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Evaluation of KAI Access Service Quality Using the E-SERVQUAL Method

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Abstract: Digitalization has transformed public transportation services by encouraging service providers to deliver faster, more accessible, and customer-oriented mobile applications. This study examines the electronic service quality of the Access by KAI application using the E-SERVQUAL method. The objective is to identify gaps between user expectations and perceived service performance across seven dimensions: efficiency, fulfillment, system availability, privacy, responsiveness, compensation, and contact. A descriptive quantitative approach was applied by distributing questionnaires to 100 respondents with experience using the application. Respondents were selected through purposive sampling, and each questionnaire item was measured using a five-point Likert scale for expectation and perception scores. The research instrument underwent validity and reliability testing before the data were analyzed. The results show that all E-SERVQUAL dimensions had negative gap values, indicating that perceived service quality did not fully meet user expectations. The overall expectation score was 4.61, whereas the overall perception score was 3.67, resulting in an average gap of −0.94. The largest gap was found in compensation (−1.28), followed by system availability (−1.15), responsiveness (−1.14), and contact (−1.02). These findings indicate that refund handling, ticket cancellation, failed transaction resolution, application stability, complaint response, and access to customer support are the main areas requiring improvement. The results provide practical guidance for improving digital railway ticketing services and supporting user satisfaction in Indonesia's transportation sector.

Keywords: E-SERVQUAL; Electronic Service Quality; Access by KAI; Digital Transportation Service; User Satisfaction.

1. Introduction

The development of information and communication technology has changed how transportation services are designed, delivered, and accessed by the public. Services that previously depended largely on ticket counters and other manual procedures have increasingly shifted to digital platforms that allow users to obtain information and complete transactions through mobile devices. This transition can reduce users' dependence on physical service locations, shorten transaction processes, and provide access to services across different times and locations. Digitalization has consequently become an important part of transportation management and service delivery (Kartsan & Mavrin, 2023). Technological developments in transportation and logistics also show that digital systems are increasingly used to support information exchange, transaction processing, service coordination, and interactions between providers and customers (Wang & Wang, 2021). The presence of a digital platform, however, does not automatically ensure that users receive a reliable service. Its value

also depends on whether the system is accessible, understandable, stable, secure, and able to complete transactions as expected.

In Indonesia's railway transportation sector, this development is reflected in the Access by KAI application, formerly known as KAI Access. The application was developed by PT Kereta Api Indonesia to provide mobile access to railway services. Users can search for train schedules, book tickets, make payments, select seats, view travel details, change departure schedules, cancel tickets, submit refund requests, and use electronic boarding passes. These functions allow customers to complete various travel-related activities without visiting a station ticket counter. Previous studies of online railway ticketing have indicated that usability, technology acceptance, and user interaction are relevant to the use of railway reservation systems (Christanto, 2022; Christanto *et al.*, 2024; Christanto & Sediyono, 2020). Access by KAI therefore functions not merely as an additional booking channel but as a service interface connecting customers with several stages of railway travel, from obtaining schedule information to handling changes or problems after a transaction.

The availability of multiple features does not necessarily mean that the application's electronic service quality meets user expectations. Users may evaluate the application based on the ease of understanding its menus, the speed of obtaining travel information, the accuracy of schedules and ticket availability, and the ability to complete payments without interruption. System stability, protection of personal and financial data, clarity of transaction status, and access to customer support also affect the service experience. Research in different electronic service settings has found that users' evaluations are associated with the quality, reliability, and responsiveness of services delivered through digital platforms (Kurniasih *et al.*, 2023; Salamah *et al.*, 2022; Wisnel *et al.*, 2022). These aspects are particularly relevant to railway ticketing because users conduct financial transactions for journeys with fixed departure times. Errors during booking, delays in payment confirmation, inaccurate schedule information, or tickets that do not appear after payment may disrupt travel arrangements and create uncertainty. Problems involving cancellations and refunds may also affect users when the required procedures, processing periods, or transaction statuses are unclear. Studies of railway reservation systems and online ticket booking have similarly identified usability and service performance as relevant elements in users' evaluations of digital ticketing services (Christanto & Sediyono, 2020; Widjaja *et al.*, 2025).

Electronic service quality offers an appropriate basis for examining these issues. E-SERVQUAL adapts the assessment of service quality to services delivered through electronic platforms by comparing what users expect with what they perceive after using a website or application (Nguyen *et al.*, 2023; Swaid & Wigand, 2009; Vatolkina *et al.*, 2020). In this study, E-SERVQUAL is operationalized through seven dimensions: efficiency, fulfillment, system availability, privacy, responsiveness, compensation, and contact. Efficiency concerns the ease and speed with which users can access information and complete activities in the application. Fulfillment refers to the application's ability to deliver the promised services, including accurate travel information, successful ticket booking, payment confirmation, and proper operation of its features. System availability addresses application accessibility, technical stability, and the continuity of transaction processes, while privacy relates to the protection of users' personal information and payment data. Responsiveness assesses the speed and clarity of the provider's response when users encounter errors or submit complaints. Compensation concerns the handling of cancellations, refunds, failed transactions, and other service failures. Contact evaluates whether users can easily locate and communicate with customer-support services. These dimensions cover both routine application use and service recovery when a transaction cannot be completed as expected (Nguyen *et al.*, 2023; Wong & Anita, 2024).

Previous research has applied electronic service-quality concepts to several forms of mobile and transportation services. Fauzi (2018) examined electronic service quality in mobile applications operated by online transportation providers, including Go-Jek, Grab, and Uber. Justitia *et al.* (2019) assessed customer satisfaction with online taxi mobile applications, while Wulandari *et al.* (2024) evaluated the quality of the MAXIM application using an electronic service-quality approach. Research concerning railway applications has also examined usability, technology acceptance, and competition between digital ticket-booking platforms (Christanto, 2022; Christanto *et al.*, 2024; Christanto & Sediyono, 2020). The studies cited in this research show that mobile transportation services need to be assessed beyond the presence of digital features because users also encounter issues associated with system performance, transaction reliability, ease of use, and access to assistance. Nevertheless, the available studies provide limited information about how user expectations compare with perceived performance across the seven E-SERVQUAL dimensions in the Access by KAI application. Examining this difference is necessary because a feature may be available while its actual performance remains below the level expected by users.

