



Understanding Customer Satisfaction Through Aspect-Based Sentiment Analysis in The Aku Cinta Indonesia App

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ABSTRACT

Understanding customer satisfaction is essential for digital service providers operating in highly competitive markets, particularly in the online transportation sector, as numerical ratings alone are often insufficient to capture the complexity of user experiences expressed in textual reviews. This study employs Aspect-Based Sentiment Analysis (ABSA) to obtain a more granular understanding of customer satisfaction based on user reviews of the Aku Cinta Indonesia (ACI) application collected from the Google Play Store. Five key service aspects are examined, namely User Experience, Payment, Service, Promo and Benefit, and Security and Access. To support the analysis, two sentiment classification approaches, Naive Bayes and IndoBERT, are utilized to evaluate sentiment polarity at the aspect level. The results indicate that User Experience, Payment, and Service are the most influential aspects shaping customer satisfaction, as they consistently appear in both positive and negative reviews. While both models demonstrate reliable performance, IndoBERT achieves higher classification accuracy at 82% compared to Naive Bayes at 77%, indicating a stronger ability to capture contextual nuances in Indonesian user generated content. From a business perspective, these findings highlight how ABSA transforms unstructured customer feedback into actionable insights that enable service providers to identify critical improvement areas, prioritize service quality enhancements, and strengthen customer satisfaction strategies. This study demonstrates the value of ABSA as a business analytics tool that supports data driven decision making and enhances competitiveness in the digital transportation service market.

Keywords: Aku Cinta Indonesia, Aspect-Based Sentiment Analysis, Customer Satisfaction, Sentiment Analysis, Naive Bayes

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1. INTRODUCTION

The rapid growth of digital technology has significantly transformed how people interact with services in Indonesia. Internet access has evolved beyond communication purposes and now serves as a fundamental infrastructure supporting various digital based services, including online transportation platforms. According to the Indonesian Internet Service Providers Association, internet penetration in Indonesia reached 74.6 percent of the population in 2025, equivalent to approximately 212 million users, creating substantial opportunities for the expansion of digital service applications that rely on continuous user interaction (APJII, 2025). In this environment, customer satisfaction becomes a critical factor influencing service adoption, continuity, and competitiveness.

Online transportation services represent one of the most widely adopted digital services in Indonesia. Data from GoodStats (2024) indicate that approximately 66.7 percent of

Indonesians have used online transportation applications, placing Indonesia among the countries with the largest user bases globally. This high adoption rate intensifies competition among service providers, which is dominated by major platforms such as Gojek and Grab, while simultaneously creating opportunities for local digital applications to compete by offering differentiated service value. Under these competitive conditions, understanding customer satisfaction is essential for ensuring service sustainability and long term user retention.

User reviews published on digital platforms function as a form of voice of customer that reflects users' direct experiences with specific service attributes. Previous studies have shown that online reviews influence consumer decision making and provide valuable insights for service evaluation and improvement (Choi & Maasberg, 2021). Moreover, the qualitative content embedded in user reviews captures users' attitudes toward service features, making reviews a strategic data source for understanding customer satisfaction and identifying service deficiencies that may contribute to customer dissatisfaction or churn (Davoodi et al., 2025).

Despite their availability, user reviews are often underutilized as a systematic input for business analysis. Rating scores tend to oversimplify customer perceptions and fail to capture the nuanced opinions expressed in textual reviews, which are typically unstructured and linguistically diverse (Kumar & Hanji, 2024). Conventional sentiment analysis approaches have been widely applied to classify reviews into positive, negative, or neutral categories. However, these methods primarily operate at the document level and provide limited insight into which specific service aspects most strongly influence customer satisfaction or dissatisfaction (Ishaq et al., 2024).

To address these limitations, Aspect Based Sentiment Analysis has been developed to identify service aspects discussed in user reviews and associate each aspect with a corresponding sentiment. By linking opinions to specific service features, ABSA enables a more fine grained understanding of customer satisfaction and offers more actionable insights for service improvement (Chavan, 2022; Yin, 2024; Tadkal et al., 2024). However, empirical studies applying Aspect-Based Sentiment Analysis (ABSA) in the Indonesian language, particularly within the context of online transportation services, remain limited. Previous literature reviews indicate that most ABSA studies predominantly utilize English datasets and focus on widely studied domains such as restaurants, laptops, and consumer electronics (Ahmad et al., 2023). Furthermore, most existing studies emphasize the technical performance of sentiment classification models rather than examining ABSA as a business analytics tool for understanding customer satisfaction.

