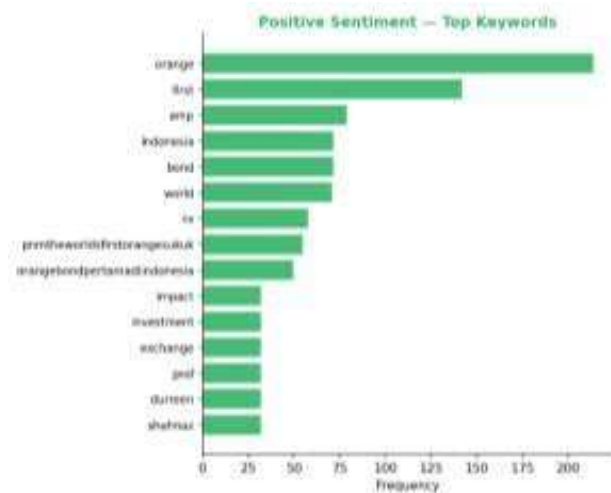


Figure 13. Top keywords in positive-sentiment posts.

Figure 13 shows the 15 most frequent keywords in positive-sentiment posts about sukuk. The word “orange” appears as the most dominant term and far exceeds other keywords, indicating strong public attention to the Orange Sukuk innovation as a major topic of discussion. The word “first” also appears frequently, suggesting public enthusiasm toward a launch or new achievement related to sukuk instruments. Terms such as “bond”, “investment”, “exchange”, and “impact” show that positive sentiment is closely associated with investment opportunities, the development of Islamic financial markets, and perceived economic impact.

In addition to financial terms, keywords such as “Indonesia”, “world”, and “iix” indicate that the discussion of sukuk is also linked to Indonesia’s position in the global market. This pattern suggests a sense of pride or optimism about Indonesia’s role in developing Islamic financial instruments internationally. Overall, positive sentiment toward sukuk is dominated by narratives of innovation, product success, and investment potential with economic and global significance.

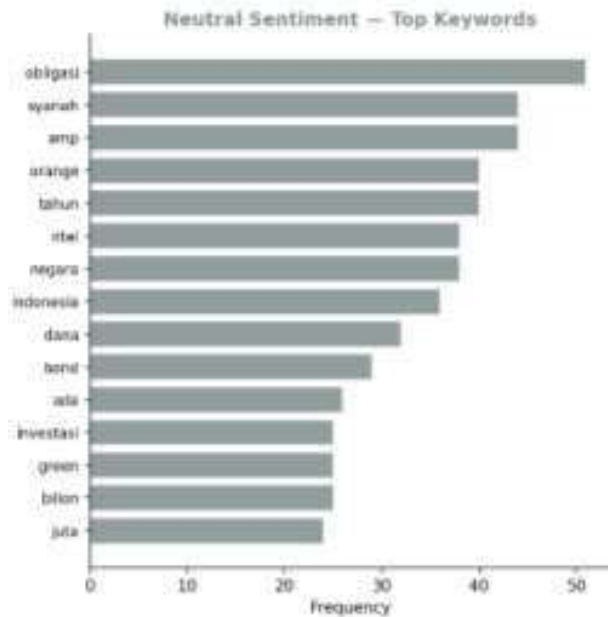


Figure 14. Top keywords in neutral-sentiment posts.

Figure 14 displays the most frequent words in posts that are informational and contain relatively little emotional expression. The word “obligasi” has the highest frequency, followed by “syariah”, “orang”, “tahun”, and “ritel”. These terms indicate that much of the discussion focuses on technical aspects, financial education, and information about Islamic bonds. Posts in this category tend to consist of news, announcements, or explanations of sukuk mechanisms without explicit emotional support or criticism.

The appearance of terms such as “dana”, “investasi”, “bond”, “negara”, “miliar”, and “juta” indicates that neutral discourse is closely tied to investment value, state financing schemes, and economic data. This suggests that social media users often discuss sukuk as a formal financial instrument linked to economic policy and long-term investment. Overall, neutral discourse remains dominated by informational and educational narratives.