This study analyzes the electronic service quality of the Access by KAI application using the E-SERVQUAL method. It measures the gaps between user expectations and perceptions across efficiency, fulfillment, system availability, privacy, responsiveness, compensation, and contact. The comparison is intended to determine which dimensions perform relatively close to user expectations and which dimensions require greater attention. A negative gap indicates that users' perceived service performance remains below their expected level, while the size of the gap is used to establish priorities for service improvement. The findings are expected to provide

practical input for the management and development of Access by KAI, particularly in relation to application reliability, transaction clarity, data security, complaint handling, refunds, and access to customer support. The interpretation remains limited to the service assessments reported by the respondents included in this study.

2. Theoretical Background and Related Work

2.1 Electronic Service Quality and E-SERVQUAL

Electronic service quality refers to users' assessments of services delivered through electronic platforms, including websites and mobile applications. Unlike conventional services, electronic services depend on the technological interface through which users search for information, complete transactions, submit requests, and communicate with service providers. Their quality is therefore determined not only by the availability of features but also by ease of use, information accuracy, system reliability, transaction security, and the provider's ability to resolve service failures. Vatolkina *et al*. (2020) explained that digital and hybrid services share several service-quality attributes, although digital services place greater emphasis on technology-mediated interactions. Nguyen *et al*. (2023) also described electronic service quality as a multidimensional concept that has developed alongside changes in digital service delivery. These characteristics are relevant to Access by KAI because most interactions between users and the railway service provider occur through the application. E-SERVQUAL provides a basis for evaluating whether an electronic service corresponds to users' expectations. The method compares the service expected by users with the performance they perceive after using an electronic platform. The difference between perceived performance and expected service represents a service-quality gap. A positive gap indicates that perceived performance exceeds expectations, a zero gap indicates that performance meets expectations, and a negative gap indicates that perceived performance remains below the expected level. Swaid and Wigand (2009) showed that customers assess electronic services through multiple attributes rather than through technological functionality alone. E-SERVQUAL can therefore be used to identify specific service attributes requiring attention instead of relying only on a general evaluation of the application.

2.2 E-SERVQUAL Dimensions

This study operationalizes E-SERVQUAL through seven dimensions: efficiency, fulfillment, system availability, privacy, responsiveness, compensation, and contact. Efficiency concerns the ease and speed with which users access information and complete activities in the application, including registration, login, schedule searches, and ticket booking. Fulfillment refers to the application's ability to deliver the promised service through accurate travel information, updated ticket availability, successful payment, correct ticket issuance, and proper operation of its features. System availability addresses application accessibility, technical stability, and continuity during booking and transaction processes. Privacy concerns the protection of personal and financial information, as railway ticketing requires users to provide identity details, account credentials, and payment information. These four dimensions primarily describe the quality of routine services experienced when users access and operate the application (Nguyen *et al*., 2023; Vatolkina *et al*., 2020). Responsiveness, compensation, and contact are more closely related to service recovery when the application or transaction does not operate as expected. Responsiveness assesses the speed and clarity of the service provider's response to complaints, payment errors, missing tickets, and other application problems. Compensation concerns the handling of cancellations, refunds, failed transactions, and other service failures, including whether procedures, processing periods, and request statuses are communicated clearly. Contact evaluates whether users can locate and communicate with customer support when automated features cannot resolve their problems. These dimensions are relevant to digital railway ticketing because service failures may involve both financial transactions and time-sensitive travel plans. An application may perform adequately during routine use but still receive poor evaluations if users cannot obtain clear and timely assistance when a problem occurs. The seven dimensions therefore allow the assessment to cover both normal application performance and the handling of unsuccessful services (Wong & Anita, 2024).

2.3 Related Studies

Electronic service quality has been examined in several transportation and mobile service settings. Fauzi (2018) analyzed electronic service quality in mobile applications operated by online transportation providers, including Go-Jek, Grab, and Uber, demonstrating the relevance of service-quality measurement in application-based transportation. Justitia *et al*. (2019) assessed customer satisfaction with online taxi applications, while Wulandari *et al*. (2024) evaluated the quality of the MAXIM application using an electronic service-quality approach. These studies show that transportation applications need to be evaluated not only according to the number of available features but also according to usability, system reliability, transaction performance, and customer support. However, ride-hailing applications differ from railway ticketing applications in terms of fixed

travel schedules, ticket issuance, seat selection, cancellation rules, and refund procedures. Their findings therefore provide a useful comparison but cannot be applied directly to Access by KAI without considering the characteristics of railway services. Research concerning railway ticketing has focused on usability, technology acceptance, marketing strategy, and user satisfaction. Christanto and Sediyono (2020) analyzed the usability of an online railway ticket-booking system from a human–computer interaction perspective, establishing the importance of ease of interaction in digital railway services. Christanto (2022) examined the marketing strategies of KAI Access and Traveloka based on usability, while Christanto *et al.* (2024) analyzed the benefits of an online train ticket reservation application using a technology-acceptance perspective. Widjaja *et al.* (2025) evaluated user satisfaction in online ticket booking using the PIECES method. These studies contribute to understanding the interaction between users and digital ticketing systems, although their analytical focus differs from that of the present research. PIECES is commonly applied to aspects of information-system performance, while technology-acceptance and usability studies address users' willingness to use a system and their interaction with its interface. E-SERVQUAL instead focuses on the difference between expected and perceived electronic service performance.

2.4 Research Position

The available studies have examined electronic service quality in ride-hailing applications, satisfaction with online taxi services, usability in railway ticketing systems, and acceptance of online train reservation applications. They provide a basis for assessing application usability, system performance, and users' responses to digital transportation services. However, the studies cited in this research provide limited evidence concerning how user expectations compare with perceived performance across efficiency, fulfillment, system availability, privacy, responsiveness, compensation, and contact in Access by KAI. This study addresses that area by applying the seven E-SERVQUAL dimensions to routine application services and service-recovery processes. The analysis identifies gaps between users' expectations and perceptions and uses the magnitude of those gaps to establish improvement priorities. Rather than claiming that the study is the first evaluation of Access by KAI, its contribution lies in applying a gap-based assessment that considers ticket searches and transactions alongside complaints, cancellations, refunds, and access to customer support.

