

# Sentiment Analysis of User Reviews of E-commerce Applications: Case Study on the Shopee Platform

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## ABSTRACT

The development of e-commerce in Indonesia is driven by the large population and extensive geography. One of the leading e-commerce applications in Indonesia is Shopee. User reviews of this application reflect public sentiment towards Shopee. The Naive Bayes method was used to classify reviews, with an accuracy rate of 90.76%. Using TF-IDF helps calculate the weight of words in reviews. Performance evaluation shows that the model has high accuracy in scenario 1 with a 60:40 split between training data and test data. The use of information technology has changed the business paradigm, including in e-commerce such as Shopee. The importance of understanding consumer sentiment can be seen from social media platforms, where sentiment analysis using Naive Bayes and Topic Modeling shows negative sentiment at the 11:11 Shopee Flashsale event. Suggestions for Shopee include improving event strategies such as Flashsale by inviting artists and improving customer service. Responsiveness to technical application problems is also emphasized to increase customer satisfaction. The increase in e-commerce transactions in Indonesia shows rapid growth, with many platforms emerging. Sentiment analysis such as that done with K-Nearest Neighbor (K-NN) on Google Play Store reviews provides insight into the experience of e-commerce users in Indonesia, with an accuracy rate of up to 82%. This research provides significant implications for e-commerce companies in better understanding and meeting customer expectations.

Keywords: e-commerce, shopee, google play store, sentiment.

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## INTRODUCTION

In Indonesia, the use of e-commerce is growing rapidly due to a shift in consumer behavior which is increasingly shopping online (Alfanur & Kadono, 2021). Based on the latest report from We Are Social, around 178.9 million Indonesians have shopped online from the beginning of 2022 to the end of 2023, recording growth of 12.8% every year. Apart from that, it is estimated that the Indonesian population's online spending reached US\$55.97 million or around Rp. 851 trillion in the same period.

However, maintaining the user base and improving the service quality of an e-commerce platform relies heavily on customer satisfaction (Ali et al., 2021). Several e-commerce platforms that can be used as references include Shopee, Tokopedia, Lazada, Bukalapak, and Blibli (Putri et al., 2023). Shopee was chosen as the research object in analyzing public sentiment because of its popularity which dominates the e-commerce market in Indonesia (Salim et al., 2021). To understand the level of user satisfaction and trust in this platform, it is necessary to analyze public sentiment regarding its use (Ye et al., 2023).

This research proposes an approach to conduct sentiment analysis of public opinion regarding the use of Shopee using the K-Nearest Neighbor algorithm (Kirana & Al Faraby, 2021). Data was collected from the Google Play Store website using web scraping techniques, which were then processed by removing stopwords, tokenization,

and stemming before applying the K-Nearest Neighbor (K-NN) and Natural Language Processing (NLP) algorithms to classify sentiment into positive or negative. Evaluation is carried out using a confusion matrix and classification report (Tharwat, 2021).

The development of e-commerce makes transactions between sellers and buyers easier through smartphone applications that allow easy access anytime and anywhere. According to data from APJII, e-commerce transactions in Indonesia increase every year, showing significant growth in the use of e-commerce. However, with so many e-commerce emerging, people are often confused about choosing a trusted platform. Therefore, sentiment analysis on social media is needed to determine the level of popularity of e-commerce based on positive or negative opinions expressed by the public.

## **RESEARCH METHODS**

In this research, Twitter is used as social media to collect public opinion because of its popularity in conveying opinions directly. Twitter allows interaction between users that helps in decision making. Sentiment analysis was carried out using the Naïve Bayes method, a machine learning technique for classifying text data based on opinion classes. Naïve Bayes improves scalability, accuracy, and efficiency in the text classification process.

Based on this problem, this research analyzes the level of popularity of e-commerce in Indonesia using sentiment analysis on Twitter social media with the Naïve Bayes method. The development of e-commerce technology in Indonesia facilitates digital transactions between organizations and individuals. The value of e-commerce transactions increased from IDR 25 trillion in 2014 to IDR 69.8 trillion in 2016, and is projected to reach IDR 114 trillion in 2018.

