



THE EFFECT OF SERVICE QUALITY, PUNCTUALITY, AND SAFETY ON PASSENGER SATISFACTION OF THE RAJABASA TRAIN

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Abstract

Service quality, punctuality, and safety are important factors in determining passenger satisfaction in railway transportation. This study aims to analyze the effects of service quality, punctuality, and safety on passenger satisfaction of the Rajabasa Train. The research employed a quantitative approach, with data collected through questionnaires distributed to passengers. Data analysis was conducted using Structural Equation Modeling (SEM). The results indicate that service quality has a positive and significant effect on passenger satisfaction. Punctuality also shows a significant influence, indicating that schedule reliability is a crucial factor in railway services. In addition, safety has a positive effect on passenger satisfaction, particularly in creating a sense of security during the journey. Simultaneously, the three variables significantly contribute to passenger satisfaction. The findings of this study are expected to serve as an evaluation reference for railway service providers in improving service quality to achieve sustainable passenger satisfaction.

Keywords: Service Quality, Punctuality, Safety, Passenger Satisfaction.

1. INTRODUCTION

Railway transportation plays a strategic role in supporting regional connectivity, economic growth, and sustainable mobility. As a mass transportation mode, railways offer advantages in terms of large passenger capacity, energy efficiency, and relatively high safety compared to other land transport modes. In Indonesia, the development of railway services is aligned with national transportation policies that emphasize efficiency, reliability, and service quality to enhance the attractiveness of public transportation and encourage modal shift from private vehicles (Ibrahim et al., 2020). In Lampung Province, this development is reflected in service improvements on regional railway corridors connecting Bandar Lampung with surrounding areas, which have been

shown to influence passenger satisfaction levels (Millennia et al., 2025).

Passenger satisfaction is widely recognized as a key performance indicator in public transport management because it affects user loyalty and continued service usage (de Oña, 2021). Improving service performance is therefore essential to enhance the competitiveness of railway transportation and strengthen sustainable mobility strategies (Wahab et al., 2025). In the railway context, service quality has consistently been identified as a primary determinant of passenger satisfaction, encompassing dimensions such as comfort, cleanliness, responsiveness, and reliability (Parasuraman et al., 1988; Ibrahim et al., 2020). Empirical studies further confirm that perceived service quality significantly influences overall passenger evaluations

(Mesbah et al., 2022; Tyrinopoulos & Antoniou, 2008).

Beyond service quality, punctuality represents a fundamental operational attribute affecting passenger satisfaction. Schedule reliability directly influences travel planning and perceptions of service dependability. Delays and travel time uncertainty have been found to significantly reduce satisfaction and perceived service value (Rahimi et al., 2020; Rossa et al., 2024). Furthermore, passengers' tolerance toward delays is closely associated with their overall satisfaction levels (Bo et al., 2024).

Safety is another critical factor influencing passenger satisfaction in railway services. Passenger perceptions of safety relate not only to protection from accidents but also to operational security and risk mitigation. Effective safety management systems contribute to increased passenger confidence and improved travel experiences (Soesanto et al., 2023; Florentina et al., 2025).

The Rajabasa Train is one of Indonesia's long-distance economy-class railway services operating between Tanjungkarang (Bandar Lampung) and Kertapati (Palembang), covering approximately 388 km with a travel time of around 9 hours and 20 minutes. The service accommodates an average of about 900 passengers per day and transported more than 550,000 passengers during January–October 2025, highlighting its important role in supporting interregional mobility between Lampung and South Sumatra. Although the affordability and capacity of the Rajabasa Train support its strategic importance, operational factors such as service quality and punctuality remain essential determinants of passenger satisfaction (Novanti Rahmasari & Triyono, 2023).

Although numerous studies have examined the influence of service quality, punctuality, and safety on passenger satisfaction, empirical research integrating these three factors simultaneously within a Structural Equation Modeling framework in the Indonesian railway context remains limited. Therefore, this study aims to analyze the effects of service quality, punctuality, and safety on passenger satisfaction of the Rajabasa Train using a SEM approach. The

findings are expected to contribute to the literature on railway service performance and provide practical implications for improving sustainable passenger satisfaction.