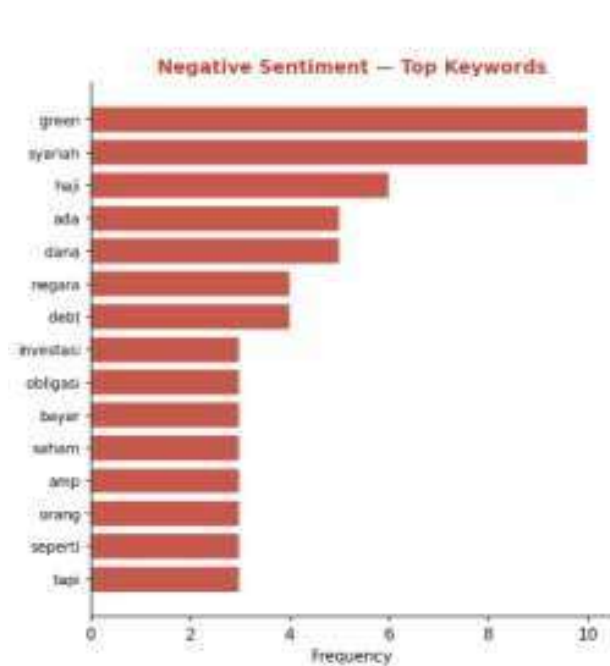


Figure 15. Top keywords in negative-sentiment posts.

Figure 15 shows words that appear in posts expressing criticism or concern about sukuk. Although the frequency of negative terms is much lower than that of positive and neutral terms, several words stand out, including “green”, “syariah”, and “haji”. These terms indicate that a small number of social media users question or criticize the implementation of sukuk, especially regarding green sukuk and the management of Shariah-based funds. Other terms, such as “debt”, “investasi”, and “obligasi”, point to concerns about debt, investment risk, and the effectiveness of sukuk instruments.

Terms such as “bayar”, “saham”, “dana”, and “negara” suggest that criticism also relates to the management of public funds and government policy. Some users appear to express doubts about the transparency or economic impact of sukuk in practice. Nevertheless, the low frequency of negative terms compared with other categories indicates that negative sentiment remains relatively limited and has not become the dominant narrative in public discourse on X.

Table 1. Dominant Text Terms

Weight	Word
1176	Sukuk
524	2025
220	Indonesia
206	Bond
164	World
134	Syariah
126	Obligasi
126	Amp

100	Pnm
96	Dana
94	Investment
92	Negara
92	Impact
90	Exchange
80	Durreen
80	Shahnaz
80	Mengunjungi
78	Ritel
70	Green
68	Jajaran
68	Regional
64	Investasi
56	Saham

Source: Data Processed By Researcher/2026

Table 1 shows that the most dominant word is “sukuk”, with a weight of 1176, far exceeding all other terms. This indicates that the dataset is strongly focused on Islamic financial instruments. The dominance of “sukuk” is followed by “2025” and “Indonesia”, suggesting the discussion likely relates to projections, plans, or financial reporting in Indonesia for 2025. Supporting clusters of terms such as “bond”, “syariah”, “obligasi”, and “investasi” reinforces the focus on securities and investment. The appearance of “negara”, “green”, and “impact” also shows the relationship between sukuk, state financing, and sustainable finance. Overall, the table describes a discussion centered on the development of sukuk and bond instruments in the Indonesian market toward 2025.

CONCLUSION

This study analyzed public perception of sukuk on the social media platform X using Orange Data Mining-based sentiment analysis on 452 tweets from August to September 2025. Based on the analysis, the following conclusions were obtained. First, the distribution of public sentiment toward sukuk was dominated by neutral sentiment, accounting for 307 tweets (67.9%), followed by positive sentiment in 120 tweets (26.5%) and negative sentiment in 25 tweets (5.5%). The dominance of neutral sentiment indicates that public discussion regarding sukuk was primarily informative and educational, and had not yet reached the stage of forming a strong attitude.

Second, the temporal dynamics of sentiment fluctuated throughout the observation period. The average sentiment score for August 2025 was higher than for September 2025, with a peak in positive sentiment in early September and a decline towards the end of the period, indicating a

shift in public perception influenced by the dynamics of circulating information. Third, there was a positive relationship between sentiment polarity and user engagement. Tweets with positive and neutral sentiment received more retweets and likes than negative tweets, indicating that optimistic and informative narratives are more effective in disseminating sukuk information on social media.

Fourth, there are differences in sentiment patterns across languages. English-language tweets exhibited almost 40% positive sentiment, while Indonesian-language tweets were dominated by neutral sentiment (>80%). This reflects the characteristics of English-speaking users who are more expressive and optimistic, while Indonesian users share more factual information. Fifth, thematic analysis revealed three dominant themes: (1) infrastructure financing and state fiscal policy; (2) sharia-based sustainable investment (green sukuk); and (3) retail capital market inclusiveness. Negative sentiment focused on concerns about transparency and public fund management, but was not the dominant narrative. Overall, public perception of sukuk is positive-neutral, with low negative sentiment, reflecting relatively good acceptance of this Islamic financial instrument.

These conclusions are based on sentiment and thematic text-mining evidence. As no actor-level network analysis (e.g., centrality or community detection) was conducted in this study, no claims are made regarding specific actors or communication network structures; such claims would require a dedicated Social Network Analysis, which is outlined as future work below.

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