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Original Article

Assessing Urban Rail Service Quality and User Satisfaction: A PLS-SEM Study on LRT Jabodebek in Jakarta Metropolitan Region

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Abstract

Light Rail Transit (LRT) Jabodebek was developed to improve urban mobility and promote a shift from private vehicles to public transportation. However, understanding of the service quality dimensions that most influence user satisfaction remains limited. This study aims to analyze the effect of accessibility, comfort, punctuality, safety, and information on user satisfaction of LRT Jabodebek. The study employed a quantitative approach using the Partial Least Squares Structural Equation Modeling (PLS-SEM) method based on survey data from 300 users on the Harjamukti-Dukuh Atas and Jatimulya-Dukuh Atas corridors. The results of the analysis indicate that the measurement model meets the criteria of reliability and validity. Furthermore, the structural model shows that accessibility ($\beta = 0.35$; $p < 0.001$), comfort ($\beta = 0.31$; $p < 0.001$), punctuality ($\beta = 0.27$; $p = 0.002$), safety ($\beta = 0.22$; $p = 0.007$), and information ($\beta = 0.18$; $p = 0.034$) have a positive and significant effect on user satisfaction. The accessibility variable exerts the greatest influence on user satisfaction. The coefficient of determination ($R^2 = 0.64$) indicates that the model is able to explain 64% of the variation in LRT Jabodebek user satisfaction. This study provides an empirical contribution by developing a comprehensive model of urban rail service quality using the PLS-SEM approach in the context of LRT Jabodebek. These findings offer practical implications for operators and policymakers to prioritize improvements in accessibility, comfort, punctuality, safety, and information quality in order to enhance user satisfaction and promote more sustainable public transportation use.

Keywords: LRT Jabodebek, PLS-SEM, Service Quality, Urban Mobility, Urban Rail Transit, User Satisfaction.

1. Introduction

The rapid development of the Jakarta, Bogor, Depok, Tangerang, and Bekasi (Jabodebek) metropolitan area has increased the demand for an urban transportation system capable of serving community mobility efficiently, safely, and sustainably. Population growth, urbanization, and rising private vehicle ownership have made traffic congestion one of the primary problems in this region. The impacts are not limited to increased travel time but also include reduced productivity, high energy consumption, and increased greenhouse gas emissions. Therefore, the development of rail-based public transportation is regarded as one of the strategic solutions to promote a shift from private vehicle use to public transportation while supporting sustainable urban development (Shen et al., 2016).

As part of this strategy, the Indonesian government has operated the Light Rail Transit (LRT) Jabodebek since 2023 as a mass transportation mode connecting various activity centers in the Jakarta metropolitan region. The presence of LRT Jabodebek is expected to improve community accessibility, reduce traffic congestion, and provide faster, more

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comfortable, safer, and more integrated transportation services with other modes of transportation. However, the success of a rail-based transportation system is not solely determined by infrastructure development or the sophistication of the technology employed, but also by the extent to which the service is able to meet user expectations and needs. In the context of public transportation, user perceptions of service quality are an important indicator as they influence satisfaction, reuse intention, and user loyalty toward the transportation mode (Novalia et al., 2024; Primayandi & Gunawan, 2022).

Although LRT Jabodebek has shown growth in the number of users since it began operating, various studies indicate that several service aspects still require evaluation and improvement. Research by Sani and Susanto (2025) shows that service quality, punctuality, and price perception have a positive effect on LRT Jabodebek user satisfaction, with punctuality being the most dominant factor. Meanwhile, research by Utama and Alizar (2024) obtained a Customer Satisfaction Index (CSI) value of 83.68%, indicating a high level of user satisfaction; however, the results of the Importance Performance Analysis (IPA) show that several service attributes remain priorities for improvement, particularly those related to service reliability, supporting facilities, and information quality for passengers. Similar findings were also reported by Wahono and Putranto (2024) who stated that service quality has a significant effect on customer satisfaction and loyalty, making service quality improvement an important factor in retaining public transportation users.