Therefore, this study applies Aspect Based Sentiment Analysis to user reviews of the Aku Cinta Indonesia application collected from the Google Play Store by employing two sentiment classification approaches, namely Naive Bayes and IndoBERT. This study aims to enhance the understanding of customer satisfaction by identifying dominant service aspects and sentiment patterns that shape user perceptions. The findings are expected

to contribute to the literature on customer satisfaction and business analytics in the Indonesian digital service context, while also providing practical insights for local application developers in improving service quality and competitiveness.

2. LITERATURE REVIEW

Aku Cinta Indonesia

Aku Cinta Indonesia (ACI) is a local digital application that operates within this competitive landscape by offering transportation and various digital services through a single application ecosystem. Based on data from the Google Play Store (2025), ACI has recorded more than 100,000 downloads with an average rating of 4.4 derived from approximately 5,000 user reviews. Although these indicators suggest a relatively positive reception, ACI's rating remains lower than those of leading competitors, which have achieved significantly higher download volumes and ratings. This disparity indicates potential differences in user perceptions that cannot be fully explained through numerical ratings alone, highlighting the need for a deeper analysis of textual user feedback.

Aspect-Based Sentiment Analysis (ABSA)

Aspect Based Sentiment Analysis represents an advanced analytical approach that extends traditional sentiment analysis by associating sentiment polarity with specific product or service attributes. Zhang et al. (2022) describe ABSA as a method for identifying sentiment expressions linked to particular aspects of a product or service, enabling a more fine grained analysis of user opinions. Unlike document level sentiment analysis, which produces an overall sentiment score, ABSA allows businesses to identify which service attributes contribute most strongly to customer satisfaction or dissatisfaction.

Prior studies have demonstrated the relevance of ABSA for analyzing user reviews in digital platforms. Studies have shown that ABSA enables organizations to extract detailed insights related to service features such as usability, service quality, and pricing, thereby supporting targeted service improvements (Hua et al., 2024; Kandhro et al., 2023). From a business analytics perspective, ABSA provides a structured mechanism for converting unstructured textual feedback into analyzable data that can inform managerial decision making. However, most existing studies emphasize the technical performance of ABSA models, with limited attention to its role in supporting customer satisfaction analysis, particularly in emerging digital markets.

Customer Satisfaction

Customer satisfaction is a central concept in service management and plays a critical role in customer retention and long-term business performance. Customer satisfaction is generally understood as an evaluation of whether a product or service meets or exceeds customer expectations and reflects a post-consumption evaluation process (Mittal et al., 2023). Customer satisfaction can be formed through both individual service encounters and cumulative experiences over time, making it a multidimensional and dynamic construct (Davoodi et al., 2025).

In digital service environments, customer satisfaction is increasingly expressed through user generated content such as online reviews. These reviews capture customers' direct evaluations of specific service attributes and provide insights that extend beyond numerical rating scores. As such, analyzing textual reviews enables a deeper understanding of customer satisfaction by revealing the underlying reasons behind positive or negative evaluations. ABSA offers a suitable analytical approach for examining these reviews, as it allows satisfaction related sentiments to be mapped to specific service aspects such as application usability, service responsiveness, and transaction processes.

Sentiment Analysis

Sentiment Analysis (SA), also known as opinion mining, is a subfield of Natural Language Processing (NLP) that focuses on identifying opinions and emotions expressed in unstructured textual data (Davoodi et al., 2025). Sentiment analysis can be conducted at different, including document level, sentence level, and aspect level. Among these, aspect level sentiment analysis provides the most detailed insights by linking sentiment expressions to specific attributes mentioned in user reviews.

Various analytical approaches have been applied in sentiment analysis. Traditional classifiers such as Naive Bayes remain widely used due to their simplicity and computational efficiency, making them suitable for baseline sentiment classification tasks (Peretz et al., 2024). In contrast, deep learning models such as IndoBERT utilize contextualized language representations to capture semantic nuances in Indonesian user-generated content, enabling more accurate analysis of informal and context-dependent expressions (Mustofa et al. 2025; Perwira et al. 2025).

