



Sentiment Analysis of KAI Access App Customer Reviews to Improve Customer Service Using Natural Language Processing

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Abstrak, This research analyzes user sentiment reviews of the KAI Access application from Google Play Store to improve customer service at PT Kereta Api Indonesia. The study uses a Natural Language Processing (NLP) approach with the Latent Dirichlet Allocation (LDA) algorithm to extract main topics from 10,000 reviews collected from April 2024 to April 2025. Analysis results show 40.7% positive sentiment reviews and 49.3% negative. After data preprocessing through case folding, normalization, tokenization, stopword removal, and stemming, seven optimum topics were found from negative sentiment with a coherence score of 0.508343 and two optimum topics from positive sentiment with a coherence score of 0.511673. Analysis based on five service quality dimensions (tangibles, reliability, responsiveness, assurance, and empathy) reveals that the reliability dimension becomes the main issue, including system instability, transaction failures, login difficulties, and data inaccuracy. The responsiveness dimension is the second priority, with users expecting fast and responsive service to complaints. The results of this study provide recommendations for PT KAI to prioritize improvements in system reliability and responsiveness aspects to enhance the overall user experience, which will ultimately impact customer satisfaction and loyalty.

Keywords: Customer Relationship Management, KAI Access, Latent Dirichlet Allocation, Natural Language Processing, Sentiment Analysis, Service Quality

1. INTRODUCTION

In today's digital era, the transformation of transportation services through mobile applications has become a strategic key for companies to enhance customer experience. PT Kereta Api Indonesia (KAI) as the largest train transportation service provider in Indonesia has developed the KAI Access application as a digital platform that allows customers to book tickets, view departure schedules, track train positions, and access various services related to train travel online. As the use of mobile applications for transportation services increases, user reviews on application distribution platforms such as Google Play Store become a very valuable source of information. These reviews contain direct feedback from customers that reflect levels of satisfaction, expectations, complaints, and suggestions for improvements to the application and services provided. However, the large and growing volume of reviews creates its own challenge in extracting meaningful insights manually.

Natural Language Processing (NLP) as a branch of artificial intelligence offers solutions to efficiently analyze large amounts of textual data. By implementing sentiment analysis, companies can categorize user reviews based on polarity (positive or negative) and identify

specific aspects that are of concern to customers. This allows PT KAI to understand user perceptions of the KAI Access application and customer service in a more structured and comprehensive manner. The importance of this research becomes increasingly relevant given the rising user expectations for mobile applications and the increasingly fierce competition in the transportation industry. The inability to respond to customer complaints or needs quickly and accurately can impact customer satisfaction, user retention, and ultimately the company's competitive position in the market. Sentiment analysis with an NLP approach enables identification of service areas that need immediate improvement, customer satisfaction trends over time, and development of more targeted service improvement strategies.

Additionally, review data from the Play Store provides authentic and unfiltered user perspectives, encompassing diverse demographics and different user backgrounds. This diversity allows PT KAI to obtain a comprehensive picture of user experiences across various customer segments, which might not be revealed through conventional survey methods. This research aims to develop a sentiment classification model that can automatically and accurately analyze user reviews of the KAI Access application from Google Play Store. The results of this analysis are expected to provide useful insights for PT KAI to identify priority areas in application development and customer service improvements, thereby increasing user satisfaction, driving application adoption, and strengthening long-term customer loyalty.

2. LITERATURE REVIEW

Theoretical Study

Latent Dirichlet Allocation (LDA)

According to Rahmawati (2021), Latent Dirichlet Allocation is an approach widely used in topic modeling and analysis. The Latent Dirichlet Allocation process includes summarizing, grouping, connecting, and processing data to produce a list of relevant topics for each document (Campbell, et al., 2015). This method is a text mining technique that aims to find certain patterns in documents by generating a number of different topics, without specifically categorizing documents into a single topic (Patmawati & Yusuf, 2021). LDA is applied to identify several topics that emerge from each opinion in each category. The advantage of the LDA method is its ability to effectively extract topics from large datasets (Merawati, et al., 2021).

