Equivalent: Jurnal Ilmiah Sosial Teknik
Volume 8, Issue 4, 1872-1884
e_ISSN: 2775-0833
https://jurnalequivalent.id/index.php/jequi/index
DOI: doi.org/10.59261/jequi.v8i4.435

Passenger Boarding Service Quality at Waisai High-Speed Craft Terminal: SERVQUAL–IPA–CSI Framework

Oktovianus Cristian Karubaba[1*]
Politeknik Pelayaran Sorong, Indonesia

Yudhiyono[2]
Politeknik Pelayaran Sorong, Indonesia

Mukhlas Hamdani[3]
Politeknik Pelayaran Sorong, Indonesia

Arief Nashrul Firdani[4]
Politeknik Pelayaran Sorong, Indonesia

***Corresponding author:**
Oktovianus Cristian Karubaba, Politeknik Pelayaran Sorong, Indonesia. ✉kodim.karubaba@gmail.com

Article Info :

Article history:
Received: August 14, 2026
Revised: September 15, 2026
Accepted: October 5, 2026
Available Online: October 21, 2026

Keywords:
Boarding Service Quality;
Customer Satisfaction Index;
High-Speed Craft;
Importance–Performance Analysis;
SERVQUAL;

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Abstract

Background: Efficient boarding services are essential to ensuring passenger safety, operational efficiency, and overall service quality in maritime transportation, particularly in high-speed craft operations, where rapid yet safe transit is critical.
Objective: This study evaluates boarding service quality at the Waisai Passenger Terminal by examining service quality gaps, prioritizing key attributes for operational improvement, and assessing overall passenger satisfaction.
Methods: A quantitative cross-sectional survey was conducted with 398 high-speed craft passengers. Respondents were recruited through accidental sampling immediately after boarding. Data were analyzed using SERVQUAL gap analysis, expectation-based Importance–Performance Analysis (IPA), and the Customer Satisfaction Index (CSI).
Results: All 30 service attributes exhibited negative expectation–perception gaps. The largest dimensional deficits were observed in empathy (−0.378), tangibles (−0.358), and reliability (−0.354). The IPA classified six attributes (T06, RI01, RE02, RE04, A03, and E02) in the immediate-priority quadrant. The CSI was 78.72%, falling within the study's predefined *Satisfied* interval and indicating that overall satisfaction can coexist with specific service deficiencies.
Conclusion: This integrated framework distinguishes attribute-level service deficiencies, operational priorities, and overall passenger satisfaction. It therefore supports more targeted resource allocation and continuous service quality monitoring at high-speed craft passenger terminals.

To cite this article: Karubaba, O. C., Yudhiyono, Hamdani, M., & Firdani, A. N. (2026). Passenger boarding service quality at Waisai High-Speed Craft Terminal: SERVQUAL–IPA–CSI framework. Equivalent: Jurnal Ilmiah Sosial Teknik, 8(4), 1872-1884. https://doi.org/10.59261/jequi.v8i4.435

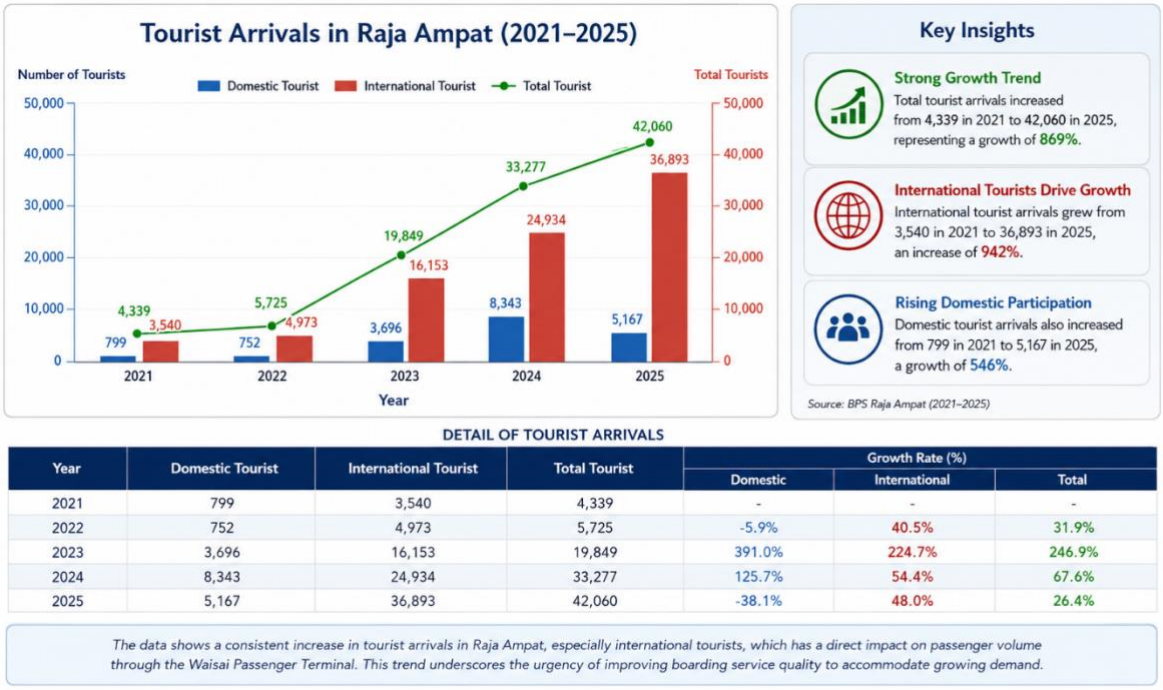
INTRODUCTION

As the world's largest archipelagic country, Indonesia comprises more than 17,000 islands, a geography that makes maritime transportation indispensable for passenger mobility and regional connectivity. Maritime transport underpins interisland travel, tourism, commerce, and access to public services in remote areas where few alternative modes of transportation exist. Globally, the governance of maritime services is increasingly shaped by heightened safety expectations, demands for resilience, and the adoption of digitalization and automation to streamline information flows and reduce