From a business analytics perspective, comparing different sentiment classification approaches is relevant not only to assess technical performance, but also to evaluate the practicality of implementing these models in real world business settings. Lightweight models such as Naive Bayes may be suitable for rapid analysis with limited resources, while advanced models such as IndoBERT provide deeper insights that support more comprehensive understanding of customer satisfaction.

Naive Bayes

Business analytics is a data-driven approach that supports organizational decision making by transforming raw data into actionable insights. Business analytics can be understood as a set of processes and techniques used to analyze data in order to improve business performance, while also integrating analytical methods with business knowledge to align insights with organizational objectives (Bawack & Ahmad, 2021). From a managerial perspective, business analytics enables organizations to better understand customer behavior, market dynamics, and operational performance, thereby supporting strategic and operational decisions.

In service oriented digital platforms, business analytics plays a critical role in evaluating customer experiences and identifying performance gaps that may affect customer satisfaction. Bawack & Ahmad (2021) argue that the primary objective of business analytics is not merely data processing, but the provision of accurate, relevant, and timely information that can guide managerial actions. Within this context, customer generated data such as online reviews represents a valuable yet underutilized resource for understanding customer perceptions and improving service quality.

3. METHODOLOGY

This study adopts a business analytics approach to analyze customer satisfaction based on user generated content in the form of online reviews. The methodological objective is to transform unstructured textual feedback into structured, aspect based insights that support a deeper understanding of customer satisfaction in the Aku Cinta Indonesia (ACI) online transportation application. Aspect Based Sentiment Analysis is employed as the primary analytical technique to identify service attributes discussed by users and to evaluate sentiment associated with each attribute. The overall research process adopted in this study is illustrated in Figure 1, which outlines the sequential stages of data collection, data preprocessing, aspect identification, sentiment annotation, modeling, and evaluation.

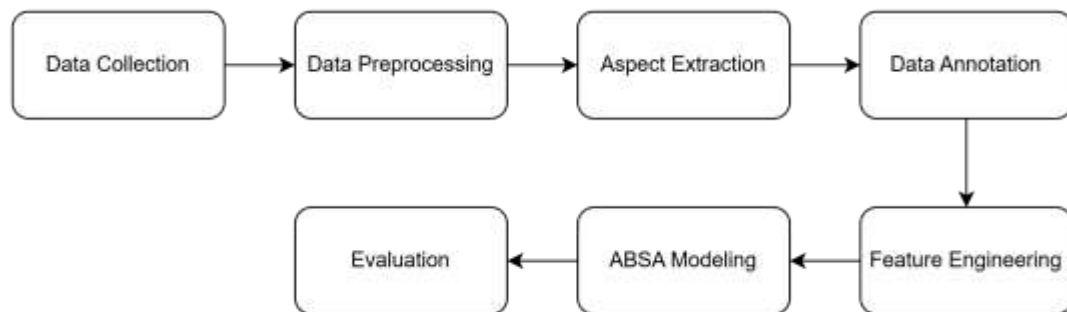


Figure 1. Research Data Analysis Process
 Source: Adapted Davoodi et al. (2025)

Data Collection

User reviews of the Aku Cinta Indonesia application were collected from the Google Play Store using an automated web-based data extraction process. The data collection was restricted to Indonesian-language reviews submitted by users located in Indonesia and ordered by the most recent publication date. Reviews posted between January 1, 2024 and November 1, 2025 were included in the dataset. A total of 1,172 reviews were initially collected, after which irrelevant and incomplete entries were removed to ensure data quality. The refined dataset served as the primary input for subsequent analysis stages.

Data Preprocessing

Data preprocessing was conducted to clean and normalize user reviews prior to analysis. The preprocessing steps included text cleaning, normalization of informal expressions, stopword removal, and stemming. These procedures were applied to reduce noise and ensure consistency in textual representation, allowing sentiment patterns to accurately reflect user opinions expressed in the reviews.

Aspect Extraction

Aspect extraction was conducted to identify service attributes discussed by users and to enable sentiment analysis at the aspect level. This stage allows customer satisfaction to be analyzed based on specific service dimensions rather than overall review polarity, providing a more precise understanding of how different service attributes shape user perceptions.

A linguistic-based approach was applied to capture meaningful expressions related to service attributes by identifying relevant word combinations that commonly appear in user reviews. This approach enables the extraction of aspects grounded in actual user expressions and contextual language use, ensuring that identified aspects reflect real service experiences rather than predefined assumptions.

