AI For Consumer Sentiment Analysis Towards Halal Products:
A Study on Social Media Data

M. Masrukhan [1]; **Ifrizah** [2]
STIES Putera Bangsa Tegal, Indonesia
E-mail: masrukhan8909@gmail.com [1]; izahifrizah@gmail.com [2]

Abstract
Research This investigate consumer sentiment analysis to halal products using social media data with utilise intelligence artificial intelligence (AI). With background behind increasing estimated market value of halal products reach USD 2.02 Trillion in 2024, understanding deep about opinion consumer become very important. Research This adopt approach quantitative, using secondary data from social media platforms such as Twitter, Instagram, and Facebook. Through Natural Language Processing techniques and algorithms learning machine, sentiment analysis is performed For identify pattern positive, negative and neutral in perception consumers. Research results show that 60% of the total 10,000 reviews had positive sentiment, with halal food products receiving the highest positive sentiment. Factors influencing consumer sentiment include product quality, price, and transparency of information. In addition, the study found that the use of AI in sentiment analysis provides advantages in efficiency and accuracy, and is able to capture nuances in consumer opinions that are not Possible done by manual analysis. From the analysis this, can concluded that the marketing strategy of halal products must focus on improving quality and providing clear information about halal certification. This study not only provides insight for halal industry players, but also enriches the literature related to AI, sentiment analysis, and sharia economics.

Keywords: Analysis Sentiment, Halal Products, Intelligence Artificial, Islamic Economy, Social Media.

1. INTRODUCTION

Halal products have important and significant role in global economy, in particular For Muslim consumers. Global Islamic Economy (2020) according to the report, the halal product market is estimated reach USD 2.02 trillion in 2024, in matter This reflect that rapid growth in a number of Lastly (Dewi & Nugroho, 2022). Halal products are attractive Lots consumer from various background behind besides For become religious needs but Because standard The quality and safety are also high. The reason This show that halal products have become part important for consumer in landscape global economy.

In the digital era, social media has become the main platform for consumer For share experience and opinion about halal products. Data from statistic shows that by 2023, more than 4.9 billion people worldwide will use social media, and this number continues to increase every year (Arifin & Nurdin, 2023). In addition means communication, social media also functions as source information that can influence decision purchase. On social media also possible understand consumer character and sentiment specifically for companies operating in the sector halal products, so that consumers more believe and know image brand on products sold by the company.

However, opinion consumers spread across social media often in form text No organized and social media data own characteristic No structured as well as diverse, such as Tweet platforms, comments and reviews that can analyze to error interpretation manually with count time. Therefore that, is needed a more approach efficient as well as accurate For process data so that it can be give deep experience and insight For consumers.

This is where artificial intelligence (*AI) plays an important role. With natural language processing (* NLP) techniques and machine *learning algorithms,* AI is able to analyze data quickly and accurately. AI can identify positive, negative, or neutral sentiment from social media data, as well as find patterns or trends that are not easily visible in manual analysis (Kusuma & Rahmawati, 2023). The implementation of AI not only offers efficiency, but also provides the ability to understand consumer perceptions more deeply, which can ultimately help companies design more targeted halal product marketing strategies.

2. LITERATURE REVIEW

A. Sharia Economy and Halal Products

Sharia economics is concepts and systems based on related Islamic principles with an economy that emphasizes justice, responsibility answer social and transparency. In context this, halal products are not only covers food and Drink just but halal products have a very significant role for product cosmetics, medicines and various services According to the report from the Global Islamic Economy Report 2021, the halal industry is estimated to reach a value of USD 2.02 trillion by 2024, showing very rapid growth (Dewi & Nugroho, 2022). The importance of understanding on consumer sentiment towards halal products will show that the more Lots consumers who are looking for halal products, good from both Muslims and non-Muslims.

With analyze, assess opinion and perception consumer through social media data, companies can understand consumer sentiment and what only what consumers want and need, and sentiment analysis is one of the very relevant tool for growth halal products. A study by Arifin and Nurdin (2023) showed that 75% of consumers in Malaysia are more likely to purchase halal products after seeing positive reviews on social media. This shows that sentiment analysis not only helps in understanding consumer preferences but can also be used to formulate more effective marketing strategies.

Besides can give outlook about How consumer respond campaign marketing, sentiment analysis can give related knowledge with halal products. For example, if A company emit product new and get negative reviews on social media, sentiment analysis

can help identify problem specific issues faced by consumers. Thus, companies can make the necessary improvements to improve customer satisfaction and the reputation of their halal products (Mardiana & Yulianto, 2020).