3. Methodology

This study employed a descriptive quantitative approach and the E-SERVQUAL method to evaluate the electronic service quality of the Access by KAI application. The quantitative approach was selected because respondents' assessments were collected and analyzed as numerical data, while the descriptive approach was used to characterize service quality based on the differences between users' expectations and perceptions. The object of the study was Access by KAI, a digital application developed by PT Kereta Api Indonesia to support railway travel services, including schedule searches, ticket booking, payment, seat selection, schedule changes, ticket cancellation, refund submission, and access to customer support. E-SERVQUAL was selected because Access by KAI delivers its services through a mobile application. This method assesses electronic service quality through attributes associated with ease of use, service fulfillment, system stability, data protection, responsiveness, compensation, and access to customer support (Bahri *et al.*, 2025; Nguyen *et al.*, 2023; Vatolkina *et al.*, 2020; Wulandari *et al.*, 2024). The research procedure comprised problem identification, literature review, data collection, validity and reliability testing, E-SERVQUAL gap analysis, formulation of improvement recommendations, and report preparation. The sequence of these activities is shown in Figure 1.

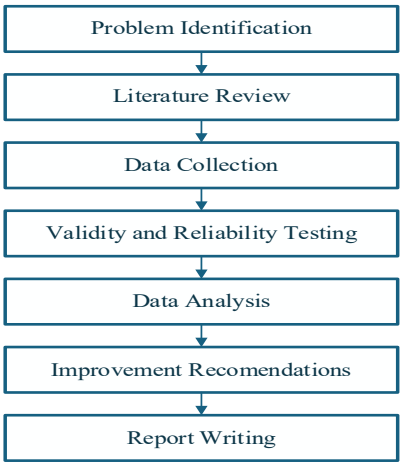

Figure 1. Research stages

3.1 Problem Identification

Problem identification focused on the electronic services provided through Access by KAI and the difficulties that users might experience when using the application. Access by KAI supports several travel-related activities, including searching for train schedules, booking and paying for tickets, selecting seats, changing departure schedules, cancelling tickets, and submitting refund requests. The quality of these services depends on whether users can complete their intended activities accurately, securely, and without technical interruption. The preliminary identification considered potential problems involving application accessibility, booking and payment processes, transaction status, system stability, cancellation procedures, refunds, and customer support. These issues formed the basis for the research objective, which was to measure the gaps between user expectations and perceptions of the application's electronic service quality. The identified service areas were subsequently aligned with the dimensions and measurement attributes used in the research instrument.

3.2 Literature Review and Measurement Dimensions

The literature review examined electronic service quality, digital service applications, user expectations and perceptions, and the application of E-SERVQUAL. It provided the conceptual basis for selecting the measurement dimensions and developing the questionnaire. E-SERVQUAL was considered appropriate because it assesses both routine electronic service performance and the handling of service failures (Nguyen *et al.*, 2023; Vatolkina *et al.*, 2020). Seven dimensions were used in this study. Efficiency measured the ease and speed with which users accessed and operated the application. Fulfillment assessed whether the application met users' needs and delivered its promised services. System availability concerned the accessibility and technical stability of the application. Privacy addressed the protection of users' personal and transaction data. Responsiveness measured the speed and clarity of responses to complaints and transaction problems. Compensation assessed the resolution of cancellations, refunds, failed transactions, and other service errors. Contact measured the ease with which users could access and communicate with customer-support services (Wong & Anita, 2024). These dimensions were used to develop questionnaire items that reflected the service characteristics of Access by KAI.

3.3 Data Collection

Data were collected through an online questionnaire distributed to respondents with experience using Access by KAI. The size of the study population was estimated with reference to the application's Google Play listing, which reported more than 10 million downloads. This figure was treated as an approximate population benchmark because the number of downloads does not necessarily represent the exact number of active or unique users. Respondents were recruited through purposive sampling, which selects participants according to criteria relevant to the research objective (Andrade, 2021). The questionnaire was distributed using Google Forms through social media and personal messaging platforms. Screening questions were presented before the main questionnaire to determine respondents' eligibility. Participants were required to have used Access by KAI, searched for train schedules or booked tickets through the application, used at least one of its service features, and agreed to complete the questionnaire. The target sample size was calculated using the Slovin formula with a margin of error of 10%. The formula is shown in Equation (1).

$$n = \frac{N}{1+Ne^2} \quad (1)$$

Where:
n = is the required sample size;
N = is the estimated population size; and
e = is the specified margin of error.

The questionnaire was developed from the seven E-SERVQUAL dimensions. Each statement was rated on a five-point Likert scale, where 1 represented *strongly disagree* and 5 represented *strongly agree*. Each item was assessed in two forms: expectation and perception. The expectation assessment represented the level of service respondents considered desirable, while the perception assessment represented the service they experienced when using Access by KAI. The questionnaire contained 33 items, as listed in Table 1.

Table 1. E-SERVQUAL questionnaire items

No.	Dimension	Code	Measurement attribute
1	Efficiency	EF1	The Access by KAI application is easy for users to understand.
		EF2	The Access by KAI application is easy to use when searching for travel information.
		EF3	The menus and features in the application are easy to find.
		EF4	Users can search for train schedules quickly.
		EF5	The registration and login processes are easy to complete.
2	Fulfillment	FL1	The train schedules displayed in the application are accurate.
		FL2	The data and information provided in the application are regularly updated.
		FL3	The ticket-booking process operates according to users' needs.
		FL4	The ticket-payment process can be completed properly.
		FL5	Booked tickets appear correctly in the application.
		FL6	Users can select seats easily according to availability.
		FL7	The application's features function as intended.
3	System availability	SA1	The application can be accessed whenever it is needed.
		SA2	The application rarely experiences errors during use.
		SA3	The application remains stable during ticket booking.
		SA4	Transactions are not interrupted by system problems.
		SA5	Information about maintenance or application updates is communicated clearly.
4	Privacy	PR1	Users feel safe when conducting transactions through the application.
		PR2	Users' personal data are kept confidential.
		PR3	Users' payment information is adequately protected.
		PR4	The application gives users confidence when booking tickets.
5	Responsiveness	RS1	The service provider responds promptly to user complaints.
		RS2	The service provider responds promptly when transaction errors occur.
		RS3	The service provider offers solutions when users encounter problems in the application.
		RS4	The help information in the application is easy to understand.
6	Compensation	CP1	The procedures for ticket cancellation and refund requests are clearly explained.
		CP2	Users receive clear information when transaction failures occur.
		CP3	Refunds are processed according to the applicable terms and conditions.
		CP4	The application provides appropriate solutions when service errors occur.
7	Contact	CT1	The application provides help or customer-support services that are easy to access.
		CT2	Users can contact the service provider when they encounter problems.
		CT3	Contact information or the help center is clearly available in the application.
		CT4	The support service provides clear guidance to users.