operational delays. These developments make service quality an issue that extends beyond individual customer satisfaction to encompass overall system reliability and safety (**UNCTAD, 2024**). Enhancing the quality and efficiency of maritime passenger services is therefore a key component of Indonesia's broader transportation agenda.

Contemporary trends in passenger transportation suggest that service quality now carries weight comparable to operational performance. Travelers no longer evaluate transportation services solely in terms of journey duration, safety, and fares; they also consider reliability, waiting times, terminal amenities, accessibility, information availability, and staff responsiveness throughout the passenger journey (Nguyen-Phuoc et al., 2021; Roh et al., 2025; Shang et al., 2023). Among the activities performed at a terminal, boarding is one of the most critical service encounters because it brings together ticket verification, security screening, queue management, passenger information provision, and embarkation. When boarding is managed inefficiently, congestion may increase, waiting times may lengthen, schedule reliability may deteriorate, and passenger satisfaction may ultimately decline (Kishore et al., 2024; Mikuličić et al., 2024).

The importance of boarding service quality is particularly evident in High-Speed Craft (HSC) operations, in which vessels operate at high departure frequencies and have short turnaround times. Efficient and orderly passenger processing is therefore essential to maintaining schedule punctuality while complying with the International Code of Safety for High-Speed Craft (HSC Code) established by the International Maritime Organization (Nazarov, 2024; Organization, 2021). These considerations are particularly important in Raja Ampat Regency, Southwest Papua, where maritime transport is essential for connecting the regional administrative center of Waisai with Sorong and neighboring islands. As a major maritime gateway to Raja Ampat, the Waisai Passenger Terminal occupies a strategic position in supporting tourism, regional accessibility, and local socioeconomic development.



DETAIL OF TOURIST ARRIVALS

Year	Domestic Tourist	International Tourist	Total Tourist	Growth Rate (%)		
				Domestic	International	Total
2021	799	3,540	4,339	-	-	-
2022	752	4,973	5,725	-5.9%	40.5%	31.9%
2023	3,696	16,153	19,849	391.0%	224.7%	246.9%
2024	8,343	24,934	33,277	125.7%	54.4%	67.6%
2025	5,167	36,893	42,060	-38.1%	48.0%	26.4%

The data shows a consistent increase in tourist arrivals in Raja Ampat, especially international tourists, which has a direct impact on passenger volume through the Waisai Passenger Terminal. This trend underscores the urgency of improving boarding service quality to accommodate growing demand.

Figure 1. Tourist Arrivals in Raja Ampat (2021, 2022, 2023, 2024, 2025)

Following the COVID-19 pandemic, the rapid recovery of tourism has intensified demand along the Sorong–Waisai corridor. As shown in Figure 1, total tourist arrivals increased from 4,339 in 2021 to 42,060 in 2025, while international tourist arrivals rose from 3,540 to 36,893 over the same period. Because travel between Sorong and Waisai relies heavily on maritime transport, this growth indicates increasing demand for the terminal's services and its HSC operations. However, the available tourism statistics do not directly measure passenger throughput at the terminal, and the study did not obtain verified data on average boarding waiting times or terminal congestion. These operational aspects are therefore discussed qualitatively. Nevertheless, the documented increase in tourist arrivals underscores the need to provide safe, reliable, and passenger-oriented boarding services.

Previous research has established three complementary yet analytically distinct approaches to

service-quality assessment. SERVQUAL identifies gaps between customer expectations and perceptions of service performance (Kurniawan et al., 2025; Pantouvakis, 2010; Parasuraman et al., 1988). Importance–Performance Analysis (IPA) subsequently helps prioritize service attributes according to their relative importance and perceived performance (Aicher et al., 2023; Mikuličić et al., 2024), while Customer Satisfaction Index (CSI) methods aggregate satisfaction measures into an overall index (Fornell et al., 1996; Johnson et al., 2001; Zeglat & Mukattash, 2023). Comparable evidence from Indonesian ferry services also documents discrepancies between passenger expectations and perceived service performance (Della et al., 2024; Della & Rachmanullah, 2021). The challenge is not a lack of measurement methods but rather that each method, when applied in isolation, addresses only one managerial question: SERVQUAL quantifies service-quality gaps, IPA identifies attributes that warrant improvement attention, and CSI summarizes overall customer satisfaction. This study therefore proposes an integrated analytical approach that compares the three sets of results while recognizing that a substantial service-quality gap does not necessarily indicate the highest improvement priority and that a satisfactory overall satisfaction score may coexist with significant weaknesses in individual service attributes.