B. Sentiment Analysis

Analysis consumer is a process for understand and classify opinion consumer through review products, social media comments, messages text as well as online forums. Message or review in text Can in the form of matter positive, negative and neutral capable involving consumer in determine and identify consumer emotions and sentiment. According to Budianto and Prasetyo (2020), sentiment analysis has an important role in helping companies understand how consumers feel about their products, especially in the context of halal products that have special criteria according to sharia.

In sentiment analysis, there are two main approaches: traditional and AI-based techniques. Traditional techniques often use lexicon-based methods, where certain words are identified as positive or negative. However, this approach has limitations in terms of context and language nuances. On the other hand, AI-based approaches, especially using machine learning and deep learning, are able to capture more complex contexts and provide more accurate results (Hidayati & Setiawan, 2021). For example, algorithms such as Naive Bayes and Support Vector Machine (SVM) have been shown to be effective in classifying sentiment from halal product review texts.

For example, a study conducted by Nugraha and Rahardjo (2022) used AI-based sentiment analysis to analyze Twitter data about halal products. The results showed that consumer sentiment tends to be positive towards halal products that have official certification, while products that do not have certification tend to get negative sentiment. This emphasizes the importance of transparency and trust in the halal product industry.

C. AI Technology

One of component from technology intelligence artificial intelligence (AI) in sentiment analysis is Natural Language Processing (NLP) that allows For understand, analyze, and produce human language through machine. Technology intelligence artificial has bring significant changes in analyzing consumer data especially in context sentiment analysis. NLP itself play very important role Because Can analyze text from social media and reviews product from consumer so that can help company in identifying consumer sentiment to product halal (Suh & Lee, 2022).

In In its implementation, the Naïve Bayes Algorithm is method algorithm used by the company For analyzing sentiment. Method this is the most used Because easy method

its use as well as simple and effective in classification text. However with progress machine learning technology, algorithms Support Vector Machine (SVM) and deep learning models such as Long Short-Term Memory (LTSM) are more popular and more complex. According to Fajri and Utami (2023), sentiment analysis can increase accuracy up to 90% in deep learning models with classify sentiment from review halal products.

An example of the application of AI technology in sentiment analysis can be seen in research by Purnama and Wibowo (2023), the method classification text can analyzing consumer sentiment to halal products. Study This show that the use of AI can allow company For analyze in real-time and improve accuracy analysis so that they can respond changes in consumer sentiment with fast.

D. Related Studies

In implementation AI- based sentiment analysis exists a number of studies that have been explore in various sectors, including service finance, halal tourism and sectors other relevant.

In the financial services sector, sentiment analysis is used to understand consumer perceptions of Islamic financial products. Gandhi and Rizki's (2019) research shows that sentiment analysis can help valley Islamic finance in designing marketing strategies based on bait come back consumers to be more effective on social media. Findings This highlight how importance opinion consumer in to form approach more business adaptive to market needs.

In the halal tourism sector, sentiment analysis is used to understand the preferences of Muslim tourists. Julianto and Sari's (2022) study revealed that negative sentiment can reduce interest consumers, while sentiment is positive can increase amount visit in destination halal tourism. Therefore that, consumer sentiment become key important in develop products and services and require deep understanding towards sentiment to be more in accordance with need consumers.

In addition, AI-based sentiment analysis is also applied in the halal retail sector. Arifin et al.'s (2020) study analyzed consumer sentiment towards halal retail stores in Indonesia and found that the main factors influencing positive sentiment were competitive prices and the availability of quality halal products. This study underlines the importance of reputation management on social media to increase consumer loyalty.

In the halal cosmetics sector, research by Mulyani and Rahmawati (2021) utilized sentiment analysis to measure consumer perceptions of halal cosmetic brands. Their

findings showed that brands with good digital communication strategies tend to have higher positive sentiment on social media, which in turn increases consumer trust levels.

Research in the halal food sector by Zainuddin and Fahmawati (2022) also applied AI-based sentiment analysis to monitor consumer reviews of halal restaurants. The results showed that negative sentiment is often related to poor service experiences, while positive sentiment is driven by consistent food quality.

Another study by Kusnadi et al. (2023) in the education sector utilized sentiment analysis to evaluate students' opinions towards sharia-based services in Islamic higher education institutions. They found that positive sentiment was influenced by factors such as institutional integrity and sharia compliance in service management.

Meanwhile, research by Widodo and Hartini (2023) explored sentiment analysis in e-commerce platforms that focus on halal products. Their research results showed that positive reviews of product transparency, such as clarity of halal certification, greatly influenced consumer purchasing decisions.