The extracted terms were subsequently grouped into predefined aspect categories based on their semantic relevance to digital transportation services. Five main service aspects were defined in this study, namely User Experience, Service, Payment, Promo and Benefit, and Security and Access. These categories represent key dimensions through which users evaluate online transportation applications. The definitions of each aspect category are presented in Table 1 to ensure consistency in interpretation throughout the analysis.

Table 1. Aspect Categories and Descriptions

No.	Aspect	Description
1	User Experience	Evaluates app performance, bugs, display, and ease of use.
2	Service	Relates to driver service, response speed, and interactions.
3	Payment	Involves payment methods, balance, top-ups, and pricing.
4	Security & Access	Focuses on account, OTP, login, and verification.
5	Promo & Benefit	Includes promotions, discounts, cashback, and bonuses.

Source: Processed by the researcher (2025)

Sentiment Annotation

Sentiment annotation was conducted to assign sentiment polarity labels (positive, negative, or neutral) to user opinions expressed toward each identified service aspect. A lexicon-based sentiment approach was employed to classify sentiment orientation by comparing words within review segments to predefined lists of positive and negative expressions.

This approach was selected due to its interpretability and practicality in contexts where large labeled datasets are unavailable. From a business analytics perspective, lexicon-based annotation enables transparent interpretation of customer opinions and supports systematic identification of satisfaction and dissatisfaction patterns across service

aspects. The resulting sentiment distribution across aspects is summarized in Table 2 and forms the basis for subsequent modeling and evaluation stages.

Table 2. Sentiment Summary by Aspect

Aspect	Positive	Negative	Neutral	Total
User Experience	250	84	354	688
Service	122	69	150	341
Payment	193	39	170	402
Security & Access	3	11	19	33
Promo & Benefit	92	16	112	220

Source: Processed by the researcher (2025)

Feature Engineering

Feature engineering was conducted to transform textual data into structured representations suitable for aspect-based sentiment analysis. This stage prepares user-generated content so that customer opinions expressed in online reviews can be systematically analyzed and compared across different service aspects while minimizing noise that may affect analytical accuracy.

Two feature representation approaches were employed. The first utilizes a statistical representation of text to support efficient and interpretable sentiment analysis, while the second adopts a contextual representation that captures semantic relationships between words in informal and context-dependent user expressions. From a business analytics perspective, this dual approach enables a balance between computational efficiency and interpretative depth, supporting practical analysis without compromising the robustness of customer satisfaction insights.

ABSA Modeling

ABSA modeling was conducted to generate aspect-level sentiment insights from structured textual data, with the objective of enabling consistent and scalable interpretation of customer sentiment across predefined service aspects. Two analytical approaches were employed: a baseline statistical model to support efficient and interpretable sentiment classification, and a contextual model to capture nuanced expressions commonly found in Indonesian user-generated content. From a business analytics perspective, the combined use of these approaches provides strategic flexibility by supporting routine sentiment monitoring while enabling deeper analysis for service evaluation and managerial decision-making.

Evaluation

Evaluation was conducted to assess the reliability of the analytical approaches in classifying sentiment polarity across service aspects. The purpose of this stage is to ensure that the sentiment classification results provide a stable and credible foundation for interpreting customer satisfaction patterns rather than emphasizing model optimization.

In this study, overall accuracy and F1-score were used as evaluation metrics to assess model performance. Accuracy measures the proportion of correctly predicted sentiment labels relative to the total number of predictions, while the F1-score evaluates the balance between precision and recall across sentiment classes. These metrics provide a comprehensive assessment of the model's ability to classify positive, negative, and neutral sentiments consistently.

To obtain these evaluation scores, both the Naive Bayes and IndoBERT models were trained on the labeled dataset and subsequently tested on unseen data. The predicted sentiment labels generated by each model were then compared with the actual sentiment labels in the test dataset to calculate the accuracy and F1-score values.

Table 3 presents a summary of the evaluation results for the two analytical approaches employed. The results indicate that both approaches demonstrate reliable performance, with the contextual model achieving higher overall accuracy and F1-score compared to the baseline approach, supporting its ability to capture nuanced expressions in Indonesian user-generated content.