Despite these contributions, three interconnected research gaps remain. Methodologically, transportation studies often present gap analysis, priority mapping, and overall satisfaction as separate outputs, making it difficult to trace how an identified service deficiency should be translated into an improvement priority and how that priority relates to the broader satisfaction profile. Contextually, research on boarding service quality at HSC terminals serving remote archipelagic regions remains limited compared with research on airports, urban public transportation, commercial ports, and conventional ferry services (Balić et al., 2022; Nguyen-Phuoc et al., 2021; Shang et al., 2023). Managerially, the use of disconnected analytical outputs may lead decision-makers to allocate resources primarily to attributes with the largest service-quality gaps, even when those attributes do not have the highest relative improvement priority. The research gap therefore concerns the integration of analytical results into managerial decisions rather than the development of new measurement instruments.

The present study addresses these gaps by applying an integrated SERVQUAL–IPA–CSI analytical sequence to boarding services at the Waisai Passenger Terminal. Its novelty lies not in developing new metrics but in systematically combining three established analytical approaches and applying them to HSC boarding services in a remote archipelagic setting. Theoretically, the study demonstrates that attribute-level service deficiencies, relative improvement priorities, and aggregate satisfaction can diverge within the same passenger experience. In this study, widespread negative service-quality gaps coexist with a satisfactory overall CSI. This finding broadens the assessment of maritime service quality beyond reliance on a single indicator and is particularly relevant in settings where passengers depend on maritime transport and have few alternative modes of transportation. Practically, the study offers a transparent decision-making pathway that enables terminal managers to distinguish high-priority improvements from lower-priority deficiencies while retaining an overall satisfaction benchmark for ongoing monitoring.

Accordingly, the study addresses the following research question: How can an integrated SERVQUAL–IPA–CSI framework be used to evaluate boarding service quality, identify priority service attributes for improvement, and assess overall passenger satisfaction at the Waisai Passenger Terminal? To answer this question, the study aims to evaluate boarding service quality by (1) measuring the gaps between passenger expectations and perceptions, (2) identifying service attributes that should be prioritized for improvement, and (3) determining overall passenger satisfaction using the integrated framework.

Academically, the study contributes empirical evidence that service-quality gap magnitude, attribute-level improvement priorities, and aggregate satisfaction should be interpreted as related but distinct indicators in remote archipelagic passenger transportation. Practically, the framework provides terminal operators and policymakers with a transparent means of identifying service deficiencies, prioritizing improvements, and monitoring overall satisfaction without treating every negative service-quality gap as equally urgent. Together, these contributions support more targeted service management and more efficient allocation of scarce operational resources.

METHOD

This study adopted a quantitative, cross-sectional survey design to assess the quality of

passenger boarding services at the Waisai Passenger Terminal in Raja Ampat, Southwest Papua, Indonesia. A cross-sectional approach was chosen because it allowed passengers' expectations and perceptions to be captured at the same time, immediately after the boarding process, thereby reducing recall bias and providing an assessment of boarding service quality under actual operating conditions (Creswell & Creswell, 2018; Weyant, 2022).

The target population consisted of passengers traveling on high-speed craft (HSC) services along the Sorong–Waisai route between March and May 2026. Because passenger numbers fluctuated according to departure schedules and no complete sampling frame was available, respondents were recruited immediately after boarding using accidental (convenience) sampling. In total, 398 passengers who met the study's eligibility criteria and completed the questionnaire were included in the analysis. Because accidental sampling is a nonprobability sampling technique, the resulting sample did not provide every passenger with an equal or known probability of selection.

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

Reliance on accidental sampling may have introduced availability and departure-time selection biases because only passengers who happened to be present and willing to participate during the data collection period were recruited. Accordingly, the findings should be interpreted as reflecting the experiences of the surveyed passengers and should not be statistically generalized to the entire population of Waisai Passenger Terminal users.

Respondent characteristics, including age, gender, purpose of travel, frequency of HSC use, and passenger category, were not recorded in the survey. Consequently, the study could not compare service quality assessments across different passenger segments. This limitation should be considered when interpreting the findings. Future research should incorporate respondent profile variables to enable demographic comparisons and subgroup analyses.

The research instrument was a structured questionnaire comprising 30 boarding service attributes representing the five SERVQUAL dimensions: tangibles, reliability, responsiveness, assurance, and empathy. The questionnaire was developed based on the SERVQUAL framework proposed by Parasuraman et al. (1988) and Dewitte et al. (2025) adapted to the operational context of passenger boarding at maritime terminals through a comprehensive review of the relevant literature and consultation with maritime transport experts. Each attribute was rated twice using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), with passengers' expectations and perceived service performance measured separately.

Before the main survey, the questionnaire underwent expert review to establish content validity and confirm its relevance to the maritime passenger boarding context. Item validity and internal consistency reliability were subsequently assessed using the survey data. Item validity was evaluated using the Pearson product–moment correlation coefficient, with an item considered valid when its calculated correlation coefficient exceeded the critical value ($r_{calculated} > r_{table}$ at $p < .05$). Internal consistency reliability was assessed using Cronbach's alpha. In accordance with Hair et al. (2022) and Taber (2018), Cronbach's alpha values of ≥.70 were considered acceptable for well-established instruments, whereas values of ≥.60 were considered acceptable for exploratory research. The validity and reliability results indicated that all questionnaire items met the study's specified statistical criteria and were therefore considered suitable for subsequent analysis.