Note. EF = efficiency; FL = fulfillment; SA = system availability; PR = privacy; RS = responsiveness; CP = compensation; CT = contact.

3.4 Validity and Reliability Testing

Item validity and instrument reliability were examined before the E-SERVQUAL gap analysis. Item validity testing was conducted to determine whether each questionnaire item was adequately associated with the construct represented by the instrument. The test used the Pearson product–moment correlation to measure the relationship between each item score and the corresponding total score. An item was considered valid when its calculated correlation coefficient exceeded the predetermined critical value. The Pearson correlation coefficient is presented in Equation (2).

$$r = \frac{\sum_{i=1}^{n}(X_i-\bar{X})(Y_i-\bar{Y})}{\sqrt{\sum_{i=1}^{n}(X_i-\bar{X})^2 \sum_{i=1}^{n}(Y_i-\bar{Y})^2}} \quad (2)$$

Where:
r = is the Pearson correlation coefficient;
X_i = is the score of respondent i on the questionnaire item;

Y_i = is the corresponding total score;
$\bar{X}$ = is the mean item score; and
$\bar{Y}$ = is the mean total score.

Reliability testing was performed to evaluate the internal consistency of the questionnaire items. Cronbach's alpha was used because it provides an estimate of the consistency among items within a measurement scale (Madadizadeh & Bahariniya, 2025; Malkewitz *et al.*, 2023). The coefficient was calculated using Equation (3).

$$\alpha = \frac{k}{k-1}\left(1 - \frac{\sum_{i=1}^{k} \sigma_i^2}{\sigma_X^2}\right) \quad (3)$$

Where:
α = is Cronbach's alpha coefficient;
k = is the number of items in the scale;
σ_i^2 = is the variance of item i; and
σ_X^2 = is the variance of the total score.

A questionnaire scale was classified as reliable when its Cronbach's alpha coefficient exceeded the threshold specified in the study. The validity and reliability results were used to determine whether the questionnaire items were suitable for the subsequent E-SERVQUAL analysis.

3.5 E-SERVQUAL Data Analysis

The questionnaire data were analyzed by comparing the expectation and perception scores for each service attribute. The analysis involved calculating the mean expectation score, the mean perception score, and the gap between the two scores. The mean expectation and perception scores were calculated using Equations (4) and (5).

$$\bar{E} = \frac{\sum_{i=1}^{n} E_i}{n} \quad (4)$$

$$\bar{P} = \frac{\sum_{i=1}^{n} P_i}{n} \quad (5)$$

The E-SERVQUAL gap was calculated using Equation (6).

$$G = \bar{P} - \bar{E} \quad (6)$$

Where:
$\bar{E}$ =is the mean expectation score;
$\bar{P}$ = is the mean perception score;
E_i= is the expectation score provided by respondent i;
P_i = is the perception score provided by respondent i;
n = is the number of respondents; and
G = is the E-SERVQUAL gap score.

A positive gap indicated that perceived service performance exceeded user expectations, while a gap of zero indicated that perceived performance met expectations. A negative gap indicated that perceived performance remained below the expected level. Dimensions were ranked according to their gap scores, with the most negative gap receiving the highest improvement priority. The ranking was used to identify service areas in which the difference between expected and perceived performance was greatest.

3.6 Formulation of Improvement Recommendations

Improvement recommendations were formulated according to the gap results for the seven E-SERVQUAL dimensions. Greater attention was assigned to dimensions and attributes with more negative gap scores because these values indicated wider differences between user expectations and perceived service performance. The recommendations were limited to the service issues identified through the questionnaire and were not treated as evidence of technical causes that had not been examined in the study.

3.7 Report Preparation

The research report was prepared by organizing the theoretical background, research methodology, findings, discussion, conclusions, and recommendations. The results included the validity and reliability assessments, expectation and perception scores, gap values for each E-SERVQUAL dimension, priority rankings, and proposed service improvements. This procedure documented the connection between the identified problems, data-collection process, analytical results, and recommendations for the Access by KAI application.

4. Result and Discussion

4.1 Results

4.1.1 Respondent Characteristics

A total of 100 respondents participated in the study. As presented in Table 2, the sample comprised 48 male respondents and 52 female respondents. The largest age group consisted of respondents aged 21–25 years, accounting for 28% of the sample, followed by those aged 26–30 years at 27%. Respondents aged 31–40 years represented 23% of the sample, while those aged over 40 years and 17–20 years accounted for 12% and 10%, respectively. Private employees formed the largest occupational group, representing 36% of the respondents. Students accounted for 18%, civil servants or employees of state-owned enterprises for 14%, entrepreneurs for 13%, homemakers for 7%, and respondents in other occupational categories for 12%. Regarding application usage frequency, 34% of the respondents had used Access by KAI three to five times, 27% had used it six to ten times, 22% had used it once or twice, and 17% had used it more than ten times. The distribution indicates that the sample included users with different levels of experience using the application.