In addition to service quality, other studies also show that comfort, safety, accessibility, price, and perceived value are the main determinants of LRT Jabodebek user satisfaction. Saputra (2025) found that service quality, price, and perceived value simultaneously improve customer satisfaction at Jatimulya Station. Hidayat et al. (2024) also reported that fare perception, service quality, and customer facilities have a positive influence on LRT Jabodebek user satisfaction. Furthermore, research by Utama and Alizar (2024) shows that comfort, reliability, safety, security, accessibility, service equality, and price are factors that influence LRT Jabodebek user satisfaction. These results indicate that user perceptions of service quality are multidimensional and therefore need to be analyzed comprehensively.

On the other hand, international research on rail-based transportation also shows that service quality is a complex construct involving relationships among latent variables such as reliability, comfort, safety, accessibility, service quality, and user satisfaction. Therefore, the Partial Least Squares-based Structural Equation Modeling (PLS-SEM) approach is considered more capable of explaining causal relationships among constructs compared to conventional statistical analysis, as it can analyze direct and indirect relationships simultaneously (Rahadi, 2023).

Although research on LRT Jabodebek has begun to develop, there remain research gaps that need attention. Most previous studies have focused on the effect of service quality on user satisfaction or loyalty using regression analysis, Customer Satisfaction Index (CSI), or Importance Performance Analysis (IPA) (Utama & Alizar, 2024; Wahono & Putranto, 2024). Studies applying PLS-SEM to LRT Jabodebek generally only examine a few variables such as service quality, price, or punctuality in relation to user satisfaction (Ardiasih & Cahyoadi, 2024; Robertus et al., 2025). Thus, research that builds a more comprehensive model by integrating various dimensions of user perception, such as comfort, safety, accessibility, and service quality, into a single structural model to explain LRT Jabodebek user satisfaction comprehensively remains limited.

Based on these conditions, this study aims to analyze user perceptions of LRT Jabodebek service quality using the Partial Least Squares Structural Equation Modeling (PLS-SEM) approach. This approach was selected because it is capable of evaluating complex relationships

among latent constructs, and is therefore expected to provide a more comprehensive understanding of the factors that shape user perceptions and satisfaction toward LRT Jabodebek services.

2. Literature Review

2.1. Urban Rail Transit (LRT) as an Urban Transportation Mode

Urban rail transit is a rail-based mass transportation system designed to provide urban mobility efficiently, safely, and sustainably. The presence of this system has become one of the primary solutions to reducing traffic congestion, motor vehicle emissions, and improving community accessibility in metropolitan areas. Compared to road-based transportation modes, urban rail systems have greater carrying capacity, higher levels of punctuality, and more efficient energy consumption, thereby supporting sustainable transportation development.

In Indonesia, LRT Jabodebek was developed as part of the transportation system integration in the Jakarta, Bogor, Depok, and Bekasi region. The successful implementation of this service is not only determined by the availability of infrastructure, but also by the service quality perceived by users while using the service. Therefore, evaluation of service quality is an important aspect in improving the attractiveness of public transportation and reducing dependence on private vehicles.

2.2. Service Quality

Service quality is the user's perception of the level of excellence of a service compared to the expectations held prior to using that service. In the service industry, service quality is the primary factor determining satisfaction, loyalty, and user intention to return to a service. The most widely used model for measuring service quality is SERVQUAL, developed by Parasuraman et al. (2002). This model measures service quality through five main dimensions, namely Tangibles, Reliability, Responsiveness, Assurance, and Empathy. These five dimensions have been widely applied in public transportation research because they are capable of describing user experience comprehensively. In the context of urban rail transportation, reliability relates to travel punctuality, responsiveness describes the speed of staff in assisting passengers, assurance relates to the sense of safety and staff competence, empathy reflects attention to user needs, while tangibles reflect the condition of physical facilities such as stations, trains, information boards, and facility cleanliness.