Aplikasi KAI Access

The KAI Access application is the official application owned by PT. Kereta Api Indonesia (Persero) which has been launched since 2014. It contains several types of services including local and long-distance train travel (Wulandari & Fanida, 2023). The features available on the KAI Access application are quite complete, including booking local and long-distance train tickets, adding tickets, canceling tickets, changing schedules, and more. The purpose of the KAI Access application is to facilitate the use of train transportation when users want to use services from KAI Access (Akbar, et al., 2023). Therefore, the KAI Access application must run well to attract user interest, be efficient in its use, easy to use, and appropriate for user needs.

Customer Relationship Management (CRM)

Currently, customer relationship management is one of the strategies used by companies to know and understand users or customers, which can provide the best service and foster better long-term relationships with customers (Alim, et al., 2021). Implementing the CRM concept can help companies connect directly with customers so that customers can freely express their complaints. Information from customers about what they need enables the company to provide feedback and solutions to consumers quickly, thus customers will gain satisfaction and trust, and their loyalty and faithfulness will be maintained.

Service Quality

Service quality is a key element in Customer Relationship Management (CRM), as this is interconnected and plays a major role in customer satisfaction and loyalty (Farida, 2016). According to Sholikhah & Hadita (2023), service quality is defined as a way to meet user needs by matching the results obtained with the expectations of each customer. Service quality is determined by a company's ability to fulfill consumer requests and aspirations according to their expectations (Gunawan, 2022). Assessment of service quality levels should not be viewed from the company's perspective alone but must be taken from the assessment perspective of members. Therefore, when designing service strategies and programs, companies need to focus on member interests and consider quality elements relevant to them.

Dewi et al. (2023) state that in the context of service quality, there are five dimensions: tangibles (physical evidence), reliability, responsiveness, assurance, and empathy. Tangibles (physical evidence) describe the physical appearance, features, equipment, staff, and communication materials of services provided by the company. Reliability emphasizes consistency in presenting accurate, optimal, and trustworthy services. Responsiveness relates to the speed in helping users and providing services. Assurance covers the ability to provide

confidence and trust to users about the services provided. Empathy refers to expressions of attention and care shown to customers.

Literature Review

The first reference study is titled "Sentiment Analysis and Topic Modeling of E-grocery Application Reviews Using Naive Bayes and Support Vector Machine: A Case Study of Segari Data Review on Google Play Store" by (Dhammananda, et al., 2023). This research explores sentiment analysis and topic modeling regarding e-grocery application reviews. In this study, two classification algorithms, Naive Bayes and Support Vector Machine, were used to analyze 10,507 reviews. Evaluation of the obtained model showed that the SVM method with oversampling technique provided the highest recall value, namely 89.98%. Additionally, when applying modeling using topic algorithms, researchers used LDA to identify user views of the application that resulted in three positive topics and three negative topics.

The second reference study is titled "Development of Sharing Economy Business Model for Company Sustainability: A Case Study on Gojek" written by Dewi & Sundiman (2023). This research took a qualitative approach where the data used came from 23,888 reviews on the Play Store platform processed with the Python programming language. The analysis method used was Latent Dirichlet Allocation (LDA). The results of this study found three topics that influenced the business model based on the analysis results obtained.

The third study is titled "Social Media Sentiment Analysis of Banking Applications to Determine Application User Satisfaction: A Case Study on Livin by Mandiri and BCA Mobile" written by Ranataru & Trianasari (2024). This research aims to analyze customer satisfaction through sentiment found on Twitter social media. This study also investigates consumer perceptions related to service quality measured based on e-service quality dimensions. The method used in this research is Latent Dirichlet Allocation (LDA). The results show that Livin by Mandiri generally receives positive sentiment, especially in electronic service quality dimensions such as site organization, personal needs, user ease, and responsiveness. However, there is negative sentiment in the dimensions of efficiency and reliability. In contrast, BCA Mobile tends to get negative reviews overall, especially in site organization, responsiveness, and reliability, although in the dimensions of efficiency, personal needs, and user ease, it receives positive sentiment.