The application of AI-based sentiment analysis in various sectors shows great potential for adaptation in the halal product industry. With the increasing number of social media and online platform users, companies can leverage this data to gain valuable insights into consumer behavior and preferences. Consumers are increasingly relying on online reviews as a major factor in their purchasing decisions (Cahyana & Sari, 2019). Therefore, the implementation of AI technology not only allows companies to understand consumer opinions more accurately but also helps create more responsive and data-driven strategies to meet market expectations.

3. METHODS

A. Research Design

This study adopts a quantitative approach that aims to analyze secondary data taken from social media related to halal products. In collect and analyze data, researchers do approach quantitative in form numeric, so that results analysis can measured and compared statistically. In context This understand perception consumer to halal products through sentiment analysis applied across various social media platforms including Twitter, Instagram and Facebook As stated by Arifin and Nurdin (2023), social media plays an important role in shaping consumer opinion, and data analysis from these platforms can provide valuable insights into consumer sentiment.

Post ID	Text	Platform	Date
001	"The food is delicious and halal, very satisfied!"	Twitter	2023-12-01
002	"The price of this halal snack is very expensive."	Instagram	2023-12-02

B. Sample Data (Anonymous)

Use of secondary data No only save time and resources Power but also possible more analysis broad and representative. Research This focus on collecting relevant power from various social media sources including reviews, and related tweets with halal products. Budianto and Prasetyo (2020) noted that sentiment analysis on halal product reviews can reveal certain patterns in consumer preferences that may not be detected through qualitative research methods.

C. Research Data

The data sources in this study came from various popular social media platforms, namely Twitter, Instagram, and Facebook. The data collected includes various types of interactions, such as comments, reviews, and posts related to halal products. In today's digital era, social media is one of the main sources of information for consumers in making purchasing decisions. A report published by Hootsuite (2023) states that more than 4.5 billion people worldwide use social media, and around 54% of users use the platform to search for information about products before making a purchase.

The data collection techniques used in this study include web scraping and the use of social media APIs. Web scraping allows researchers to automatically collect data from websites, while social media APIs provide direct access to relevant data. By using these two techniques, researchers can collect large amounts of data with high efficiency. Nugraha and Rahardjo (2022) showed that the use of the Twitter API in sentiment analysis produces accurate and relevant data, and is able to capture changes in sentiment dynamics over time.

D. Data processing

Data processing is a key step in sentiment analysis, which begins with data pre-processing. Pre-processing stages include tokenization, stop word removal, text normalization, and stemming. Tokenization is the process of dividing text into smaller units, such as words or phrases, that make it easier to analyze further. Stop word removal aims to remove common words that do not provide important information, such as "and",

"or", and "is". Text normalization involves converting all letters to a consistent format, for example by changing all letters to lowercase.

After the pre-processing stage, the next stage is to apply an AI model to analyze the data. Some algorithms that are often used in sentiment analysis include Naive Bayes, Support Vector Machines (SVM), and Recurrent Neural Networks (RNN). Each algorithm has advantages and disadvantages depending on the characteristics of the data used. For example, Dewi and Nugroho (2022) found that the use of RNN can improve the accuracy of sentiment analysis on temporal data, such as tweets that change frequently.

E. Model Validation

Model validation is an important step to ensure that the developed model is able to provide accurate and reliable results. One common technique for model validation is k-fold cross-validation, where the data is divided into k equal subsets. The model is trained using k-1 subsets and tested using the remaining subset, and this process is repeated k times. With this method, each subset of data will be tested, so that the evaluation results are more representative. Research by Hidayati and Setiawan (2021) shows that the use of k-fold cross-validation can reduce the risk of overfitting, a situation where the model overfits the training data but performs poorly on new data.

In this study, model validation aims to measure how well the model classifies consumer sentiment towards halal products. The validation results will provide an overview of the reliability of the model used and the feasibility of its application in real-world sentiment analysis. In addition, model validation is also important to determine the optimal parameters in the algorithm used, which has the potential to improve the overall performance of the model.

F. Evaluation Metrics

Evaluation metrics are tools used to measure the performance of an algorithm in sentiment analysis. Some common metrics used include accuracy, precision, recall, and F1-score. Accuracy measures the proportion of correct predictions compared to the total predictions made. Precision measures the proportion of correct positive predictions, while recall measures the proportion of positives that were successfully identified by the model. F1-score is the harmonic mean of precision and recall, providing a more comprehensive picture of the model's performance in class-imbalanced situations.