Table 2. Respondent characteristics

Characteristic	Category	Frequency	Percentage
Gender	Male	48	48%
	Female	52	52%
Age	17–20 years	10	10%
	21–25 years	28	28%
	26–30 years	27	27%
	31–40 years	23	23%
	Over 40 years	12	12%
Occupation	Student	18	18%
	Private employee	36	36%
	Civil servant or state-owned enterprise employee	14	14%
	Entrepreneur	13	13%
	Homemaker	7	7%
	Other	12	12%
Application usage frequency	1–2 times	22	22%
	3–5 times	34	34%
	6–10 times	27	27%
	More than 10 times	17	17%

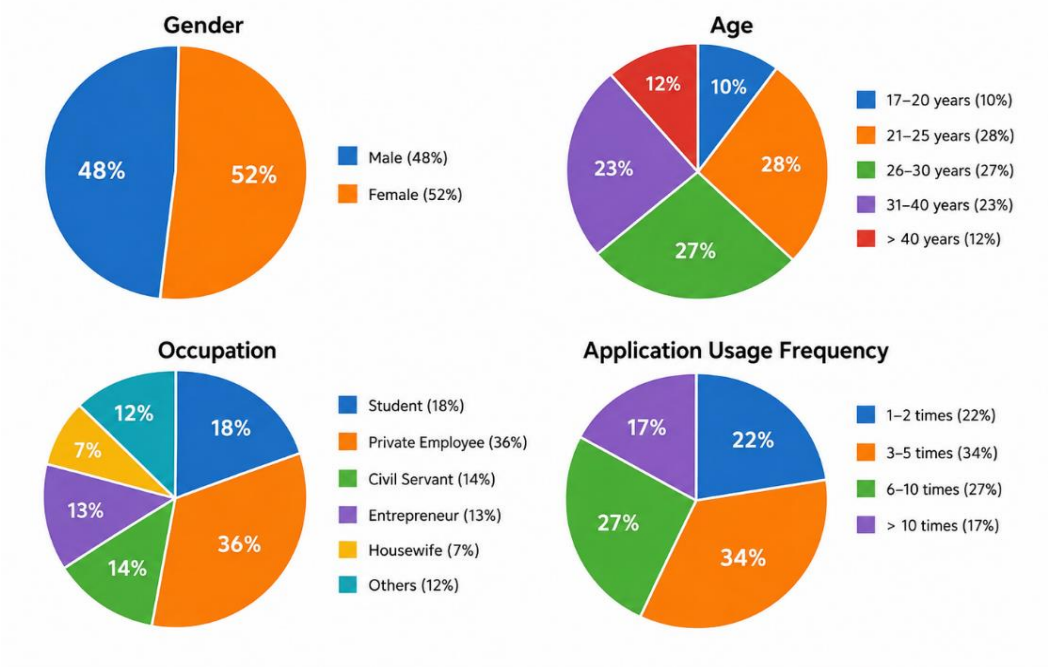

Figure 2. Distribution of Respondent Characteristics

4.1.2 Item Validity

Item validity was assessed using the Pearson product–moment correlation. The calculated correlation coefficient for each item was compared with the critical value of 0.1966. As shown in Table 3, the calculated coefficients ranged from 0.594 to 0.745, and all values exceeded the critical value. PR1 had the highest coefficient at 0.745, while EF4 had the lowest at 0.594. Based on the criterion applied in this study, all 33 questionnaire items were retained for the E-SERVQUAL analysis.

Table 3. Item-validity results

Dimension	Code	$r_{calculated}$	$r_{critical}$	Result
Efficiency	EF1	0.612	0.1966	Valid
	EF2	0.658	0.1966	Valid
	EF3	0.641	0.1966	Valid
	EF4	0.594	0.1966	Valid
	EF5	0.627	0.1966	Valid
Fulfillment	FL1	0.703	0.1966	Valid
	FL2	0.681	0.1966	Valid
	FL3	0.654	0.1966	Valid
	FL4	0.692	0.1966	Valid
	FL5	0.715	0.1966	Valid
	FL6	0.638	0.1966	Valid
	FL7	0.669	0.1966	Valid
System availability	SA1	0.724	0.1966	Valid
	SA2	0.691	0.1966	Valid
	SA3	0.677	0.1966	Valid
	SA4	0.706	0.1966	Valid
	SA5	0.632	0.1966	Valid
Privacy	PR1	0.745	0.1966	Valid
	PR2	0.721	0.1966	Valid
	PR3	0.708	0.1966	Valid
	PR4	0.689	0.1966	Valid
Responsiveness	RS1	0.664	0.1966	Valid
	RS2	0.701	0.1966	Valid
	RS3	0.683	0.1966	Valid
	RS4	0.646	0.1966	Valid
Compensation	CP1	0.673	0.1966	Valid
	CP2	0.711	0.1966	Valid

	CP3	0.697	0.1966	Valid
	CP4	0.659	0.1966	Valid
Contact	CT1	0.642	0.1966	Valid
	CT2	0.676	0.1966	Valid
	CT3	0.695	0.1966	Valid
	CT4	0.661	0.1966	Valid

4.1.3 Instrument Reliability

Reliability was evaluated using Cronbach's alpha, with 0.60 applied as the minimum coefficient in this study. Table 4 shows that the coefficients for the seven dimensions ranged from 0.798 to 0.871. Fulfillment had the highest coefficient at 0.871, while Contact had the lowest at 0.798. The overall coefficient for the 33-item instrument was 0.927. All reported coefficients exceeded the specified threshold, indicating acceptable internal consistency according to the criterion used in this study.

Table 4. Instrument-reliability results

Dimension	Number of items	Cronbach's alpha	Result
Efficiency	5	0.824	Reliable
Fulfillment	7	0.871	Reliable
System availability	5	0.846	Reliable
Privacy	4	0.832	Reliable
Responsiveness	4	0.815	Reliable
Compensation	4	0.807	Reliable
Contact	4	0.798	Reliable
Overall instrument	33	0.927	Reliable

4.1.4 E-SERVQUAL Gap Results

The E-SERVQUAL analysis compared the expectation and perception scores for each questionnaire item. All items produced negative gap scores, indicating that perceived service performance remained below respondents' expectations. The item-level and dimension-level results are reported below.