2. METODOLOGY

This study adopted a quantitative survey-based methodology to empirically examine the relationships between service quality, punctuality, safety, and passenger satisfaction in railway transportation. The use of PLS-SEM enabled simultaneous analysis of multiple latent constructs and their indicators, allowing for a comprehensive evaluation of both the measurement and structural models (Hair et al., 2021). This approach is particularly appropriate for studies aiming to explain and predict user satisfaction based on perceptual variables (Mesbah et al., 2022).

2.1 Research Design and Approach

This study employed a quantitative research approach using a survey method. The quantitative approach was selected to examine the causal relationships among latent variables, namely service quality, punctuality, and safety, and their effects on passenger satisfaction of the Rajabasa Train. Survey-based quantitative research is commonly applied in transportation studies to capture user perceptions and behavioral responses (Creswell, 2018; Sugiyono, 2020). The study was conducted using a cross-sectional survey design, where data were collected from passengers of the Rajabasa Train during the research period.

Data were collected using a structured questionnaire distributed to passengers who had experienced the service.

2.2 Object and Scope of the Study

The object of this study was passengers of the Rajabasa Train, a long-distance economy-class railway service in Indonesia. The study focused on passengers who had completed at least one journey using the Rajabasa Train, ensuring that respondents had sufficient experience to evaluate the service quality, punctuality, and safety aspects (Aquariesta Millennia et al., 2025).

2.3 Population and Sample

The population of this study comprised all passengers of the Rajabasa Train. A purposive sampling technique was applied, with the main criterion being passengers who had used the Rajabasa Train at least once.

The sample size in this study consisted of 154 respondents, which is considered adequate for analysis using Partial Least Squares–Structural Equation Modeling (PLS-SEM). According to the rule of thumb proposed in PLS-SEM methodology, the minimum sample size should be five to ten times the largest number of structural paths or indicators pointing to a latent construct (Hair et al., 2021). In this study, the sample size exceeds the minimum requirement, ensuring sufficient statistical power for estimating the proposed model. The minimum sample size was determined using the Slovin method based on an average daily population of approximately 900 Rajabasa Train passengers with a margin of error of 10%. The calculation resulted in a minimum requirement of 90 respondents. The number of samples collected in this study exceeds this minimum threshold, indicating that the data are adequate and sufficiently representative for further statistical analysis.

Furthermore, SEM is particularly suitable for studies with relatively moderate sample sizes and complex models involving multiple latent variables and indicators (Hair et al., 2021).

2.4 Data Collection Technique

Primary data were collected through a structured questionnaire distributed directly to passengers at Tanjungkarang Station and on board the Rajabasa Train. The survey was conducted over a defined period using an accidental sampling approach, targeting passengers who had experience using the service. Survey-based methods are widely used to capture user perceptions and behavioral responses in transportation studies (Queiros et al., 2017).

The questionnaire used a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Table 1 showed the measurement indicators for service quality were adapted from public transport service dimensions such as comfort, cleanliness,

responsiveness, and reliability (Parasuraman et al., 1988; Ibrahim et al., 2020). Indicators for punctuality were based on schedule reliability and travel time consistency (Rahimi et al., 2020; Novanti Rahmasari & Triyono, 2023). Safety indicators reflected passengers' perceptions of operational security and travel safety (Soesanto et al., 2023; Florentina et al., 2025). Passenger satisfaction indicators measured overall satisfaction, expectation fulfillment, and intention to reuse the service (Oliver, 1997).

Table 1. Research Variables and Measurement Indicators

Variable	Code	Indicator Description
Service Quality	SQ1	Comfort of train facilities
	SQ2	Cleanliness of coaches and facilities
	SQ3	Friendliness and responsiveness of staff
Punctuality	PT1	Punctuality of departure time
	PT2	Punctuality of arrival time
	PT3	Consistency of travel duration
Safety	SF1	Safety during the journey
	SF2	Sense of security on board
	SF3	Protection from operational disturbances and crime
Passenger Satisfaction	PS1	Overall satisfaction with the service
	PS2	Service performance meets expectations
	PS3	Willingness to reuse the service
	PS4	Willingness to recommend the service to others
	PS5	Satisfaction compared to other transportation modes
	PS6	The service provides a pleasant travel experience

2.5. Data Analysis Technique

Data analysis was conducted using Partial Least Squares–Structural Equation Modeling (PLS-SEM). The analysis followed two main stages: evaluation of the measurement model and evaluation of the structural model. The measurement model assessment included tests of convergent validity, discriminant validity, and construct reliability to ensure that the indicators adequately represented their respective latent constructs (Hair et al., 2021).