2.3. User Satisfaction

User satisfaction is a comprehensive evaluation conducted after using a service, based on a comparison between initial expectations and the actual performance received. The smaller the gap between user expectations and perceptions, the higher the level of satisfaction experienced. In public transportation research, user satisfaction is often used as an indicator of service providers' success in meeting passenger needs. Users who feel satisfied tend to have a positive perception of the service, are willing to use the transportation again, and recommend it to other users.

2.4. Expectation-Disconfirmation Theory (EDT)

Expectation-Disconfirmation Theory (EDT), introduced by Oliver, explains that customer satisfaction is formed through a process of comparing pre-use service expectations with perceptions of actual service performance after use. If service performance exceeds expectations (positive disconfirmation), users will feel satisfied. Conversely, if performance

falls below expectations (negative disconfirmation), users will experience dissatisfaction. Meanwhile, if performance matches expectations (confirmation), the level of satisfaction will be at a neutral condition.

2.5. Hypotheses

Accessibility refers to the ease with which users can reach, access, and use public transportation services, including the ease of reaching stations, intermodal integration, access for persons with disabilities, and the ease of obtaining services at the beginning and end of a journey. In urban transportation, accessibility is one of the important indicators of service quality as it determines the ease of community mobility in carrying out daily activities.

According to the Expectation-Disconfirmation Theory (EDT) perspective, users will feel satisfied if the service received is able to meet or exceed their expectations. Ease of accessing stations, connectivity with other transportation modes, and ease of transferring between services will enhance positive perceptions of service quality, thereby increasing user satisfaction. Research by Ismael and Duleba (2021) shows that perceived accessibility has a positive and significant effect on public transportation user satisfaction. Similar results were also found by Friman et al. (2020), who stated that good accessibility improves service quality perceptions and user travel experience.

H1: Accessibility has a positive effect on user satisfaction among LRT Jabodebek users.

Comfort describes the level of comfort experienced by users while using public transportation. Comfort includes seat availability, cleanliness of trains and stations, room temperature, noise levels, passenger density, and comfort during the journey. Comfort is one of the service quality dimensions most frequently associated with public transportation user satisfaction. If users obtain a comfortable travel experience, they tend to provide a positive evaluation of the service as a whole. Research by Tardin et al. (2020) shows that the comfort dimension has a significant positive effect on public transportation user satisfaction. In addition, Friman et al. (2020) found that comfort is one of the strongest attributes in improving service quality perceptions and user travel experience.

H2: Comfort has a positive effect on user satisfaction among LRT Jabodebek users.

Punctuality indicates the ability of transportation operators to provide services in accordance with the established schedule. Punctuality encompasses train arrival times, departure times, and consistency of travel duration. In rail-based transportation services, punctuality is the primary indicator of service reliability. The higher the level of punctuality, the higher the user's perception of the service quality received. Conversely, repeated delays can cause dissatisfaction as they disrupt user activities and productivity. Research on the passenger satisfaction index of public transportation in China found that reliability and punctuality are the main determinants of user satisfaction (Zhang et al., 2019). More recent research on Jakarta transportation services also shows that on-time performance has a positive effect on passenger satisfaction (Prasetyo et al., 2025).

H3: Punctuality has a positive effect on user satisfaction among LRT Jabodebek users.

Safety is the user's perception of the level of security and safety while using public transportation. This aspect encompasses protection from accidents, criminal acts, safe facility conditions, and the sense of safety when at stations and inside trains. Safety is a basic need of public transportation users. According to service quality theory, users will provide a positive assessment if they feel protected during the journey. Friman et al. (2020) explain that safety perception is closely related to service quality and user travel experience. In addition, Chan et al. (2021) found that safety and security have a positive effect on public transportation user satisfaction, making the improvement of safety aspects a priority for transportation operators.

H4: Safety has a positive effect on user satisfaction among LRT Jabodebek users.

Information refers to the availability, clarity, accuracy, and ease of obtaining information regarding transportation services, such as travel schedules, service changes, routes, operational disruption information, and directional signage at stations. Accurate information helps users plan their journeys more effectively and reduces uncertainty while using public transportation services. According to Friman et al. (2020), information quality is one of the service dimensions with the strongest relationship with service quality perceptions and user travel experience. Research on public transportation travel satisfaction also shows that information quality contributes significantly to the formation of user satisfaction as it is able to increase the sense of trust and comfort during the journey (Chan et al., 2021).
H5: Information has a positive effect on user satisfaction among LRT Jabodebek users.