Table 3. Evaluation Summary

Model	Accuracy	F1-Score
Naive Bayes	0.7668	0.692
IndoBERT	0.8198	0.758

Source: Processed by the Researcher (2025)

4. RESULTS

This section reports the results of the aspect-based sentiment analysis on user reviews of the Aku Cinta Indonesia (ACI) application. The findings highlight how different service aspects shape customer satisfaction and dissatisfaction through aspect-level sentiment distribution and co-occurrence patterns in positive and negative reviews, providing actionable insights for service improvement.

Overview of Aspect-Based Sentiment Distribution

The distribution of sentiment across service aspects indicates that user perceptions of the ACI application are unevenly distributed. As shown in Figure 2, User Experience is the most dominant aspect, appearing most frequently in both positive and negative reviews, underscoring the central role of application usability, system performance, and interface stability in shaping customer satisfaction.

Payment and Service emerge as the second and third most discussed aspects. Although both receive substantial positive sentiment, they also contribute significantly to negative sentiment, indicating that transactional reliability and service execution remain critical determinants of user evaluation. Promo and Benefit appears moderately in both sentiment categories, suggesting its role as a complementary factor rather than a primary driver of satisfaction. Security and Access is the least discussed aspect, implying that access-related issues gain attention mainly when problems occur. Overall, the results indicate that customer satisfaction in the ACI application is primarily driven by core functional aspects related to usability, service delivery, and payment processes, rather than auxiliary features.

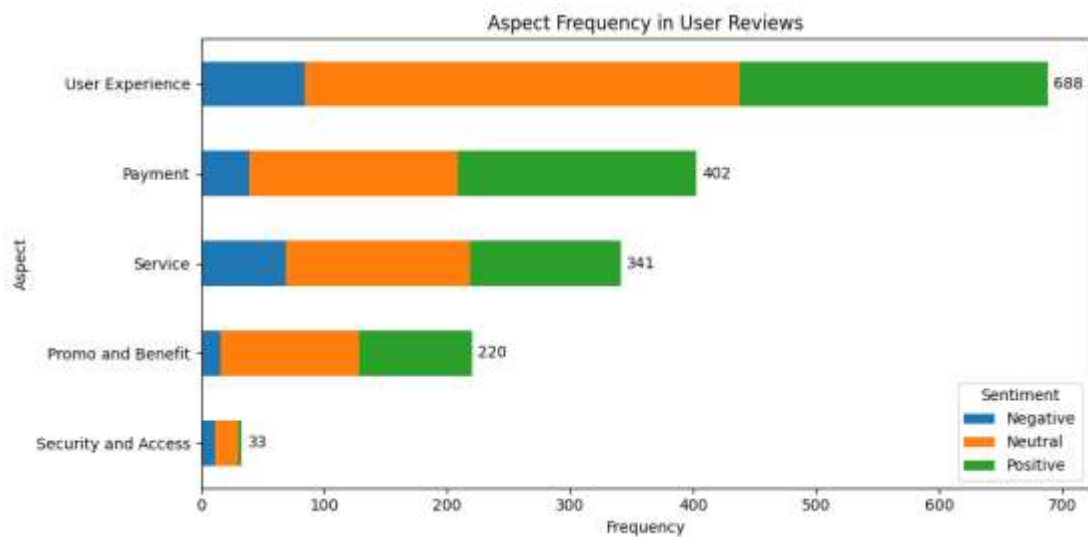


Figure 2. Aspect Sentiment Distribution

Aspect Co-occurrence Patterns in Negative Reviews

Negative perceptions toward the ACI application rarely stem from a single service aspect. Instead, dissatisfaction typically arises from the interaction of multiple dimensions. Table 4 presents the most frequent combinations of service aspects in negative reviews.

Table 4. Most Frequent Aspect Co-occurrence Patterns in Negative Reviews

Aspect	Frequency
Service, User Experience	15
Payment, Service, User Experience	7
Payment, User Experience	5
Payment, Promo & Benefit, Service, User Experience	4
Security and Access, User Experience	4

Source: Processed by the Researcher (2025)

The most dominant co-occurrence pattern is Service and User Experience, appearing 15 times in negative reviews. This pattern indicates that technical application problems often occur simultaneously with operational service issues. This interaction is illustrated by user comments such as “The service is poor, drivers are rarely available, and the application is not useful” and “Please add a cancellation feature for customers; sometimes drivers take too long and the ride cannot be canceled” (translated from Indonesian). These comments show that users experience application-related problems alongside service execution barriers, which together form stronger negative perceptions.