Data were collected through on-site, face-to-face interviews conducted immediately after passengers completed the boarding process, ensuring that respondents evaluated the service based on their most recent experience. Participation was entirely voluntary. Before completing the questionnaire, respondents were informed of the study's objectives and provided informed consent. No personally identifiable information was collected, and all responses were treated anonymously and confidentially. Ethical clearance for data collection was granted by the Waisai Passenger Terminal Authority. The study adhered to institutional research ethics principles concerning voluntary participation, confidentiality, privacy protection, and respondents' right to withdraw at any time without penalty.

Descriptive statistics, reliability testing, validity testing, and SERVQUAL gap calculations were performed using IBM SPSS Statistics version 27, whereas the IPA matrix and CSI calculations were performed using Microsoft Excel 2021. An integrated SERVQUAL–Importance–Performance Analysis (IPA)–Customer Satisfaction Index (CSI) framework was applied to provide a comprehensive assessment of passenger boarding service quality. First, the SERVQUAL analysis calculated the service quality gap for each attribute using the following equation:

$$SQ_i = P_i - E_i \quad (2)$$

in which (SQ_i) denotes the service quality gap for attribute i, (P_i) is the mean perception score, and (E_i) is the mean expectation score. A negative gap signals that perceived performance lies below passenger expectations, whereas a positive value signals that performance surpasses them (Dewitte et al., 2025; Parasuraman et al., 1988).

An expectation-based adaptation of Importance–Performance Analysis (IPA) was then used to classify the service attributes into four managerial priority quadrants. Because the questionnaire did not include a separate, direct measure of importance, expectation scores were used as an operational proxy for relative service salience rather than treated as conceptually equivalent to importance. In the matrix, the horizontal axis represents perceived performance, while the vertical axis represents expected service levels as a proxy for relative salience. The overall mean scores for these two measures served as the coordinates of the crosshairs dividing the matrix into four quadrants. Accordingly, the resulting matrix is best interpreted as an expectation–performance prioritization tool rather than as a conventional IPA based on independently measured importance. Future applications should measure importance separately to assess the robustness of the resulting priority classifications.

$$\bar{P} = \frac{\sum P_i}{n} \quad (3)$$

$$\bar{E} = \frac{\sum E_i}{n} \quad (4)$$

The four quadrants were labeled Concentrate Here, Keep Up the Good Work, Low Priority, and Possible Overkill. Within the adapted framework used in this study, these labels indicate relative priorities based on expected service levels and perceived performance; they do not imply that expectations and importance are theoretically equivalent.

Finally, passenger satisfaction was assessed using the Customer Satisfaction Index (CSI). To maintain consistency with the available questionnaire data, expectation scores were used as the basis for calculating the Mean Importance Score (MIS). Consequently, the resulting index is most appropriately interpreted as an expectation-weighted satisfaction measure rather than a conventional importance-weighted CSI. The calculation incorporated the Mean Importance Score (MIS), Weight Factor (WF), Weighted Score (WS), and overall CSI, following the general CSI calculation procedure described by Fornell et al. (1996) and Morgeson et al. (2023).

$$WF_i = \frac{MIS_i}{\sum MIS_i} \quad (5)$$

$$WS_i = WF_i \times MPS_i \quad (6)$$

$$CSI = \frac{\sum WS_i}{HS} \times 100\% \quad (7)$$

Here, MIS denotes the Mean Importance Score derived from the expectation proxy, WF denotes the Weight Factor, WS denotes the Weighted Score, MPS denotes the Mean Performance Score, and HS denotes the highest possible scale value (5). For clarity, the calculation sequence was as follows: $MIS_i = \Sigma E_i/n$; $WF_i = MIS_i/\Sigma MIS$; $WS_i = WF_i \times MPS_i$; and $CSI = (\Sigma WS_i/HS) \times 100$. The satisfaction categories used in this study were defined by dividing the 0–100 scale into five equal-width intervals: 0–20 = Very Dissatisfied, >20–40 = Dissatisfied, >40–60 = Neutral, >60–80 = Satisfied, and >80–100 = Very Satisfied. Accordingly, a CSI of 78.72% falls within the Satisfied category, whereas the Very Satisfied category begins at values greater than 80%.

Integrating SERVQUAL, IPA, and CSI provides a comprehensive analytical framework for identifying service quality gaps, prioritizing improvement actions, and quantifying overall passenger satisfaction. The findings therefore provide an evidence-based foundation for managerial decision-making aimed at improving boarding service quality at the Waisai Passenger Terminal.

RESULTS AND DISCUSSION

Reliability and Validity Assessment

Before passengers' perceptions of boarding service quality were analyzed, the reliability and validity of the SERVQUAL instrument were assessed using responses from 398 passengers. Internal

consistency reliability was examined using Cronbach's alpha, while item validity was assessed using Pearson product–moment correlations between each questionnaire item and its corresponding total score (Hair et al., 2022). Corrected item–total correlation coefficients exceeding 0.30 were considered acceptable evidence of item discrimination (Field, 2018; Hair et al., 2022).