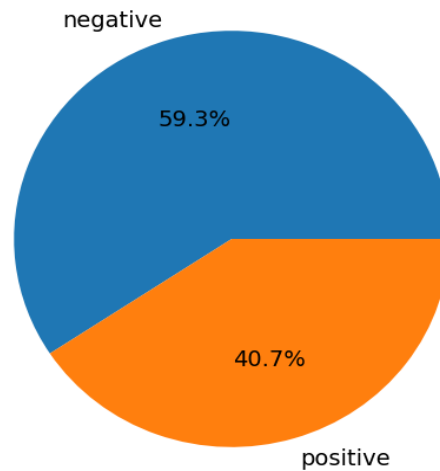
3. DISCUSSION

This research uses data obtained from the Play Store platform amounting to 10,000 data taken from April 30, 2024, to April 30, 2025. After obtaining the data, data preprocessing is carried out which aims to clean the data to eliminate irrelevant information and break sentences into basic words. Data preprocessing starts from the stages of case folding, normalization, tokenization, stopwords removal, and stemming. The following are the results of the preprocessing process shown in Table 1.

Proses	Hasil
<i>Filtering</i>	Setiap pembelian kursi penuh aja padahal udah coba beda hari ..
<i>Case Folding</i>	setiap pembelian kursi penuh aja padahal udah coba beda hari
<i>Normalize</i>	setiap pembelian kursi penuh aja padahal udah coba beda hari
<i>Stopword Removal</i>	beli kursi penuh coba beda
<i>Tokenization</i>	['beli', 'kursi', 'penuh', 'coba', 'beda']
<i>Steaming</i>	['beli', 'kursi', 'penuh', 'coba', 'beda']

The results obtained after conducting the analysis show positive and negative sentiment results. As many as 40.7% have positive sentiment and 49.3% have negative sentiment based on the data that has been obtained and has undergone preprocessing. The following is an image showing the percentage of sentiment analysis.

Polaritas Sentimen pada Data Ulasan (label InSet)
(total = 10000 ulasan)



Gambar 1 Presentase Analisis Sentimen Ulasan

In this study, there is a word cloud that aims to determine the distribution of words that are most numerous and most often written in reviews. The word cloud in this study is made based on the percentage of positive sentiment and negative sentiment from the results that have been analyzed. The following is a word cloud that has been obtained based on the analysis results.