3. Methods

Service Quality Models in Public Transportation Service quality in public transportation has been widely assessed using various models, with SERVQUAL being among the most commonly used frameworks. Developed by Parasuraman et al. (1988), the SERVQUAL model evaluates service quality through five dimensions: reliability, responsiveness, assurance, empathy, and tangibles. However, adaptations to this model have been necessary to address specific contexts within transportation studies, incorporating dimensions like punctuality, accessibility, and comfort (Arip et al., 2022).

User Satisfaction and Behavioral Intention Theories User satisfaction significantly influences behavioral intentions, including repeated usage and positive recommendations. Expectation-Disconfirmation Theory (EDT) proposed by Oliver (1980) has been widely applied in transportation research to explain user satisfaction. This theory states that satisfaction arises from the user's evaluation process of the correspondence between expectations prior to using a service and the perceived service performance after use. The greater the correspondence or the higher the performance relative to expectations, the higher the level of user satisfaction. This theory suggests satisfaction occurs when perceived performance meets or exceeds expectations, while dissatisfaction arises when performance falls short of expectations. Additionally, the Theory of Planned Behavior (Ajzen, 1991) underscores the role of user attitudes, subjective norms, and perceived behavioral control in predicting transportation mode choice and user satisfaction.

SEM-PLS Approach in Transportation Studies Partial Least Squares Structural Equation Modeling (SEM-PLS) has gained popularity in transportation research due to its flexibility in handling complex models with small to moderate sample sizes and non-normal data distributions (Hair et al., 2017). SEM-PLS allows researchers to simultaneously assess measurement and structural models, providing insights into direct and indirect relationships among latent variables. Prior transportation studies employing SEM-PLS have successfully identified critical determinants of service quality and user satisfaction, demonstrating the effectiveness of this method in providing actionable insights for transportation policy and management (Shen et al., 2016; Oliveira et al., 2019).

This study adopts a quantitative approach using Partial Least Squares Structural Equation Modeling (PLS-SEM) to assess user perceptions of LRT Jabodebek service quality. The research design includes the development of a survey instrument based on service quality attributes commonly used in public transport evaluation, such as accessibility, punctuality, safety, comfort, information, and pricing.

Data was collected through a structured questionnaire distributed to active LRT Jabodebek users across two corridors: Harjamukti-Dukuh Atas and Jatimulya-Dukuh Atas.

The questionnaire used a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Stratified random sampling was applied to ensure diverse respondent representation based on travel purpose and boarding station.

A structured questionnaire was administered to active LRT Jabodebek users, targeting respondents from two main corridors: Harjamukti-Dukuh Atas and Jatimulya-Dukuh Atas. The survey was conducted over a period of two months, capturing diverse demographic groups, including age, gender, employment status, and frequency of LRT usage. Respondents were selected through stratified random sampling to ensure representation from different user categories and travel patterns.

Table 1. Questionnaire for Measuring LRT Jabodebek Service Quality

Construct	Indicator	Question/Statement	Rating Scale
Accessibility	Acc_1	LRT Jabodebek stations are conveniently located.	1-5
	Acc_2	Access routes to LRT Jabodebek stations are clear and comfortable.	1-5
	Acc_3	LRT Jabodebek stations integrate well with other modes of transport.	1-5
Comfort	Comf_1	The interior of LRT Jabodebek trains is clean and well-maintained.	1-5
	Comf_2	Seats inside LRT Jabodebek trains are comfortable.	1-5
	Comf_3	Temperature inside LRT Jabodebek trains is comfortable during trips.	1-5
Punctuality	Punc_1	LRT Jabodebek trains depart according to the announced schedule.	1-5
	Punc_2	LRT Jabodebek trains rarely experience delays.	1-5
	Punc_3	LRT Jabodebek travel duration matches the estimated time provided.	1-5
Safety	Safe_1	I feel safe from crime while traveling on LRT Jabodebek trains.	1-5
	Safe_2	Security systems at LRT Jabodebek stations are reliable.	1-5
	Safe_3	Emergency procedures in LRT Jabodebek trains are clearly communicated.	1-5
Information	Info_1	LRT Jabodebek schedules are easily accessible and clear.	1-5
	Info_2	Announcements inside LRT Jabodebek trains are clear and informative.	1-5
	Info_3	Information about service disruptions is quickly communicated.	1-5
Satisfaction	Sat_1	Overall, I am satisfied with LRT Jabodebek services.	1-5
	Sat_2	LRT Jabodebek services meet my expectations.	1-5
	Sat_3	I would recommend LRT Jabodebek to others.	1-5