Table 2
Reliability Statistics of the SERVQUAL Instrument

Measurement Scale	Number of Items	Corrected Item–Total Correlation	Cronbach's Alpha if Item Deleted	Overall Cronbach's Alpha	Interpretation
Perception (P)	30	0.455–0.478	0.645–0.661	0.699	Marginally acceptable
Expectation (E)	30	0.327–0.470	0.507–0.584	0.617	Marginal (exploratory)

As shown in Table 2, the Perception and Expectation scales yielded Cronbach's alpha coefficients of 0.699 and 0.617, respectively. Although the reliability coefficient for the Expectation scale fell slightly below the conventional benchmark of 0.70, both coefficients exceeded the minimum threshold of 0.60 sometimes accepted for exploratory research (Hair et al., 2022; Taber, 2018). These results indicate marginally acceptable internal consistency, particularly for the Expectation scale. Furthermore, all corrected item–total correlation coefficients exceeded 0.30, indicating acceptable item discrimination. Nevertheless, the coefficients should be interpreted as evidence of modest rather than strong internal consistency, especially for the Expectation scale ($\alpha = 0.617$). Accordingly, subsequent analyses based on the instrument should be regarded as exploratory and interpreted with appropriate caution.

Table 3
Correlation between SERVQUAL Dimensions and Overall Scale

SERVQUAL Dimension	Perception (r)	Expectation (r)	p-value	Interpretation
Tangibles	0.757	0.753	<0.01	Strong
Reliability	0.666	0.601	<0.01	Moderate
Responsiveness	0.654	0.597	<0.01	Moderate
Assurance	0.657	0.578	<0.01	Moderate
Empathy	0.659	0.599	<0.01	Moderate

As shown in Table 3, all five SERVQUAL dimensions were positively and significantly correlated with the overall scale ($p < 0.01$). The correlation coefficients ranged from 0.654 to 0.757 for the Perception scale and from 0.578 to 0.753 for the Expectation scale. Taken together, these findings provide evidence of positive associations between the individual dimensions and the overall scale. However, these correlations alone do not establish the instrument's overall construct validity. Considered alongside the item-level validity and internal consistency results, they provide preliminary support for using the instrument in the subsequent SERVQUAL gap analysis, Importance–Performance Analysis (IPA), and Customer Satisfaction Index (CSI) calculations.

SERVQUAL Gap Analysis

Table 4
Average SERVQUAL Scores and Service Quality Gaps by Dimension

SERVQUAL Dimension	Perception	Expectation	Mean Gap
Tangibles	3.913	4.271	-0.358
Reliability	3.927	4.281	-0.354
Responsiveness	3.952	4.270	-0.318
Assurance	3.956	4.293	-0.337
Empathy	3.955	4.333	-0.378
Overall	3.936	4.286	-0.350

Note: *Gap denotes Perception minus Expectation. A negative value means that perceived service performance falls short of passenger expectations.*

Table 5
Top Ten Boarding Service Attributes with the Largest Negative SERVQUAL Gap Scores

Rank	Code	Boarding Service Attribute	Gap (P – E)
1	E03	Elderly passengers, children, and pregnant women receive special assistance.	-0.437
2	A03	Passengers feel physically and psychologically safe during the boarding process.	-0.430
3	RE01	The HSC departs on time according to the established schedule.	-0.417
4	RI01	Staff are quick to assist passengers experiencing difficulties.	-0.415
5	T05	Signs and directional indicators at the terminal are clear and informative.	-0.412
6	T09	The terminal area has adequate lighting and ventilation.	-0.405
7	RI02	The boarding process takes place according to the announced time.	-0.402
8	A01	Staff thoroughly understand the boarding and ticket verification procedures.	-0.399
9	T06	Boarding support facilities are safe to use.	-0.397
10	T02	The toilet facilities at the terminal are in proper, usable condition.	-0.389

Note: *Only the ten most negative SERVQUAL gap scores are reported here; the full set of results for all 30 service attributes informed the subsequent IPA and CSI analyses.*

Following the reliability and validity assessments, a SERVQUAL gap analysis was conducted to compare passengers' perceived service performance with their expectations across the 30 boarding service attributes. In the SERVQUAL model, service quality is evaluated by comparing customer expectations with perceived performance, with negative gaps indicating that perceived performance falls short of expectations (Dewitte et al., 2025; Ladhari, 2009; Parasuraman et al., 1988). The overall mean perception score was 3.936, compared with an overall mean expectation score of 4.286, yielding an overall service quality gap of −0.350. This finding indicates that the boarding services at the Waisai Passenger Terminal did not fully meet passenger expectations.

Negative gaps were observed across all five SERVQUAL dimensions. Empathy exhibited the largest mean gap (−0.378), followed by Tangibles (−0.358), Reliability (−0.354), Assurance (−0.337), and Responsiveness (−0.318). The prominence of Empathy is consistent with the item-level finding for E03, which recorded the largest negative gap and concerned special assistance for elderly passengers, children, and pregnant women. In an archipelagic terminal setting, dependence on scheduled maritime transport may increase the practical importance of clear, attentive assistance during boarding, particularly for passengers who require additional help with vessel access and departure procedures. This interpretation highlights the operational significance of the empathy gap without asserting a causal mechanism that was not directly measured.