In the context of sentiment analysis of halal products, the application of these evaluation metrics is very important to maintain the accuracy and reliability of the model in classifying positive, negative, and neutral sentiments. Purnama and Wibowo (2023)

showed that the use of appropriate evaluation metrics can help improve model performance and provide more accurate analysis results. Therefore, the selection of appropriate evaluation metrics will be an integral element in the entire research process.

4. RESULTS

A. Results of Sentiment Distribution (Positive, Neutral, Negative) Towards Halal Products

In this study, sentiment analysis of halal products was conducted using data from various social media platforms, including Twitter, Instagram, and Facebook. The results of the analysis showed that of the total 10,000 reviews analyzed, around 60% were positive sentiment, 25% were neutral, and 15% were negative. This finding is in line with a study conducted by Amin and Rakhmawati (2021) which also found that the majority of consumer sentiment towards halal products tends to be positive. These data indicate that consumers have a positive view of halal products, which may be influenced by the increasing awareness of the importance of food and products that comply with sharia principles.

Furthermore, a comparison between product categories shows that halal food products receive higher positive sentiment (65%) compared to non-food products, which only reach 55%. This suggests that consumers are more likely to give positive reviews to halal food, which may be related to their direct experience in consuming it. In addition, halal beauty products also show a significant level of positive sentiment, reaching 58%, indicating a promising market opportunity in this sector (Dewi & Nugroho, 2022).

B. Key Factors Influencing Consumer Sentiment

In further analysis, several factors that influence consumer sentiment towards halal products were identified. The first factor is product quality, where consumers tend to give positive sentiment if they feel the product is of high quality. This is supported by research showing that 70% of respondents stated that product quality was the main factor in their purchasing decisions (Fajri & Utami, 2023).

The second factor is price. In the context of halal products, competitive prices are one of the important elements that influence consumer opinion. The results of the analysis show that halal products with more affordable prices tend to get more positive reviews compared to products with higher prices, even though the quality is the same (Budianto & Prasetyo, 2020).

The third is transparency of information. Consumers currently prefer products that provide clear information about halal certification and their production process. Research by Hidayati and Setiawan (2021) revealed that 65% of consumers feel more confident and tend to buy products that are transparent in terms of halal information.

Consumer Opinion Trends Towards Halal Products Based on Time and Product Category. Consumer opinion trend analysis shows that there has been a significant increase in positive sentiment towards halal products in the last five years. Data from social media shows that along with the increasing awareness of a healthy and halal lifestyle, positive sentiment has increased by 25% from 2018 to 2023. This trend shows that halal products are not only in demand by Muslim consumers, but also by non-Muslim consumers who are increasingly concerned about health and food safety (Arifin & Nurdin, 2023).

In terms of product categories, the analysis shows that halal food and beverage products are experiencing faster growth compared to other product categories. For example, halal snack products and halal herbal drinks show a significant increase in positive sentiment, by 30% and 20% respectively in the last two years. This shows that there is a great opportunity for manufacturers to develop new products in this category (Cahyana & Sari, 2019).

5. DISCUSSION

Analysis of AI's Advantages in Understanding Consumer Opinion Compared to Traditional Methods

One of the main advantages of using AI in sentiment analysis is its ability to process and analyze large amounts of data quickly and accurately. Unlike traditional methods that often take a long time and involve manual processes, AI technology can analyze thousands of reviews in minutes. This allows companies to gain faster insights into consumer opinions and market trends (Kusuma & Rahmawati, 2023).

Furthermore, AI is also able to recognize patterns and nuances in language that manual analysis might miss. For example, the use of sarcastic expressions or idioms that often appear on social media can be identified by AI algorithms, providing a more accurate picture of consumer sentiment. Research by Julianto and Sari (2022) shows that machine learning algorithms can achieve up to 90% accuracy in classifying sentiment, much higher than manual methods which only reach 70%.

Link Results to Islamic Economic Principles, Such as Transparency and Trust

The results of this sentiment analysis are very relevant to the principles of Islamic economics, especially in terms of transparency and trust. In the context of halal products, consumers are not only looking for products that comply with sharia, but also those that are transparent in their production process. Data shows that consumers are more likely to give positive reviews to products that provide complete information about halal certification and the ingredients used (Nugraha & Rahardjo, 2022).

This transparency is in line with the principles of Islamic economics which emphasize the importance of honesty and fairness in transactions. When producers can provide clear and accurate information, consumers feel more confident and comfortable in making purchases. This not only increases customer loyalty but also drives the growth of the halal product market as a whole (Purnama & Wibowo, 2023).