1) Efficiency

The Efficiency dimension had a mean expectation score of 4.50 and a mean perception score of 3.90, resulting in a gap of −0.60. EF4, which measured the speed of searching for train schedules, had the most negative gap within this dimension at −0.73. EF5, concerning registration and login, followed with a gap of −0.68. EF1 had the smallest gap at −0.49.

Table 5. Efficiency results

Code	Measurement attribute	Expectation	Perception	Gap	Interpretation
EF1	The application is easy for users to understand.	4.52	4.03	−0.49	Below expectations
EF2	The application is easy to use when searching for travel information.	4.50	3.92	−0.58	Below expectations
EF3	The menus and features in the application are easy to find.	4.48	3.95	−0.53	Below expectations
EF4	Users can search for train schedules quickly.	4.55	3.82	−0.73	Below expectations
EF5	The registration and login processes are easy to complete.	4.46	3.78	−0.68	Below expectations
Mean		4.50	3.90	−0.60	Below expectations

2) Fulfillment

The Fulfillment dimension produced a mean expectation score of 4.63 and a mean perception score of 3.82, resulting in a gap of −0.81. FL4, which concerned completion of the ticket-payment process, had the most negative gap at −1.22. The next largest gaps were observed for FL5, concerning the appearance of booked tickets in the application, and FL6, concerning seat selection, at −0.92 and −0.86, respectively.

Table 6. Fulfillment results

Code	Measurement attribute	Expectation	Perception	Gap	Interpretation
FL1	The train schedules displayed in the application are accurate.	4.64	4.05	−0.59	Below expectations
FL2	The data and information provided in the application are regularly updated.	4.62	3.98	−0.64	Below expectations
FL3	The ticket-booking process operates according to users' needs.	4.60	3.90	−0.70	Below expectations
FL4	The ticket-payment process can be completed properly.	4.70	3.48	−1.22	Below expectations
FL5	Booked tickets appear correctly in the application.	4.68	3.76	−0.92	Below expectations
FL6	Users can select seats easily according to availability.	4.58	3.72	−0.86	Below expectations
FL7	The application's features function as intended.	4.56	3.84	−0.72	Below expectations
Mean		4.63	3.82	−0.81	Below expectations

3) System Availability

System Availability had a mean expectation score of 4.66 and a mean perception score of 3.51, producing a gap of −1.15. SA2 had the most negative gap at −1.34, followed by SA4 at −1.28 and SA3 at −1.24. These items addressed application errors, transaction interruptions, and application stability during ticket booking.

Table 7. System-availability results

Code	Measurement attribute	Expectation	Perception	Gap	Interpretation
SA1	The application can be accessed whenever it is needed.	4.66	3.62	−1.04	Below expectations
SA2	The application rarely experiences errors during use.	4.72	3.38	−1.34	Below expectations
SA3	The application remains stable during ticket booking.	4.68	3.44	−1.24	Below expectations
SA4	Transactions are not interrupted by system problems.	4.70	3.42	−1.28	Below expectations
SA5	Information about maintenance or application updates is communicated clearly.	4.55	3.70	−0.85	Below expectations
Mean		4.66	3.51	−1.15	Below expectations

4) Privacy

Privacy recorded the highest mean perception score among the seven dimensions at 4.07. Its mean expectation score was 4.69, resulting in a gap of −0.62. PR3, which concerned the protection of users' payment information, had the most negative gap at −0.72. The remaining item gaps ranged from −0.56 to −0.62.

Table 8. Privacy results

Code	Measurement attribute	Expectation	Perception	Gap	Interpretation
PR1	Users feel safe when conducting transactions through the application.	4.68	4.12	−0.56	Below expectations
PR2	Users' personal data are kept confidential.	4.70	4.08	−0.62	Below expectations
PR3	Users' payment information is adequately protected.	4.72	4.00	−0.72	Below expectations
PR4	The application gives users confidence when booking tickets.	4.64	4.06	−0.58	Below expectations
Mean		4.69	4.07	−0.62	Below expectations

5) Responsiveness

The Responsiveness dimension had a mean expectation score of 4.61 and a mean perception score of 3.47, resulting in a reported gap of −1.14. RS1, which measured the speed of responses to complaints, had the most negative gap at −1.29. RS2, concerning responses to transaction errors, followed with a gap of −1.26.

Table 9. Responsiveness results

Code	Measurement attribute	Expectation	Perception	Gap	Interpretation
RS1	The service provider responds promptly to user complaints.	4.65	3.36	−1.29	Below expectations
RS2	The service provider responds promptly when transaction errors occur.	4.66	3.40	−1.26	Below expectations
RS3	The service provider offers solutions when users encounter problems in the application.	4.62	3.48	−1.14	Below expectations
RS4	The help information in the application is easy to understand.	4.52	3.62	−0.90	Below expectations
Mean		4.61	3.47	−1.14	Below expectations

6) Compensation

Compensation produced a mean expectation score of 4.65 and a mean perception score of 3.38, resulting in a gap of −1.28. This was the most negative dimension-level gap. CP3, which measured whether refunds were processed according to the applicable terms and conditions, recorded the most negative item-level gap in the study at −1.40. CP1 and CP2 followed with gaps of −1.34 and −1.26, respectively.

Table 10. Compensation results

Code	Measurement attribute	Expectation	Perception	Gap	Interpretation
CP1	The procedures for ticket cancellation and refund requests are clearly explained.	4.68	3.34	−1.34	Below expectations
CP2	Users receive clear information when transaction failures occur.	4.64	3.38	−1.26	Below expectations
CP3	Refunds are processed according to the applicable terms and conditions.	4.70	3.30	−1.40	Below expectations
CP4	The application provides appropriate solutions when service errors occur.	4.58	3.48	−1.10	Below expectations
Mean		4.65	3.38	−1.28	Below expectations

7) Contact

The Contact dimension had a mean expectation score of 4.54 and a mean perception score of 3.52, producing a reported gap of −1.02. CT1, which concerned access to help or customer-support services, had the most negative gap at −1.12. CT2, concerning users' ability to contact the service provider when problems occurred, had a gap of −1.08.