As shown in Table 5, the largest negative service quality gaps were recorded for E03 (special assistance for elderly passengers, children, and pregnant women; −0.437), A03 (physical and psychological safety during boarding; −0.430), RE01 (departure punctuality; −0.417), RI01 (prompt assistance for passengers experiencing difficulties; −0.415), and T05 (clarity of terminal signage; −0.412). Across all 30 service attributes, RI04 recorded the smallest negative gap (−0.244), indicating that its perceived performance was comparatively closer to passenger expectations. However, gap scores alone do not establish the relative priority of each attribute. The attributes were therefore examined further using the expectation-based IPA adaptation to identify those warranting earlier managerial attention.

Importance–Performance Analysis (IPA)

To establish managerial priorities, the expectation-based IPA adaptation was conducted using the grand mean perception score (3.936) and grand mean expectation score (4.286) as the crosshair coordinates. As shown in Figure 2 and summarized in Table 6, the 30 service attributes were classified into four relative-priority quadrants. Because expectation scores served as a proxy for relative service salience rather than as a direct measure of importance, the resulting matrix is interpreted as a pragmatic expectation–performance prioritization tool.

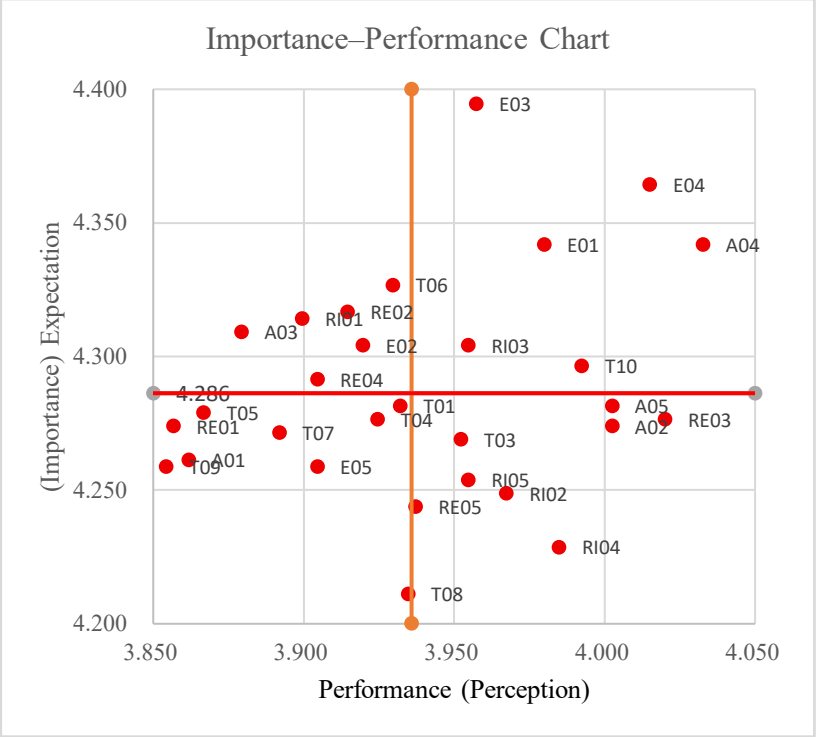


Figure 2. Importance Performance Analysis (IPA) Matrix of Boarding Service Attributes

Table 6

Classification of Boarding Service Attributes Based on the Importance–Performance Analysis (IPA)

Code	Mean Perception Score	Mean Expectation Score	IPA Quadrant	Managerial Action
T01	3.932	4.281	Q3 = Low Priority	Gradual Improvement
T02	3.847	4.236	Q3 = Low Priority	Gradual Improvement
T03	3.952	4.269	Q4 = Possible Overkill	Monitor Resource Allocation
T04	3.925	4.276	Q3 = Low Priority	Gradual Improvement
T05	3.867	4.279	Q3 = Low Priority	Gradual Improvement
T06	3.930	4.327	Q2 = Concentrate Here	Immediate Improvement
T07	3.892	4.271	Q3 = Low Priority	Gradual Improvement
T08	3.935	4.211	Q3 = Low Priority	Gradual Improvement
T09	3.854	4.259	Q3 = Low Priority	Gradual Improvement
T10	3.992	4.296	Q1 = Keep up the Good Work	Maintain Performance
RI01	3.899	4.314	Q2 = Concentrate Here	Immediate Improvement
RI02	3.967	4.249	Q4 = Possible Overkill	Monitor Resource Allocation
RI03	3.955	4.304	Q1 = Keep up the Good Work	Maintain Performance
RI04	3.985	4.229	Q4 = Possible Overkill	Monitor Resource Allocation
RI05	3.955	4.254	Q4 = Possible Overkill	Monitor Resource Allocation
RE01	3.857	4.274	Q3 = Low Priority	Gradual Improvement
RE02	3.915	4.317	Q2 = Concentrate Here	Immediate Improvement
RE03	4.020	4.276	Q4 = Possible Overkill	Monitor Resource Allocation
RE04	3.905	4.291	Q2 = Concentrate Here	Immediate Improvement
RE05	3.937	4.244	Q4 = Possible Overkill	Monitor Resource Allocation
A01	3.862	4.261	Q3 = Low Priority	Gradual Improvement
A02	4.003	4.274	Q4 = Possible Overkill	Monitor Resource Allocation
A03	3.879	4.309	Q2 = Concentrate Here	Immediate Improvement
A04	4.033	4.342	Q1 = Keep up the Good Work	Maintain Performance
A05	4.003	4.281	Q4 = Possible Overkill	Monitor Resource Allocation
E01	3.980	4.342	Q1 = Keep up the Good Work	Maintain Performance
E02	3.920	4.304	Q2 = Concentrate Here	Immediate Improvement