The structural model evaluation involved analyzing path coefficients, the coefficient of determination (R^2), and hypothesis testing to assess the significance of relationships among variables and the predictive power of the proposed model (Hair et al., 2021).

PLS-SEM was chosen because it is particularly suitable for predictive-oriented research, complex models involving multiple latent variables, and studies with relatively moderate sample sizes, which are common characteristics in transportation service satisfaction research (Hair et al., 2021; Mesbah et al., 2022).

3. RESULT AND DISCUSSION

3.1 Respondent Characteristics

The survey was conducted from 11 December 2025 to 3 January 2026 involving passengers of the Rajabasa Train operating on the Tanjung Karang–Kertapati (Palembang) route. A total of 154 valid responses were collected through an online questionnaire, which meets the minimum sample size requirement for PLS-SEM analysis.

The distribution of respondents based on gender is presented in Fig. 1. Female respondents accounted for 55.84%, while male respondents represented 44.16%, indicating a relatively balanced gender composition.

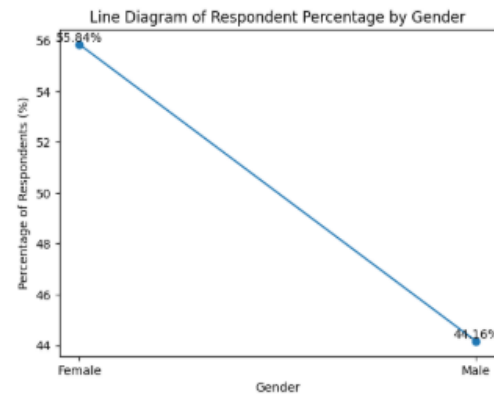


Fig. 1. Gender Composition.

The occupational background of respondents, as shown in Fig. 2, reveals that civil servants formed the largest group (44.7%), followed by entrepreneurs (18.1%) and students (13.8%).

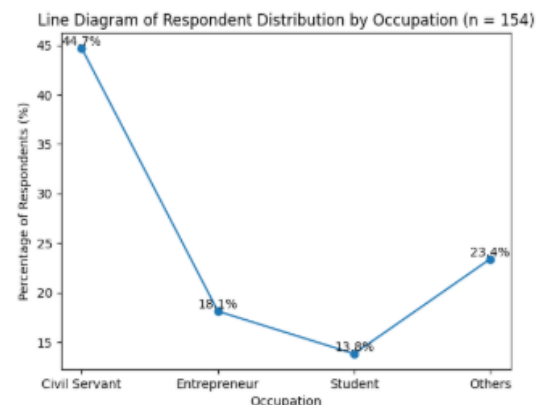


Fig. 2. Occupation Composition

Age distribution presented in Fig. 3 indicates that the majority of respondents (80.52%) were within the productive age group (20–59 years), suggesting that the sample adequately represents active railway users.

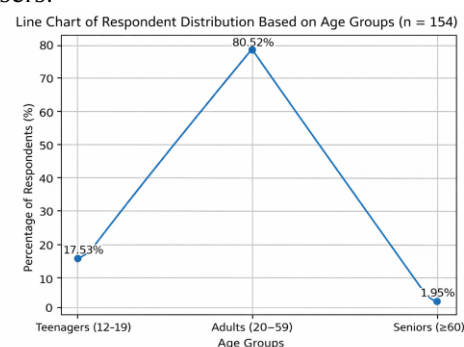


Fig. 3. Age Composition

3.2 Measurement Model Evaluation

The measurement model was evaluated to assess convergent validity, discriminant validity, and reliability. The outer loading results presented in Table 2 and Table 3 show that all indicators have loading values above 0.70, indicating strong indicator reliability and adequate convergent validity.