Table 11. Contact results

Code	Measurement attribute	Expectation	Perception	Gap	Interpretation
CT1	Help or customer-support services are easy to access.	4.56	3.44	−1.12	Below expectations
CT2	Users can contact the service provider when they encounter problems.	4.58	3.50	−1.08	Below expectations
CT3	Contact information or the help center is clearly available.	4.52	3.58	−0.94	Below expectations
CT4	The support service provides clear guidance to users.	4.50	3.54	−0.96	Below expectations
Mean		4.54	3.52	−1.02	Below expectations

4.1.5 Summary of E-SERVQUAL Results

Table 12 summarizes the expectation, perception, and gap scores for the seven E-SERVQUAL dimensions. The mean expectation score across the dimensions was 4.61, while the mean perception score was 3.67, producing a reported gap of −0.94. All dimension-level gaps were negative. Compensation had the most negative gap at −1.28 and was therefore assigned the highest improvement priority. It was followed by System Availability at −1.15, Responsiveness at −1.14, and Contact at −1.02. Fulfillment, Privacy, and Efficiency had smaller gaps of −0.81, −0.62, and −0.60, respectively.

Table 12. Summary of E-SERVQUAL results

Dimension	Expectation	Perception	Gap	Priority rank	Main issue represented by the items
Efficiency	4.50	3.90	−0.60	7	Schedule-search speed, navigation, registration, and login
Fulfillment	4.63	3.82	−0.81	Payment completion, ticket issuance, and seat selection	
System availability	4.66	3.51	−1.15	Errors, system stability, and transaction interruptions	
Privacy	4.69	4.07	−0.62	Protection of personal and payment information	
Responsiveness	4.61	3.47	−1.14	Responses to complaints and transaction errors	
Compensation	4.65	3.38	−1.28	Refunds, cancellations, and failed-transaction handling	
Contact	4.54	3.52	−1.02	Access to customer support and assistance	
Mean across dimensions	4.61	3.67	−0.94	—	Perceived performance remained below expectations

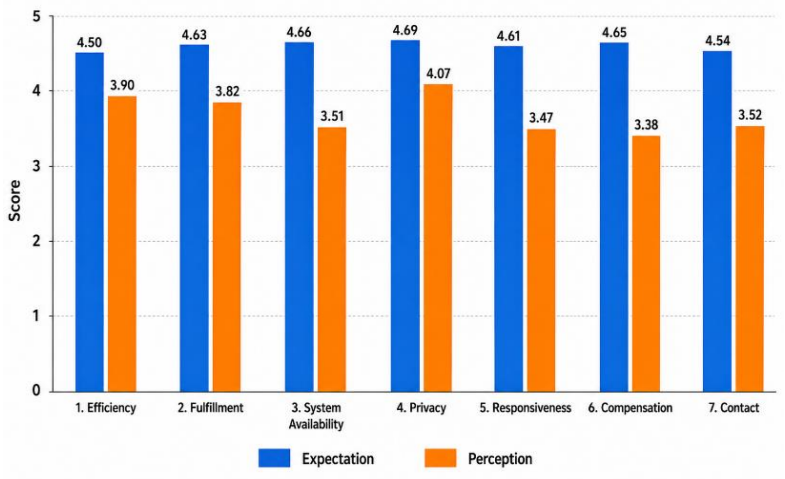

Figure 3. Comparison of expectation and perception scores by E-SERVQUAL dimension

4.2 Discussion

The negative gap scores across all seven dimensions indicate a consistent difference between the level of service expected by respondents and the performance they perceived when using Access by KAI. This pattern does not mean that every service feature failed to function. Instead, it indicates that the mean perceived performance of each dimension remained below the corresponding expectation score. The result is relevant to the E-SERVQUAL approach because service quality is evaluated through the difference between expected and perceived performance rather than through the perception score alone. Efficiency had the smallest gap at −0.60, suggesting that respondents evaluated the application's ease of use more favorably

than several other aspects. However, schedule-search speed and the registration and login processes had wider gaps than the other Efficiency items. These findings indicate that users' assessments of efficiency involve not only whether features can be located but also how quickly the application allows them to complete an intended activity. Previous research on railway reservation systems has similarly identified usability and ease of interaction as relevant to users' experiences with digital ticketing services (Christanto & Sediyono, 2020). Studies of mobile transportation applications have also shown that electronic service quality depends on how effectively users can access and operate application features (Fauzi, 2018; Wulandari *et al.*, 2024). Fulfillment had a wider gap than Efficiency and Privacy. The most pronounced result in this dimension concerned completion of the ticket-payment process, followed by the appearance of booked tickets and the seat-selection process. These items are related to the completion of the application's primary service. A user may be able to navigate the application successfully but still perceive poor fulfillment if payment does not lead to a clear and completed booking. The distinction between interface usability and service fulfillment is important because an application can be relatively easy to operate while still failing to deliver the expected transaction outcome. Similar concerns regarding system performance and transaction completion have been identified in research on online ticketing and mobile transportation services (Justitia *et al.*, 2019; Widjaja *et al.*, 2025). System Availability had the second most negative dimension-level gap. The largest item gaps concerned application errors, interruptions during transactions, and stability during ticket booking. The high expectation scores for these attributes indicate that respondents regarded technical continuity as an important requirement of a digital railway ticketing service. Railway transactions are time-sensitive because ticket availability, payment deadlines, and departure schedules may limit the time available to complete a booking. Interruptions during these processes can therefore affect users more directly than delays in services without a fixed schedule. Although the survey identifies users' perceptions of system availability, it does not establish the technical causes of application errors or interruptions. Server capacity, application code, network conditions, and device compatibility should therefore be treated as possible areas for technical examination rather than causes demonstrated by the questionnaire. Privacy had the highest perception score and the second-smallest gap. This relative performance indicates that respondents evaluated transaction safety, personal-data confidentiality, and confidence in booking more favorably than service recovery and system availability. The negative gap for payment-information protection nevertheless shows that perceived protection remained below the high level expected by users. Because the study measured perceptions rather than actual technical security, this finding should not be interpreted as evidence of a security breach or inadequate encryption. It indicates a need to maintain technical protection and communicate security and transaction information in a manner that users can understand.