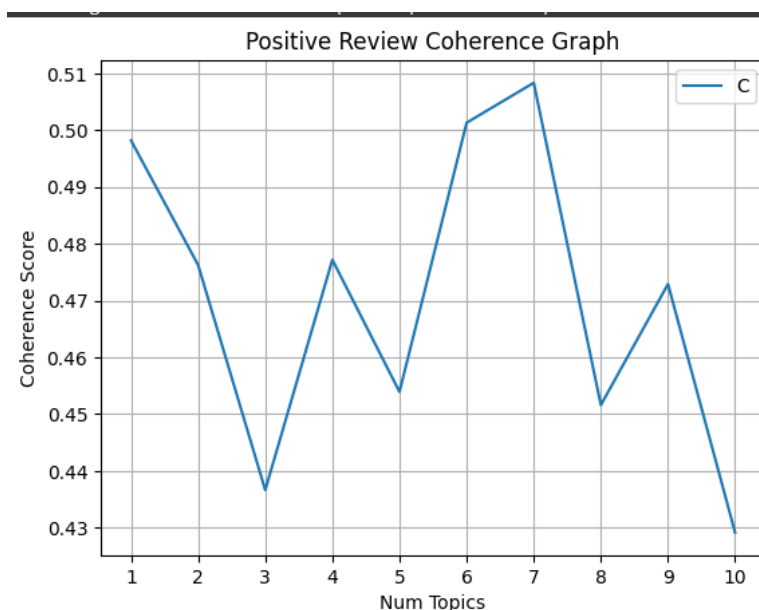


Gambar 2 Word Cloud Sentimen Positif



Gambar 3 *Word Cloud* Sentimen Negatif

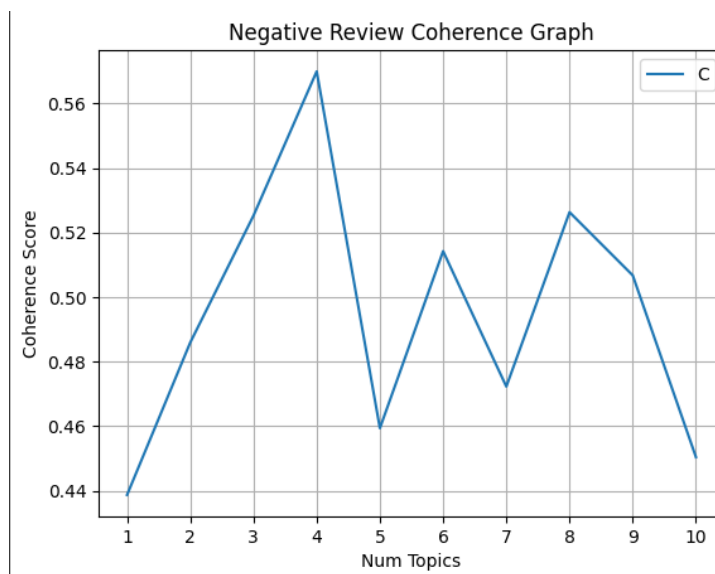
Figure 2 displays the results of positive sentiment analysis as shown by the appearance of words such as “*bagus*”, “*banget*”, “*baik*”, “*mudah*” and so on. Meanwhile, Figure 3 depicts the results of negative sentiment analysis, which is characterized by words such as “*bayar*”, “*beli*”, “*error*”, “*sistem*”, and so on. Comparison of these two images provides a general picture of user perceptions of the service, both in terms of appreciation and complaints that often arise.



Gambar 4 Nilai *Coherence Score* Sentimen Positif

Based on the analysis results using the Latent Dirichlet Allocation (LDA) algorithm, researchers determine the number of topics based on coherence scores to present data distribution to get optimum topics. Figure 4 shows the coherence score values from positive sentiment reviews. Based on these visualization results, it shows that the optimum topic is two topics with a coherence score value of 0.511673. Next, the negative analysis results show that

the optimum topic is seven topics with the highest coherence score value of 0.508343. The following is an image showing the distribution of optimum topics.



Gambar 5 Nilai Coherence Score Sentimen Negatif

Next, the optimum topics from each sentiment will be presented in table form to facilitate reading and will also be associated with service quality. Service quality itself consists of five dimensions: tangibles (physical evidence), reliability, responsiveness, assurance, and empathy. Tangibles (physical evidence) describe the physical appearance, features, equipment, personnel, and communication materials of a service provided by a company. Reliability refers more to the reliability of executing services that are appropriate, accurate, optimal, and dependable. Responsiveness is responsiveness in helping users and providing services quickly. Assurance is the ability to provide confidence and trust to users of the service, and Empathy is the statement of care and expression of attention to customers.

Tabel 1 Kata dari Nilai Coherence Score Sentimen Negatif

Topik	Kata yang menonjol
1	aplikasi, update, lambat, banget, buka, kai, error, bikin, bagus, eror, jelek, hp, baik, susah, buruk, mudah, pakai, melulu, sampah, sih
2	tiket, kereta, jam, jadwal, antri, beli, habis, aplikasi, pesan, kursi, sen, sistem, kai, stasiun, pas, pilih, menit, masuk, tumpang, susah

3	akun, daftar, masuk, login, otp, aplikasi, data, kode, upgrade, basic, member, email, susah, pakai, ribet, ulang, isi, suruh, coba, kirim
4	bayar, tiket, aplikasi, saldo, kai, masuk, gagal, potong, uang, beli, batal, pakai, up, muncul, top, hubung, baik, pay, hasil, dana