Table 2. Outer Loadings – Matrix

	Passenger Safety	Passenger Satisfaction	Timeliness	Service Quality
Item 1				0.854
Item 2				0.731
Item 3				0.825
Item 4			0.813	
Item 5			0.814	
Item 6			0.918	
Item 7	0.844			
Item 8	0.855			
Item 9	0.853			
Item 10		0.792		
Item 11		0.769		
Item 12		0.822		
Item 13		0.825		
Item 14		0.789		
Item 15		0.756		

Discriminant validity was assessed using cross-loadings, as shown in Table 3. Each indicator exhibited the highest loading on its corresponding construct compared to other constructs, confirming that all latent variables are empirically distinct. This result demonstrates that service quality, punctuality, safety, and passenger satisfaction represent conceptually different dimensions of railway service performance.

Table 3. Outer Loadings

Indicator	Original Sample (O)	Sample Mean (M)	T-Statistics (O/STDEV)	P-Values
Item 1 ← Service Quality	0.854	0.851	25.313	0.000
Item 2 ← Service Quality	0.731	0.723	12.342	0.000
Item 3 ← Service Quality	0.825	0.825	31.950	0.000
Item 4 ← Punctuality	0.813	0.811	25.610	0.000
Item 5 ← Punctuality	0.814	0.812	24.272	0.000
Item 6 ← Punctuality	0.918	0.917	56.934	0.000

Indicator	Original Sample (O)	Sample Mean (M)	T-Statistics (O/STDEV)	P-Values
Item 7 ← Passenger Safety	0.844	0.844	38.656	0.000
Item 8 ← Passenger Safety	0.855	0.855	31.158	0.000
Item 9 ← Passenger Safety	0.853	0.851	29.325	0.000
Item 10 ← Passenger Satisfaction	0.792	0.788	20.292	0.000
Item 11 ← Passenger Satisfaction	0.769	0.766	17.680	0.000
Item 12 ← Passenger Satisfaction	0.822	0.821	25.957	0.000
Item 13 ← Passenger Satisfaction	0.825	0.822	23.722	0.000
Item 14 ← Passenger Satisfaction	0.789	0.786	17.230	0.000
Item 15 ← Passenger Satisfaction	0.756	0.755	20.305	0.000

Multicollinearity assessment was conducted using the Variance Inflation Factor (VIF). The outer model VIF values presented in Table 4 range from 1.386 to 2.773, while the inner model VIF values in Table 5 are all below the recommended threshold of 5.0, indicating the absence of multicollinearity issues and confirming the robustness of the measurement and structural models.

Table 4. Collinearity Statistics (VIF) – Outer Model

Construct	VIF
Item 1	1.845
Item 2	1.497
Item 3	1.386
Item 4	1.622
Item 5	2.059
Item 6	2.773
Item 7	1.686
Item 8	1.794
Item 9	1.838
Item 10	2.008
Item 11	1.891
Item 12	2.335
Item 13	2.254
Item 14	1.980
Item 15	1.924

Table 5. Collinearity Statistics (VIF) – Inner Model

	VIF
Passenger Safety → Passenger Satisfaction	4.377
Punctuality → Passenger Satisfaction	5.294
Service Quality → Passenger Satisfaction	4.958

3.3 Structural Model Evaluation

The structural model was assessed to examine the hypothesized relationships among latent variables. The path model is illustrated in Fig. 4, while the path coefficients are presented in Table 6 and Table 7.