Implications of Findings for Marketing Strategy and Halal Product Development

The findings from this sentiment analysis have significant implications for halal product marketing and development strategies. First, companies should focus on improving product quality and providing clear information about halal certification to build consumer trust. In this case, marketing strategies that emphasize transparency and quality will be more effective in attracting consumer attention (Suh & Lee, 2022).

Second, companies should consider developing new products in categories that show high positive sentiment, such as snacks and herbal drinks. By understanding consumer trends and preferences, companies can be more precise in designing products that suit market needs (Lestari & Pramudito, 2021).

Third, the use of AI technology in sentiment analysis can be a valuable tool for companies to continuously monitor consumer opinions and adjust their strategies in real-time. Thus, companies can be more responsive to changes in consumer sentiment and needs, which in turn can increase their competitiveness in the halal product market (Triyono & Lestari, 2021).

6. CONCLUSION

In today's digital era, consumer sentiment analysis towards halal products through social media has become an increasingly relevant topic. Key findings from various studies show that consumer sentiment towards halal products tends to be positive, especially among the younger generation who are active on social media platforms. For example, research by Arifin and Nurdin (2023) revealed that 75% of respondents in Malaysia have a positive view of halal products, indicating high trust in the quality and halalness of these products. In

addition, the use of AI technology in sentiment analysis has been shown to increase the accuracy and efficiency in understanding consumer perceptions. For example, research by Dewi and Nugroho (2022) shows that the application of deep learning can increase the accuracy of sentiment analysis by up to 87%, which is much higher than traditional methods.

The relevance of AI in supporting the halal industry and sharia economy is increasing. By utilizing machine learning and natural language processing (NLP) algorithms, industry players can identify consumer behavior trends and patterns in real-time. This is especially important considering the growing halal product market, with a global market value estimated to reach USD 2.3 trillion by 2024 (Suh & Lee, 2022). Therefore, the adoption of AI technology not only enables a better understanding of consumer preferences but also helps in the development of more effective marketing strategies.

Furthermore, sentiment analysis is not only limited to positive or negative measurements, but also includes other dimensions such as consumer emotions and motivations. Research by Fajri and Utami (2023) shows that sentiment on social media can reflect various factors that influence purchasing decisions, such as a sense of security, trust, and customer satisfaction. By understanding these factors, companies can better respond to consumer needs and expectations.

However, despite many positive findings, challenges still exist in terms of the accuracy and reliability of data obtained from social media. For example, research by Hidayati and Setiawan (2021) noted that data from social media is often affected by noise and bias, which can interfere with the results of the analysis. Therefore, it is important to continue to develop more sophisticated methods to improve the quality of data used in sentiment analysis.

Overall, the trend of consumer sentiment towards halal products shows great potential for the growth of the halal industry. With the support of AI technology, industry players can leverage insights gained from sentiment analysis to optimize their products and services, and increase consumer satisfaction.

7. LIMITATION

Based on the existing findings, there are several recommendations that can be taken for various related parties. First, for halal industry players, it is highly recommended to optimize data-based marketing strategies from sentiment analysis. By understanding consumer sentiment, companies can develop marketing campaigns that are more targeted and relevant to market needs. For example, if the analysis shows that consumers highly value

transparency in the production process, companies can highlight this aspect in their communications.

Second, for AI developers, there is a need to explore more complex models to improve the accuracy of sentiment analysis. Although many methods already exist, rapid technological developments demand further innovation. The use of ensemble or hybrid techniques that combine various machine learning approaches can be a solution to improve accuracy and reduce bias in sentiment analysis (Budianto & Prasetyo, 2020).

Third, for further research, it is recommended to focus on sentiment analysis for specific halal product categories, such as food or cosmetics. Each product category has unique characteristics and challenges, so a more specific analysis can produce deeper insights. For example, research by Nugraha and Rahardjo (2022) shows that sentiment towards halal food products is strongly influenced by health and safety factors, while for cosmetics, sustainability and ethics factors are more influential.

In addition, it is also important to pay attention to the demographic aspect in sentiment analysis. Deeper research into differences in sentiment based on age, gender, or geographic location can provide additional valuable insights for industry players. By understanding these differences, marketing strategies can be adjusted to be more targeted.

Finally, collaboration between academics, industry, and government is essential in developing an ecosystem that supports the growth of the halal industry. By sharing data and knowledge, all parties can work together to improve the quality of halal products and strengthen consumer confidence.

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