The growth in social media use also supports the increase in digital purchases of goods. Shopee, as the e-commerce with the largest number of followers on Instagram in Indonesia, also occupies the top ranking of shopping applications on iOS and Android. According to the 2018 APJII survey, internet users in Indonesia increased to 143.26 million people or 54.7% of the total population.

In business, effective marketing strategies, such as 11:11 sales by Shopee, can increase product sales. Data from social media called User Generated Content (UGC) contains public opinion which can be analyzed to understand consumer sentiment. Sentiment analysis is a scientific process for classifying text based on opinions in the text, determining whether the text has positive, negative, or neutral meaning. Sentiment analysis is also known as opinion mining because it originates from a person's opinions or attitudes.

## **RESULTS AND DISCUSSION**

### **A. Data Description**

The dataset used in this research comes from user reviews of the Shopee application taken from the Google Play Store using web scraping techniques with the help of WebHarvy software (Bustami & Noviaristanti, 2022). This dataset contains 895 rows of data with Review and Sentiment columns (Ngo et al., 2022).

### **B. Data Preprocessing**

The data preprocessing stage involves data cleaning processes such as changing text to lowercase, removing punctuation marks, and deleting unnecessary characters (Abidin et al., 2019). After that, the sentence is broken down into tokens or words through a tokenization process (Vijayarani & Janani, 2016). This process is followed by stopword removal and stemming to obtain

relevant root words (Kalaivani & Marivendan, 2021).

### **C. Sentiment Analysis Model**

The sentiment analysis model in this research uses the NLP and KNN algorithms (Demircan et al., 2021). The model training process is divided into two parts: training set and testing set with a proportion of 80:20 (Shu et al., 2020). The TF-IDF technique is used to calculate the weight of each word in the review. In the training stage, the KNN algorithm is used to classify each document into positive or negative sentiment classes (Isnain et al., 2021). This model managed to achieve an accuracy of 82% and a cross validation score of 80%, indicating that the combination of the NLP and KNN algorithms is effective in sentiment analysis (Dake & Gyimah, 2023).

### **D. Model Evaluation**

Model evaluation was carried out using confusion matrix and cross validation score. The confusion matrix is used to show the number of correct and incorrect classifications of the model, while the cross validation score measures how well the model predicts data that has never been seen before.

### **Visualization**

Data visualization was carried out using wordcloud to analyze the frequency of the most dominant words in user reviews. This visualization makes it easier to understand user preferences and experiences regarding e-commerce usage, and helps identify the most significant keywords in sentiment analysis.

### **Data collection**

The text data used in this research comes from tweets and retweets by e-commerce customers such as Lazada, Tokopedia, Bukalapak, and Shopee. For each e-commerce, 500 tweet data was taken which was limited to one week before the collection date according to Twitter rules.

### **Preprocessing**

The preprocessing process includes cleaning unnecessary characters such as URL, @, #, and other symbols, followed by case folding to convert all characters to lowercase.

### **Naïve Bayes Classification**

The Naïve Bayes classification process is carried out using the Rapidminer application. The preprocessed data is entered into the application using steps such as entering a labeled dataset, selecting attributes as primary keys, entering training data, and carrying out Naïve Bayes classification. The results of the Naïve Bayes classification are displayed in a diagram to determine the level of popularity of e-commerce in Indonesia based on sentiment on Twitter social media.

### **Testing**

The test aims to determine the accuracy of the Naïve Bayes classification. This test uses the Performance method in the RapidMiner application. The test results show the percentage of negative and positive e-commerce sentiment.

### **LDA-Based Topic Modeling Results**

By using LDA-based topic modeling processed using R-Studio, the data was analyzed to see the topics discussed by users in the Shopee Instagram comments column. This analysis identified six main topics during the period 25 October 2018 to 11 November 2018, including complaints about application errors, disappointment with flash sales, the length of the shopping process, disappointment with quizzes, and dissatisfaction with cashback and free shipping programs.

On the positive side, the five main topics identified include enthusiasm for Shopee

events, discounts that are considered good, support for Shopee despite obstacles, and recognition that Shopee is the best marketplace.

Negative topics include disappointment with a slow network, promotions and cashback that are considered unsatisfactory, server problems that often experience errors, slow Shopee admin responses, and frustration with flash sales and quizzes that are considered unfair.