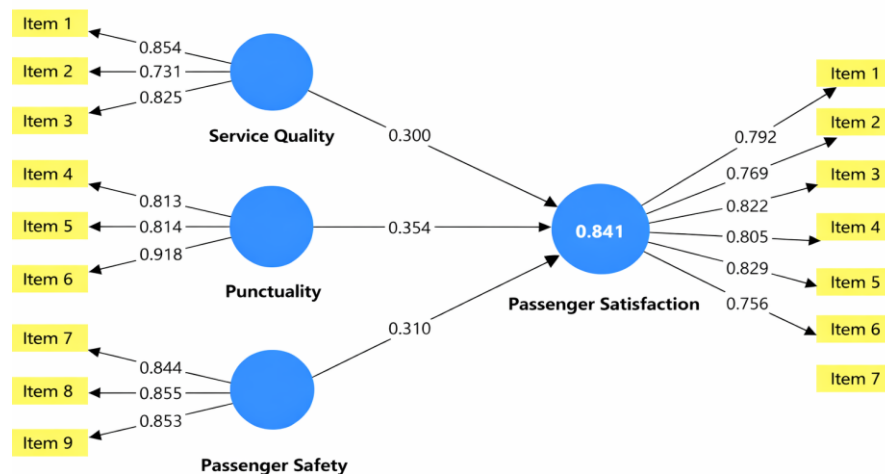


Fig. 4. Structural Equation Model Output

Table 6. Path Coefficient – Matix

	Path coefficients
Passenger Safety → Passenger Satisfaction	0.310
Punctuality → Passenger Satisfaction	0.354
Service Quality → Passenger Satisfaction	0.300

The results indicate that service quality, punctuality, and passenger safety all have positive and significant effects on passenger satisfaction. Among the three variables, punctuality exhibits the strongest influence with a path coefficient of 0.354, followed by passenger safety (0.310) and service quality (0.300). Bootstrapping results confirm that all paths are statistically significant, with t-statistics exceeding the critical value of 1.96 and p-values below 0.05 (Table 7).

Table 7. Bootstrapping - Path coefficient

	Original sample (O)	Sample mean (M)	T statistics (O/STDEV)	P values
Passenger Safety → Passenger Satisfaction	0.310	0.329	2.526	0.012
Punctuality → Passenger Satisfaction	0.354	0.333	2.756	0.006
Service Quality → Passenger Satisfaction	0.300	0.301	3.765	0.000

The coefficient of determination (R²) for passenger satisfaction is 0.841, as shown in Table 8, indicating that 84.1% of the variance in passenger satisfaction is explained by service quality, punctuality, and passenger safety. This value reflects a strong predictive power of the proposed model.

Table 8. R- Square output

	R-square	R-square adjusted
Passenger Satisfaction	0.841	0.837

Model fit indicators derived from SmartPLS, including SRMR, d_ULS, and d_G, are presented in Table 9 and Table 10. The SRMR value of 0.094 suggests that the model demonstrates an acceptable level of fit within the PLS-SEM framework. However, consistent with PLS-SEM principles, the evaluation primarily emphasizes predictive accuracy rather than global goodness-of-fit indices.

Table 9. Output SmartPLS

	<i>Saturated model</i>	<i>Estimated model</i>
SRMR	0.094	0.094
d_ULS	1.057	1.057
d_G	0.856	0.856
Chi-square	673.702	673.702
NFI	0.668	0.668

Table 10. Output Bayesian Information Criterion (BIC) SmartPLS

	<i>BIC (Bayesian information criterion)</i>
Passenger Satisfaction	-263.695

The Bayesian Information Criterion (BIC) is used to evaluate the goodness of fit of a model while considering its complexity. A lower BIC value indicates a better model because it reflects a good balance between model fit and parsimony (i.e., the model explains the data well without using too many parameters). As shown in Table 10, the BIC value for the Passenger Satisfaction model is -263.695. This negative and relatively low value suggests that the proposed structural model has a good level of fit and is efficient in explaining the observed data, indicating that the model is appropriate for further interpretation and analysis.

3.4 Discussion

The results of this study indicate that service quality, punctuality, and safety have significant effects on passenger satisfaction of the Rajabasa Train. These findings confirm that passenger satisfaction in railway transportation is influenced by both service performance and operational reliability.

First, service quality was found to have a positive and significant effect on passenger satisfaction. This result indicates that improvements in comfort, cleanliness, and staff responsiveness contribute directly to higher levels of passenger satisfaction. This finding is consistent with previous studies which identified service quality as a primary determinant of user satisfaction in railway services (Ibrahim et al., 2020; Mesbah et al., 2022). From a theoretical perspective, this result also supports the service quality concept which emphasizes that perceived service performance relative to passenger expectations determines overall satisfaction (Parasuraman et al., 1988; Oliver, 1997).