More complex combinations involving Payment, Service, and User Experience appear seven times, reflecting situations where transaction discrepancies occur alongside application instability and service issues. For instance, users reported mismatched fares caused by application bugs combined with limited service responsiveness, reinforcing the multidimensional nature of negative experiences.

Figure 3 further shows that User Experience accounts for the largest share of negative mentions, followed by Service and Payment, supporting the co-occurrence patterns identified. Although Security and Access appears less frequently, its association with User Experience suggests that access-related failures contribute to dissatisfaction when they disrupt core application usage.

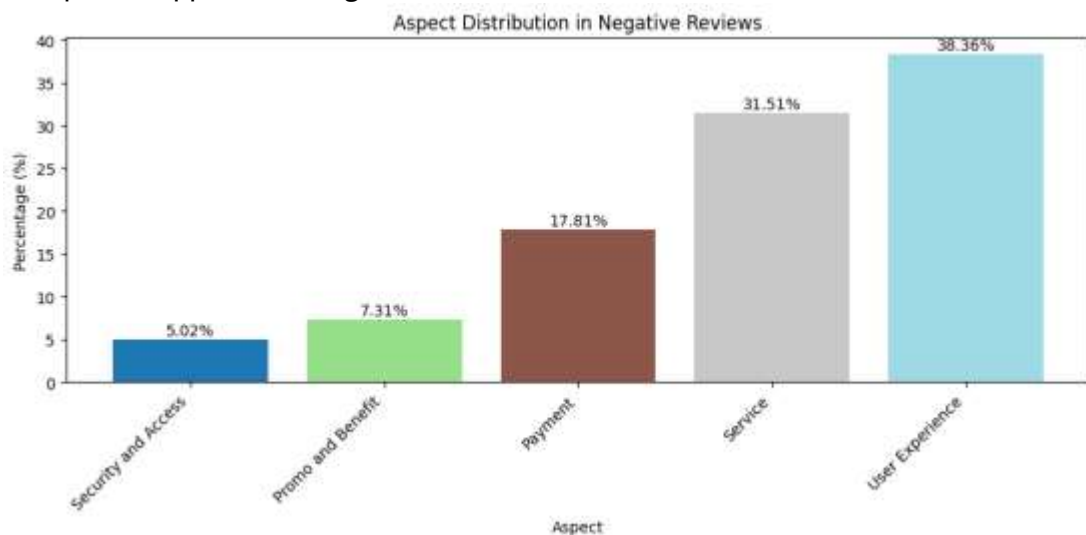


Figure 3. Distribution of Service Aspects in Negative Reviews

Aspect Co-occurrence Patterns in Positive Reviews

Positive user perceptions also reflect interactions among multiple service aspects, though the patterns are generally less complex than those in negative reviews. As shown in Table 5, the most dominant positive co-occurrence is Payment and User Experience, appearing 60 times. This finding indicates that ease of use combined with smooth transaction processes plays a key role in shaping satisfaction.

User comments such as “The application is comfortable to use, not complicated, and transactions are easy” (translated from Indonesian) highlight how application stability supports seamless payment experiences, resulting in favorable evaluations. Promo and Benefit frequently co-occurs with User Experience (28 times), suggesting that

promotional features enhance satisfaction when supported by a stable and user-friendly application rather than acting as standalone drivers.

Combinations involving Service and User Experience appear less frequently in positive reviews, indicating that service quality contributes to satisfaction primarily after fundamental usability and transactional expectations have been met. This contrasts with negative reviews, where service-related issues often amplify usability problems.

Table 5. Most Frequent Aspect Co-occurrence Patterns in Positive Reviews

Aspect	Frequency
Payment, User Experience	60
Promo & Benefit, User Experience	28
Payment, Service, User Experience	23
Payment, Promo & Benefit, User Experience	18
Service, User Experience	15

Source: Processed by the Researcher (2025)

Figure 4 shows that User Experience dominates positive mentions, followed by Payment and Service, reinforcing the co-occurrence findings. The limited presence of Security and Access in positive reviews suggests that these features are perceived as baseline requirements and receive attention mainly when they fail.