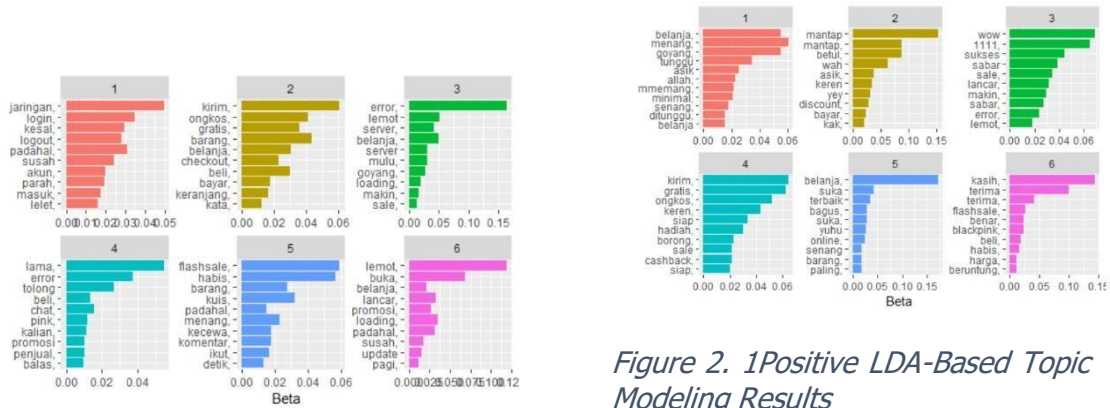


Figure 1 Negative LDA-Based Topic Modeling Results

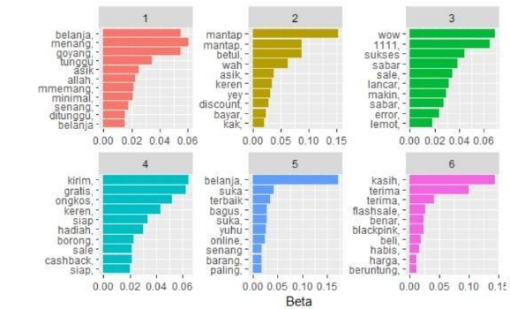


Figure 2 Positive LDA-Based Topic Modeling Results

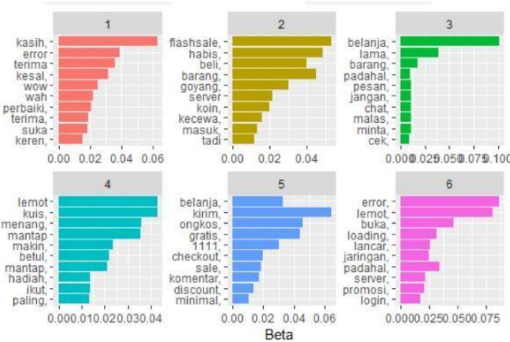


Figure 3 Results of LDA-Based Topic Modeling

**CONCLUSION**

This research employs the K-Nearest Neighbor (K-NN) algorithm and Natural Language Processing (NLP) techniques to analyze user sentiment towards the Shopee e-commerce application. The dataset comprises 895 user reviews obtained through web scraping from the Google Play Store. Preprocessing steps involved converting text to lowercase, removing punctuation, and eliminating irrelevant characters, followed by tokenization, stopwords removal, and stemming to standardize the text. The sentiment analysis model combines NLP techniques with K-NN and utilizes TF-IDF for word weighting, achieving 82% accuracy and an 80% cross-validation score in classifying reviews as positive or negative. Model evaluation using a confusion matrix and cross-validation demonstrates its robustness in predicting sentiment on unseen data. Visualization techniques, including word clouds, highlight frequently mentioned words in user reviews, providing deeper insights into preferences and experiences. Additionally, LDA-based topic modeling identifies key topics such as application errors, flash sale disappointments, and enthusiasm for cashback events. The study concludes that Shopee's popularity and mixed user sentiment, encompassing both complaints and enthusiasm for promotions, underscore the effectiveness of the NLP and K-NN approach in sentiment analysis. This research contributes valuable insights for e-commerce

companies, particularly Shopee, in enhancing service quality and customer satisfaction based on user feedback.

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