Second, punctuality emerged as the most influential factor affecting passenger satisfaction. The strong effect of punctuality highlights the importance of schedule reliability and operational consistency in railway services. Delays and travel time uncertainty can disrupt passengers' daily activities and reduce their trust in the service. This finding is in line with previous studies showing that travel time reliability and delay tolerance significantly influence passenger satisfaction levels (Bo et al., 2024; Rahimi et al., 2020). Similar evidence also indicates that service delays reduce perceived service value and overall travel experience (Rossa et al., 2024; Novanti Rahmasari & Triyono, 2023).

Third, safety was found to have a positive and significant impact on passenger satisfaction. This result confirms that passengers consider both physical safety and psychological comfort when evaluating railway services. Effective safety management, operational security, and risk mitigation increase passenger confidence and enhance their travel experience. This finding supports previous research emphasizing the importance of safety perception in improving user satisfaction and trust in railway transportation.

(Soesanto et al., 2023; Florentina et al., 2025).

Overall, the structural model results indicate that service quality, punctuality, and safety simultaneously explain a substantial proportion of passenger satisfaction. This suggests that passenger satisfaction is influenced by an integrated combination of service performance attributes rather than by a single factor. These findings are consistent with public transport studies which emphasize that improving multiple service dimensions simultaneously is necessary to enhance user satisfaction and strengthen the competitiveness of railway transportation (de Oña, 2021; Wahab et al., 2025).

From a practical perspective, the results imply that railway operators should prioritize operational reliability, particularly punctuality, while maintaining consistent service quality and safety standards. Integrated improvements across these dimensions are essential to increase passenger satisfaction, encourage continued use, and support the broader goal of promoting sustainable public transportation.

Table 11. Latent Variabels – Correlations

Constructs	Passenger Safety	Passenger Satisfaction	Punctuality	Service Quality
Passenger Safety	1.000	0.866	0.855	0.845
Passenger Satisfaction	0.866	1.000	0.881	0.870
Punctuality	0.855	0.881	1.000	0.873
Service Quality	0.845	0.870	0.873	1.000

4. CONCLUSION

This study examined the effects of service quality, punctuality, and safety on passenger satisfaction of the Rajabasa Train using the PLS-SEM approach. Based on the results of the analysis, several important conclusions can be drawn.

First, service quality has a positive and significant effect on passenger satisfaction, with a path coefficient of $\beta = 0.300$. This finding indicates that improvements in comfort, cleanliness, staff responsiveness, and service reliability contribute directly to higher levels of passenger satisfaction. The measurement model also shows strong indicator loadings ranging from 0.731 to 0.854, confirming that the service quality construct is well represented. Service quality

therefore remains a fundamental component in shaping passengers' perceptions of railway services.

Second, punctuality is identified as the most influential factor affecting passenger satisfaction, with the highest path coefficient ($\beta = 0.354$). This strong effect highlights the critical importance of schedule reliability and operational consistency in railway services. The punctuality indicators demonstrate high reliability, with loading values between 0.813 and 0.918. Delays and uncertainty in travel time can significantly reduce passengers' trust and satisfaction, indicating that punctuality should be a strategic priority for railway operators.

Third, passenger safety also has a positive and significant impact on satisfaction, with a path coefficient of $\beta = 0.310$. The loading values for safety indicators range from 0.844 to 0.855, indicating strong construct validity. These results confirm that passengers value both physical safety and psychological comfort during their journey. Effective safety management and risk control measures increase passenger confidence and enhance the overall travel experience.

Furthermore, the structural model shows a coefficient of determination ($R^2 = 0.841$), indicating that 84.1% of the variance in passenger satisfaction can be explained by service quality, punctuality, and passenger safety. The remaining 15.9% is influenced by other factors not included in the model. The passenger satisfaction construct itself is also well measured, with indicator loadings ranging from 0.756 to 0.829.

Overall, the findings demonstrate that service quality, punctuality, and safety simultaneously explain a substantial proportion of passenger satisfaction. This indicates that passenger satisfaction in railway transportation is influenced by an integrated combination of service performance and operational reliability. Therefore, efforts to improve railway services should be implemented in a holistic and coordinated manner, with particular emphasis on operational punctuality, while maintaining service quality and safety standards to achieve sustainable passenger satisfaction and strengthen the

competitiveness of railway transportation as a public transport mode.

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