Based on topic 1, it appears that user complaints reflect several problems in service quality that need to be reviewed. First, in the Tangibles dimension (physical evidence), this aspect relates to the interface appearance and media used by users to access services, indicated by the words "application" and "hp". In the Reliability dimension, words such as "lambat", "buka", "error", "eror", "jelek", "buruk", dan "melulu" are found, indicating that the application often experiences disruptions, is unstable, and slow in providing responses, indicating a low level of system reliability. Next, in the Responsiveness dimension, it can be seen from the appearance of words "susah", "bikin", dan "sih", which show user disappointment due to slow responses from the system or customer service. For the Assurance dimension, which reflects the user's sense of security and trust in the service, words such as "baik" dan "bagus" appear, although in contrast to other complaints. Finally, in the Empathy dimension, complaints that are emotional or voice user discomfort can be seen from the appearance of words "sampah" dan "banget" which indicate expressions of frustration without special attention from service providers. Of these five dimensions, the Reliability dimension appears most dominant, due to the many complaints related to stability, performance, and main functions of the application.

Based on topic 2, several service problems also emerge from various service quality dimensions. In the Tangibles dimension, although not too dominant, the presence of words such as "aplikasi" dan "stasiun" indicates the importance of physical and digital access display and comfort in buying tickets. In the Reliability dimension, words "tiket", "kereta", "jadwal", "habis", "sistem", and "beli" appear, indicating a mismatch between schedules, ticket availability, and purchasing systems, thus showing reliability problems in the service process. In the Responsiveness dimension, words "antri", "susah", and "menit" indicate that users experience constraints related to service speed and minimal direct response to constraints faced. The Assurance dimension is represented by words "pas" and "pilih", which can reflect user uncertainty in choosing a seat or schedule, thus reducing trust in the system. While in the

Empathy dimension, the presence of words “masuk” and “tumpang” shows the mismatch of services to specific user needs. Just like the previous topic, the Reliability dimension is still the most dominant because it reflects the core of the main service problem, namely ticket purchase and availability.

Based on topic 3, the main focus of users is on the registration process and logging into the application. In the Tangibles dimension, the words "application" and "use" refer to visual aspects and ease of use of the application interface. In the Reliability dimension, words such as “akun”, “daftar”, “masuk”, “login”, “otp”, “data”, “kode”, “email”, and “ulang” indicate that the system experiences constraints in handling authentication processes and account registration, which is a core part of system reliability. In the Responsiveness dimension, complaints about slow or unresponsive systems are seen through words “susah”, “coba”, and “kirim”, indicating user frustration when the entry or registration process is disrupted. In the Assurance dimension, uncertainty and user insecurity can be seen from words “upgrade”, “basic”, and “suruh” which could indicate the process of service or feature upgrades that are not transparent. For the Empathy dimension, the word "complicated" indicates user discomfort due to processes considered too convoluted, showing a lack of understanding from service providers about the user experience. In this case, the Reliability dimension again becomes the main spotlight that needs to be improved.

Based on topic 4, users highlight the main problems related to transactions and finance. In the Tangibles dimension, words "application" and "use" indicate the importance of display and ease of use of digital services. In the Reliability dimension, words such as “bayar”, “saldo”, “masuk”, “gagal”, “beli”, “batal”, and “muncul” appear, indicating that the system experiences many problems in completing transactions smoothly and stably. In the Responsiveness dimension, inconsistency in responding to problems can be seen from words “gagal” and “hubung” which show the system's lack of responsiveness in handling user complaints. For the Assurance dimension, words such as “uang”, “up”, “top”, “pay”, and “dana” reflect the importance of user security and trust in transactions. As for the Empathy dimension, the word "baik" can show user expectations for more friendly and personal attention and service, although still not fully met. From all this, it is clear that the Reliability dimension again becomes the most major problem, as it relates directly to the transaction process that should be the core function of the application.