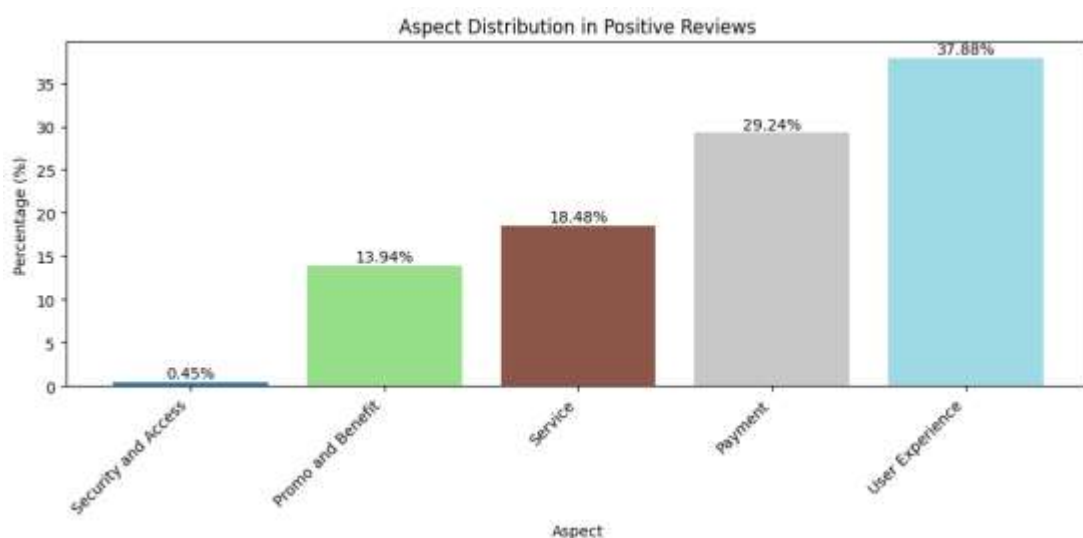


Figure 4. Distribution of Service Aspects in Positive Reviews

5. DISCUSSION

This study aims to provide a deeper understanding of user perceptions toward the Aku Cinta Indonesia (ACI) application by applying aspect-based sentiment analysis (ABSA) to user reviews collected from the Google Play Store. The discussion interprets the empirical findings by linking aspect-level sentiment patterns to relevant literature and highlighting their implications for digital service management. Rather than focusing on overall sentiment polarity, this study demonstrates how a granular, aspect-based approach enables a more nuanced understanding of customer satisfaction and dissatisfaction.

The Role of ABSA in Understanding Multidimensional User Perceptions

The findings confirm that user perceptions of the ACI application are shaped by interactions among multiple service aspects rather than isolated factors. The observed co-occurrence patterns in both positive and negative reviews highlight the strength of ABSA in capturing the multidimensional nature of user evaluations. Unlike document-level sentiment analysis, ABSA allows for the identification of specific service dimensions that jointly influence satisfaction and dissatisfaction.

From a business analytics perspective, these results support the view that unstructured user-generated content can be transformed into structured insights that inform managerial decision-making. Organizing user feedback by service aspects clarifies where service strengths and failures converge, aligning with analytical frameworks proposed by O'Brien & Marakas (2010), Tekinerdogan et al. (2019), and Bhattacharyya (2024). This capability is particularly relevant in competitive digital service environments, where identifying sources of dissatisfaction is essential for continuous improvement.

User Experience as the Central Driver of Satisfaction and Dissatisfaction

User Experience emerges as the central driver shaping both positive and negative perceptions. Its dominance across sentiment categories indicates that usability, system stability, and responsiveness form the foundation of user evaluations. In negative reviews, User Experience frequently co-occurs with Service and Payment, suggesting that technical issues tend to amplify operational and transactional problems. This pattern reflects prior findings that gaps between expected and actual service performance intensify dissatisfaction (Mittal et al., 2023).

In contrast, positive perceptions are primarily associated with combinations of User Experience and Payment, indicating that smooth usability and reliable transactions generate favorable experiences. Promotional features enhance satisfaction only when core functional performance is met, reinforcing the notion that auxiliary benefits cannot compensate for fundamental system weaknesses. These findings are consistent with previous studies emphasizing usability and transaction reliability as key determinants of digital service evaluations (Helmayanti et al., 2023; Soleman et al., 2023).