The widest gaps were concentrated in Compensation, Responsiveness, and Contact. These dimensions differ from routine application functions because they concern the assistance users receive when a service does not proceed as intended. The pattern suggests that respondents evaluated service-recovery processes less favorably than navigation, privacy, and several routine transaction functions. This distinction supports the use of E-SERVQUAL dimensions that cover both normal application performance and problem resolution. Compensation had the most negative dimension-level gap, with CP3 recording the most negative item-level gap in the study. The results indicate that respondents expected greater clarity in refund processing, cancellation procedures, information about failed transactions, and solutions to service errors. These processes involve financial consequences and may affect users' travel arrangements, which helps explain the high expectation scores. The results do not establish that refunds violated the applicable terms or that every respondent experienced a delayed refund. They show that the perceived clarity and performance of the compensation process remained below the level expected by respondents. Interpretation of this dimension should also consider whether all respondents had direct experience with cancellations and refunds, because respondents without such experience may have evaluated the items based on available information or general impressions. Responsiveness had the third most negative gap. Responses to user complaints and transaction errors received lower perception scores than the clarity of help information. This difference suggests that providing instructions is not equivalent to resolving a user's problem promptly. Users may understand the available help information but still perceive the response as inadequate if they do not receive timely confirmation or a clear solution. The result is consistent with the role of responsiveness in electronic service quality, where users assess the provider's actions after a problem has been reported rather than only the availability of a complaint channel. Contact ranked fourth in improvement priority. The gaps for access to customer support and the ability to contact the provider were wider than those for the availability of contact information and clarity of guidance. This pattern indicates that the presence of contact information alone may not provide the level of access expected by respondents. Support channels also need to be visible, practical, and connected to the problem being experienced. As with Responsiveness and Compensation, this interpretation should remain limited to respondents' assessments because the study did not measure actual response times, complaint-resolution periods, or the operational performance of customer-support staff. The concentration of wider gaps in Compensation, Responsiveness, and Contact is consistent with the distinction

between routine electronic services and service recovery. Users may complete many routine activities independently, but they depend on the provider when a transaction fails, a refund is required, or automated information does not resolve a problem. The results therefore indicate that evaluation of a railway application should not be limited to interface usability and feature availability. The processes used to address failed services form a substantial part of users' assessments of electronic service quality.

The priority ranking places Compensation, System Availability, Responsiveness, and Contact above the other dimensions because their gap scores were below −1.00. Improvement of the Compensation dimension should focus on the clarity and visibility of cancellation, refund, and failed-transaction procedures. The application could provide clearly stated procedural steps, expected processing periods, status notifications, and progress information for submitted requests. These recommendations are derived from the measured gaps and should be evaluated through usability testing and operational assessment before implementation.
System Availability requires attention to application stability during booking and payment. The relevant development team should examine error records, failed-transaction logs, loading performance, device compatibility, and application behavior during periods of high demand. Clear notifications about maintenance or temporary disruptions could also reduce uncertainty when a service is unavailable. Increasing server capacity should not be treated as the only solution because the survey did not identify the technical source of the disruptions perceived by respondents. Responsiveness and Contact can be addressed by making assistance easier to locate and by providing users with clearer information after a complaint or error has been reported. Possible measures include integrated reporting tools, complaint reference numbers, status tracking, estimated response periods, live chat, and improved automated assistance. These features should be designed to complement rather than replace access to customer-service personnel for cases that cannot be resolved automatically. Fulfillment, Privacy, and Efficiency remain relevant even though their gaps were smaller. Fulfillment improvements should address transaction completion, ticket issuance, and seat selection. Privacy measures should maintain protection of personal and payment information while communicating transaction status and security information clearly. Efficiency improvements should focus on schedule-search speed, navigation, registration, and login. The priority ranking does not indicate that lower-ranked dimensions can be disregarded; it identifies the areas where the difference between expectation and perception was greatest within the data collected from the 100 respondents.

5. Conclusion

This study evaluated the electronic service quality of the Access by KAI application by comparing user expectations and perceptions across seven E-SERVQUAL dimensions: Efficiency, Fulfillment, System Availability, Privacy, Responsiveness, Compensation, and Contact. The mean expectation score was 4.61, while the mean perception score was 3.67, producing a gap of −0.94. All seven dimensions had negative gap scores, indicating that the service performance perceived by the respondents remained below their expectations. Compensation had the most negative gap at −1.28 and therefore represented the highest improvement priority, followed by System Availability at −1.15, Responsiveness at −1.14, and Contact at −1.02. The results indicate that the widest service gaps were associated with refund and cancellation procedures, failed-transaction handling, application stability, responses to complaints, and access to customer support.

The findings provide a basis for prioritizing service improvements according to the magnitude of the measured gaps. Access by KAI could provide clearer refund and cancellation procedures, progress information for submitted requests, transaction-status notifications, and estimated processing periods. Application errors, loading performance, transaction interruptions, and maintenance communication should also be examined through technical and operational evaluation. Customer support could be made more accessible through integrated reporting tools, complaint reference numbers, status tracking, clearer help-center navigation, and communication channels suited to urgent transaction problems. These recommendations are derived from respondents' assessments and should be evaluated further before implementation because the questionnaire did not identify the technical causes of the reported service gaps. The findings also support the applicability of E-SERVQUAL for examining routine service performance and service-recovery processes in a mobile railway ticketing application.

The interpretation of the findings is subject to several limitations. The study involved 100 respondents selected through purposive sampling, and the estimated population was based on the application's download count rather than a verified number of active users. The findings therefore cannot be generalized to all Access by KAI users in Indonesia. The quantitative questionnaire captured numerical assessments but did not fully explain respondents' individual experiences, the technical conditions associated with service interruptions, or the reasons underlying their scores. The study also needs to consider whether every respondent had direct experience with refunds, cancellations, complaints, and customer-support services. Future research could involve a larger and more geographically diverse sample, distinguish respondents according to the features

they have used, and combine questionnaires with interviews, usability testing, transaction-log analysis, or a systematic analysis of user reviews. E-SERVQUAL may also be examined alongside the Technology Acceptance Model, User Experience Questionnaire, or Customer Satisfaction Index when the research design explicitly measures technology acceptance, user experience, or customer satisfaction.

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