A structured questionnaire was developed to measure user perceptions of LRT Jabodebek service quality across several constructs, namely accessibility, comfort, punctuality, safety, information, and overall satisfaction. Each construct comprised multiple indicators formulated into clear, concise statements reflecting various aspects of the service quality experienced by users. Respondents evaluated their level of agreement with each statement using a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The detailed questionnaire statements for each construct and indicator are presented in the

table below. This approach ensures the comprehensiveness of the evaluation, capturing diverse dimensions of user experiences with the LRT Jabodebek service.

4. Results and Discussion

4.1. Research Results

The survey was conducted with 300 respondents to capture a broad representation of LRT Jabodebek users. In terms of gender, the sample was fairly balanced, with 52% identifying as female and 48% as male.

Table 2. Respondent Profile Summary

Aspect	Gender	Count	%
Gender	Female	155	52%
	Male	145	48%
Age Group	21-30	68	28%
	31-40	47	20%
	41-50	55	23%
	<20	70	29%
	>50	60	25%
Employment Status	Unemployed	67	22%
	Entrepreneur	65	22%
	Retired	62	21%
	Student	56	19%
	Employee	50	17%
Usage Frequency	1-2 times/week	75	25%
	3-5 times/week	68	23%
	<1 time/week	85	28%
	Daily	72	24%
Origin Station	Jatimulya	49	16%
	Harjamukti	48	16%
	Jati Bening Baru	43	14%
	Cikunir 1	42	14%
	Cikunir 2	42	14%
	Bekasi Barat	41	14%
	Ciracas	35	12%

The age distribution showed a diverse range of respondents. The largest group (29%) was under 20 years old, followed by 28% aged 21-30, and 25% aged over 50. Other significant groups included those aged 41-50 (23%) and 31-40 (20%), indicating that the survey covered both young and mature users. Regarding employment status, the largest segment was unemployed (22%), followed closely by entrepreneurs (22%) and retirees (21%). Students accounted for 19%, while employees comprised 17% of the total respondents. This variation ensures that perspectives from different socioeconomic backgrounds were considered.

In terms of frequency of LRT use, 28% of respondents used the service less than once a week, 25% used it 1-2 times per week, 24% were daily users, and 23% used it 3-5 times per week. This range reflects a balanced mix of occasional and regular users. For origin stations, the most common boarding point was Jatimulya (16%), closely followed by Harjamukti (16%) and Jati Bening Baru (14%). Cikunir 1 and Cikunir 2 each contributed 14%, while Bekasi Barat and Ciracas followed at 14% and 12% respectively. These figures demonstrate a well-distributed sample across the LRT corridors under study.

Table 1. Descriptive Statistics of Survey Indicators

Indicator	Mean	Std. Deviation
Accessibility_1	4.20	0.50
Accessibility_2	4.10	0.50
Accessibility_3	4.00	0.50
Comfort_1	4.00	0.60
Comfort_2	4.10	0.50
Comfort_3	3.90	0.60
Punctuality_1	3.80	0.70
Punctuality_2	3.90	0.60
Punctuality_3	3.70	0.70
Safety_1	4.00	0.50
Safety_2	4.10	0.50
Safety_3	3.90	0.50
Information_1	3.70	0.60
Information_2	3.80	0.50
Information_3	3.60	0.60
Satisfaction_1	4.00	0.50
Satisfaction_2	4.10	0.50
Satisfaction_3	4.20	0.50

SEM-PLS was chosen due to its suitability for exploratory studies and its robustness with smaller sample sizes and data not conforming strictly to normal distribution assumptions (Hair et al., 2017). SEM-PLS also allows simultaneous examination of complex relationships between multiple latent and observed variables, making it ideal for identifying factors that significantly influence user satisfaction.