Differentiating Drivers of Positive and Negative Experiences

An important contribution of this study lies in distinguishing the different mechanisms underlying positive and negative user perceptions. Negative sentiment is characterized by complex aspect interactions involving technical instability, service execution issues, and payment discrepancies, indicating that dissatisfaction is cumulative and reinforcing. This

suggests that addressing complaints in isolation may be ineffective, as unresolved issues across multiple dimensions can intensify negative perceptions.

Conversely, positive sentiment is driven by fewer and more stable aspect combinations, largely centered on functional usability and transaction smoothness. Promotional benefits function as complementary enhancers rather than primary drivers of satisfaction. This asymmetry supports broader customer satisfaction literature suggesting that dissatisfaction is typically more complex and multifaceted than satisfaction.

Implications of Model Performance for Business Analytics

The comparison between Naive Bayes and IndoBERT provides insights into the practical application of ABSA. While both models successfully classify aspect-level sentiment, IndoBERT demonstrates superior accuracy and F1-score, reflecting its stronger ability to capture contextual nuances in Indonesian user-generated content. This finding aligns with prior research highlighting the effectiveness of transformer-based models for analyzing informal and diverse language patterns in digital reviews (Mustofa et al., 2025; Perwira et al., 2025).

Nevertheless, the continued relevance of Naive Bayes suggests that traditional methods remain valuable for rapid assessments and contexts with limited computational resources. From a business administration perspective, this supports a flexible analytics strategy in which lightweight models are used for routine monitoring, complemented by advanced models for deeper strategic analysis (Singgalen, 2025).

The lower performance observed in the Security and Access aspect further highlights the importance of data availability and aspect salience in achieving reliable sentiment classification, especially for service dimensions that are less frequently discussed by users. This limitation underscores that even advanced models require sufficient and representative data to generate dependable insights, consistent with findings reported in IndoBERT-based sentiment analysis research (Singgalen, 2025).

Overall, the discussion demonstrates that ABSA provides a robust analytical framework for understanding customer satisfaction in digital transportation services. By revealing how service aspects interact to shape user perceptions, this study extends existing research on digital service evaluation and highlights the strategic value of user reviews as a business analytics resource. The findings underscore the importance of prioritizing core functional performance, particularly User Experience and Payment reliability, while addressing service execution issues in an integrated manner to mitigate dissatisfaction and enhance overall service quality.

6. CONCLUSION

This study demonstrates that user reviews of the Aku Cinta Indonesia (ACI) application published on the Google Play Store represent a valuable source of business-relevant information for understanding customer perceptions in digital transportation services. By applying Aspect-Based Sentiment Analysis (ABSA), unstructured textual feedback can be systematically transformed into structured, aspect-level insights, enabling a more precise evaluation of customer satisfaction than reliance on numerical ratings alone.

The findings indicate that User Experience is the central dimension shaping both satisfaction and dissatisfaction, highlighting the importance of application usability, system stability, and responsiveness. Payment and Service emerge as key supporting aspects, particularly in relation to transaction reliability and operational service execution. Negative perceptions are largely driven by the convergence of technical, service, and transactional issues, whereas positive perceptions are associated with smooth usability and reliable payment processes, with promotional features acting as complementary value enhancers.

From a methodological perspective, the comparison between Naive Bayes and IndoBERT confirms that both approaches are effective for aspect-level sentiment analysis of Indonesian user-generated content. While Naive Bayes offers an efficient solution for rapid sentiment assessment, IndoBERT provides deeper contextual understanding, demonstrating that sentiment analysis strategies can be adapted to different analytical needs and resource constraints.

Overall, this study highlights the practical value of ABSA as a business analytics tool for digital service providers. By revealing how service aspects interact to shape user perceptions, the approach supports data-driven decision-making and helps identify priority areas for service improvement, contributing to enhanced service quality and competitiveness in the digital transportation market.

Despite these contributions, several opportunities remain for future research. Future studies may further refine the process of aspect identification in ABSA by defining aspect categories at the early stage of analysis, which may facilitate more systematic mapping of user reviews into relevant service dimensions. In addition, the use of semi-automated labeling techniques that combine system-generated aspect suggestions with researcher verification may improve the consistency and accuracy of aspect classification.

Furthermore, although IndoBERT demonstrates strong capability in processing Indonesian-language user reviews, its performance may be affected when applied to imbalanced datasets. Therefore, future research may explore data balancing strategies, larger datasets, or alternative deep learning architectures to further improve the robustness and performance of sentiment analysis models in Indonesian digital service contexts.

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