Tabel 2 Kata dari Nilai *Coherence Score* Sentimen Negatif

Topik	Kata yang menonjol
1	ok, banget, wa, cuek, failed, na, sip, bgt, errornya, markotop, playstore, butuh, ngupdate, meh, fiykum, subhanalloh, warahmatullahi, yassarollohu, assalamualaikum, barokallohu
2	kai, layan, mudah, bagus, nyaman, oke, cepat, tiket, moga, terimakasih, access, jalan, aplikasi, kereta, mesan, banget, keren, alhamdulillah, akses, aman
3	mudah, kadang, simple, akses, transaksi, support, online, lumayan, lambat, android, popmie, best, versi, keluhan, railfood, sibuk, nama, antre, bilang, hp
4	tiket, aplikasi, bayar, banget, update, saldo, top, pas, up, beli, masuk, kai, jam, pesan, baik, iya, pakai, antri, sen, habis
5	good, praktis, banyak, job, update, kerja, service, org, efektif, diskon, efisien, akun, lag, becus, apl, promo, show, merah, plat, hapus
6	mantap, manfaat, kreta, bantu, live, jalan, g, tracking, best, murah, pusat, ac, santai, hati, nyala, diupgrade, ups, pokok, makan, offline
7	kasih, terima, harga, baik, sdh, puas, kai, tambah, mahal, kakak, kursi, tiket, apps, promo, maintenance, pergi, kereta, gk, lokal, nomor

Based on topic 1, it shows several words that describe user expressions and interactions in services, especially in terms of communication and satisfaction or dissatisfaction. In this topic, there are words such as "ok", "banget", "sip", "errornya", and "playstore" which show user experiences related to application usage and success of certain functions. This reflects the Empathy dimension because it relates to how users personally feel about the service, as well as the Responsiveness dimension because there are words like "ngupdate" which shows the application's response to updates. Topic 2 emphasizes more on service quality related to ease and comfort in using the application. Words such as "layan", "mudah", "bagus", "nyaman", "cepat", "tiket", and "aplikasi" show the Tangibles and Responsiveness aspects, as users assess from the display, speed, and ease of access to services. Additionally, there are words

"terimakasih" and "alhamdulillah" which show user satisfaction and trust, falling into the Assurance dimension.

In topic 3, words such as “mudah”, “akses”, “transaksi”, “support”, and “online” show the Reliability dimension, indicating the importance of service stability and transaction smoothness. However, there are also words such as “lambat” and “keluh” indicating complaints related to performance. Words "name", "queue", and "say" reflect the empathy aspect of the user experience when interacting with the service. Topic 4 contains many words related to the process of purchasing and using services, such as “tiket”, “aplikasi”, “bayar”, “update”, “saldo”, and “beli”. This shows the Reliability dimension because it relates to the main function of the service that must be stable and run well. Words "queue" and "use" also indicate the Responsiveness aspect related to service efficiency when used. Topic 5 focuses on words that indicate ease and effectiveness of services, such as “good”, “praktis”, “banyak”, “kerja”, and “service”.. This relates to the Tangibles and Responsiveness dimensions, as users assess feature completeness and service speed. Words "discount" and "promo" also point to aspects that make users feel cared for, falling into the Empathy dimension.

Topic 6 contains words that show satisfaction and benefits such as “mantap”, “manfaat”, “bantu”, “murah”, and “Santai”. This shows the Empathy and Assurance dimensions, as users feel satisfied and confident with the services provided. There are also words "offline" and "live" which could indicate the Responsiveness dimension in different service conditions. Topic 7 shows aspects related to price and service such as kasih”, “terima”, “harga”, “baik”, “puas”, and “promo”. This indicates the Assurance and Empathy dimensions, which relate to user confidence and service attention to customer needs. Words "maintenance" and "go" show attention to aspects of service reliability and smoothness.

4. CONCLUSION

Based on the analysis results, several service quality dimensions require improvement to increase user satisfaction. The main priority lies in the Reliability dimension, which occupies a dominant position because many problems were found related to system stability, transaction failures, difficulties in the login process, and data accuracy. Problems in this reliability aspect have a significant impact on the level of user satisfaction and trust in the service. The Responsiveness dimension is also an important aspect that needs attention as the second priority. Users expect responsive and quick services in responding to complaints or problems faced, so improving this aspect will support enhancing the overall user experience.

Meanwhile, other dimensions, namely Tangibles (physical evidence), Assurance, and Empathy, although also requiring attention, are at a lower priority level compared to the two main dimensions. These dimensions play a role in strengthening user trust, providing adequate physical evidence of service, and building communication and attention to user needs. With a focus on improving the reliability dimension and increasing responsiveness, it is expected that the overall service quality will increase significantly, thereby being able to provide a more optimal and satisfying experience for users.

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