E03	3.957	4.394	Q1 = Keep up the Good Work	Maintain Performance
E04	4.015	4.364	Q1 = Keep up the Good Work	Maintain Performance
E05	3.905	4.259	Q3 = Low Priority	Gradual Improvement
Grand Mean	3.936	4.286		

Note: Quadrants were established from the grand mean perception score (3.936) and grand mean expectation score (4.286). As no separate importance item was gathered, expectation acts as an operational proxy for relative salience, so the matrix should be read as an expectation-based IPA. The managerial actions follow the relative-priority reasoning of Martilla & James (1977) and Wisudawati et al. (2023).

As shown in Table 6, six attributes fell within Quadrant II (Concentrate Here): T06, RI01, RE02, RE04, A03, and E02. Under the expectation-based IPA adaptation, these attributes combine above-average expected service levels with below-average perceived performance and therefore warrant earlier managerial attention. The available item descriptions identify boarding-support facility safety (T06), departure punctuality (RI01), boarding waiting-time performance (RE04), and boarding safety (A03) among the priority areas. The remaining attributes should be interpreted according to the original questionnaire wording. This distinction prevents the attributes with the largest SERVQUAL gaps from being conflated with those prioritized by the IPA.

Conversely, six attributes were classified in Quadrant I (Keep Up the Good Work), ten in Quadrant III (Low Priority), and eight in Quadrant IV (Possible Overkill). These classifications suggest that performance on high-priority attributes should be maintained, whereas lower-priority areas may be improved gradually or monitored to support efficient resource allocation. Such prioritization can help managers deploy limited operational resources more efficiently by focusing on service attributes that may offer greater opportunities to improve passenger satisfaction (Martilla & James, 1977; Wisudawati et al., 2023).

Notably, the attributes with the largest SERVQUAL gaps were not necessarily those identified as immediate improvement priorities by the IPA. Whereas SERVQUAL quantifies the magnitude of service quality shortfalls, conventional IPA jointly considers importance and performance to help prioritize improvement efforts (Dewitte et al., 2025; Martilla & James, 1977; Parasuraman et al., 1988). In the present study, however, expectations were used as a proxy for importance. Thus, although every service attribute exhibited a negative SERVQUAL gap, the attributes differed in their relative positions within the expectation–performance matrix. The resulting classifications provide a practical basis for directing managerial resources toward I).

Customer Satisfaction Index (CSI) and Integrated Findings

Table 7

Summary of Customer Satisfaction Index (CSI) Results

Component	Value
Mean Performance Score (ΣWS)	3.936
Maximum Scale	5.000
Customer Satisfaction Index (CSI)	78.72%
Satisfaction Category	Satisfied

Overall passenger satisfaction was assessed using the Customer Satisfaction Index (CSI), which consolidates weighted service performance across the boarding service attributes into a single index. The analysis yielded a CSI of 78.72%, indicating that passengers were, on average, satisfied with the boarding services at the Waisai Passenger Terminal. Although this result indicates a generally satisfactory level of service, it remains below the threshold for the Very Satisfied category, suggesting that further improvements may be needed to enhance the overall passenger experience. The classification follows the five equal-width bands defined in this study: scores above 60% and up to 80% fall within the Satisfied category, whereas scores above 80% fall within the Very Satisfied category.

The CSI findings complement rather than replace the SERVQUAL and priority analyses. SERVQUAL identified negative gaps across all 30 attributes, while the expectation-based IPA identified T06, RI01, RE02, RE04, A03, and E02 as immediate priorities. The CSI of 78.72% indicates that

passengers can report a generally satisfactory overall experience even when specific service deficiencies persist. This contrast underscores the importance of interpreting the three analytical outputs together rather than treating the aggregate satisfaction score as evidence that targeted improvements are unnecessary.

Collectively, SERVQUAL identified the magnitude of service quality shortfalls, the expectation-based IPA established relative priorities for improvement, and CSI quantified overall passenger satisfaction. Integrating these complementary approaches provides a structured basis for evidence-based managerial decision-making aimed at improving boarding services at the Waisai Passenger Terminal.

Integrated Interpretation and Managerial Implications

The integrated findings reveal a notable contrast: although all five SERVQUAL dimensions exhibited negative gaps, the overall CSI was 78.72%. Passengers may therefore regard the boarding service as generally satisfactory while still perceiving particular attributes as falling short of their expectations. This divergence demonstrates why an aggregate satisfaction index alone is insufficient for diagnosing operational deficiencies. CSI provides an overall satisfaction benchmark, SERVQUAL identifies expectation–performance gaps, and the expectation-based priority matrix indicates which attributes warrant earlier intervention.

Among the five SERVQUAL dimensions, Empathy (−0.378) exhibited the largest gap, followed by Tangibles (−0.358) and Reliability (−0.354). This finding is reinforced by E03, which recorded the largest item-level gap (−0.437) and concerned special assistance for elderly passengers, children, and pregnant women. In the Waisai context, this pattern may reflect the practical importance of staff assistance during boarding in an island transport system where passengers depend on scheduled maritime connections and may encounter crowding, restricted vessel access, or limited alternatives when disruptions occur. This explanation is a context-based interpretation rather than a causal conclusion because the survey did not independently measure the mechanisms underlying the empathy gap.

The priority findings further demonstrate that SERVQUAL gap magnitude and the classifications produced by the expectation-based IPA are not interchangeable. Quadrant II contains T06, RI01, RE02, RE04, A03, and E02, whereas several of the largest negative gaps were recorded for E03, A03, RE01, RI01, and T05. RE04 is particularly instructive: although its reported gap of −0.386 was not the largest among the attributes, it was classified as an immediate priority because it combined an above-average expectation score with a below-average perception score. This example illustrates why managers should not allocate improvement resources solely according to the magnitude of SERVQUAL gaps.

For a high-speed craft terminal, the value of integrating SERVQUAL, the expectation-based priority matrix, and CSI lies in sequencing three distinct management decisions rather than simply combining three methods. SERVQUAL identifies where expectations are unmet; the priority matrix distinguishes attributes requiring immediate operational attention from those that can be addressed gradually; and CSI provides an aggregate benchmark for monitoring whether service improvements enhance the overall passenger experience. This sequence is particularly relevant to boarding operations involving short vessel turnaround times because terminal managers cannot address every negative gap simultaneously, while safety, punctuality, passenger assistance, and facility readiness require targeted allocation of limited staffing and infrastructure resources.

These findings are consistent with transport research identifying reliability, safety, physical facilities, and staff responsiveness as important components of passenger service quality (Mikuličić et al., 2024; Nguyen-Phuoc et al., 2021; Roh et al., 2025; Shang et al., 2023). Research on Indonesian ferry services has likewise identified gaps between passenger expectations and perceived service performance (Della et al., 2024; Della & Rachmanullah, 2021). The present findings contribute to this body of research by demonstrating that attribute-level deficiencies and aggregate satisfaction are distinct measures: widespread negative gaps can coexist with a CSI in the Satisfied category. The theoretical implication is that maritime passenger service quality should be examined using separate diagnostic, prioritization, and aggregate-satisfaction measures. The managerial implication is that improvement programs should be guided by attribute-level evidence rather than by the CSI alone.

From a managerial perspective, terminal operators should initially address the six Quadrant II attributes and subsequently assess whether interventions improve both attribute-level performance and the overall CSI. Initial measures should prioritize the safety of boarding-support facilities, departure

punctuality, boarding safety, waiting-time management, and the frontline service processes represented by the priority codes. Passenger surveys should be repeated periodically to monitor changes in the same measures over time. Future questionnaires should also measure importance directly so that the expectation-based proxy can be replaced with a conventional IPA design.

This study contributes theoretically by distinguishing three related but separate service-management indicators (gap magnitude, relative priority, and aggregate satisfaction) within a unified empirical interpretation. Two limitations qualify this contribution. First, expectation scores served as proxies for importance because separate importance ratings were not collected. Second, accidental sampling and the absence of a complete sampling frame restrict the statistical generalizability of the findings. These limitations do not negate the descriptive results, but they require cautious interpretation of the priority matrix as an expectation-based adaptation and limit generalization to passengers beyond those whose travel circumstances resemble those of the surveyed sample.

CONCLUSION

This study addressed its objective by integrating SERVQUAL, an expectation-based IPA adaptation, and CSI to evaluate boarding service quality at the Waisai Passenger Terminal. All five SERVQUAL dimensions exhibited negative gaps, with Empathy (−0.378), Tangibles (−0.358), and Reliability (−0.354) recording the largest dimensional shortfalls. The expectation-based priority matrix identified T06, RI01, RE02, RE04, A03, and E02 as immediate priorities, while the CSI of 78.72% fell within the study's Satisfied category. Taken together, these findings demonstrate that a generally satisfactory overall passenger experience can coexist with specific service deficiencies requiring targeted intervention.

The principal contribution of this study is its integrated interpretation of service quality gap magnitude, relative improvement priority, and aggregate satisfaction in the context of a remote archipelagic high-speed craft terminal. For terminal managers, the findings support prioritizing the six Quadrant II attributes, strengthening boarding safety and operational reliability, and monitoring service improvements through repeated passenger surveys. These conclusions should be interpreted in light of the use of expectations as a proxy for importance, the nonprobability sampling method, and the absence of a complete respondent-profile dataset. Future research should validate the framework using directly measured importance, larger or probability-based samples across multiple terminals, comprehensive demographic data, and additional variables such as passenger loyalty, behavioral intentions, digital service quality, waiting times, passenger flows, and digital ticketing.

ACKNOWLEDGEMENT

The authors wish to convey their heartfelt thanks to the Waisai Passenger Terminal Authority for enabling the research and the data collection process. They also record their appreciation to all the High-Speed Craft passengers who took part in the survey of their own accord and supplied valuable information for this study.

AUTHOR CONTRIBUTION STATEMENT

Oktovianus Cristian Karubaba, Yudhiyono, Mukhlas Hamdani, and Arief Nashrul Firdani jointly undertook the study's conceptualization, research methodology, data collection, data analysis, interpretation of the findings, and manuscript preparation. All authors took part in editing the manuscript and sanctioned the final version for publication.

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