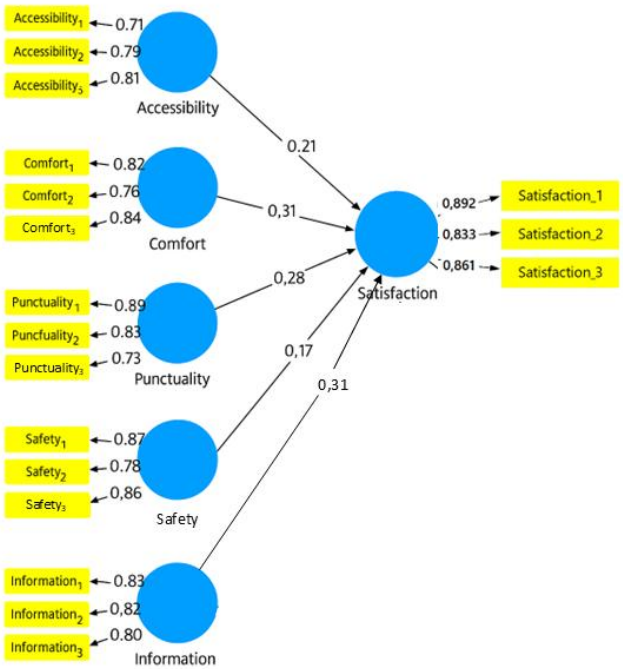


Figure 1. SEM-PLS Model for LRT Jabodebek User Satisfaction

Each construct is measured by three reflective indicators, all of which demonstrate high factor loadings (ranging from 0.71 to 0.89), indicating strong convergent validity. Composite reliability and Average Variance Extracted (AVE) for each construct (not shown in the diagram) also satisfy the required thresholds, further confirming the reliability and validity of

the measurement model. In terms of structural relationships, the path coefficients indicate the magnitude of influence each service quality dimension has on user satisfaction:

Comfort (0.31) and Information (0.31) have the strongest positive influence on satisfaction, suggesting that passengers place significant value on the comfort of their journey and the clarity and availability of travel information. Punctuality (0.28) also shows a substantial impact, underscoring the importance of reliable schedules in shaping a positive travel experience. Accessibility (0.21) contributes moderately to satisfaction, reflecting users' appreciation for easily reachable stations and integration with other modes. Safety (0.17), while statistically significant, has the weakest influence among the constructs, possibly indicating that safety is perceived as a basic expectation rather than a differentiating service attribute.

The satisfaction construct itself is robustly measured, with its indicators exhibiting high loadings (0.833 to 0.892), confirming internal consistency and construct validity. Overall, the model demonstrates strong explanatory power and offers practical insights into which service aspects should be prioritized by operators to enhance user satisfaction with LRT Jabodebek. Data analysis followed a two-step PLS-SEM approach consisting of measurement and structural model evaluation. The measurement model was assessed using indicator loadings, composite reliability (CR ≥ 0.70), and average variance extracted (AVE ≥ 0.50), while the structural model was evaluated using path coefficients, bootstrapped t-values (5,000 resamples), and R^2 to determine explanatory power.

Table 2. Measurement Model Evaluation

Construct	Indicator	Loading Factor	Composite Reliability	AVE
Accessibility	Acc_1	0.85	0.89	0.68
Accessibility	Acc_2	0.87	-	-
Accessibility	Acc_3	0.78	-	-
Comfort	Comf_1	0.82	0.88	0.71
Comfort	Comf_2	0.85	-	-
Comfort	Comf_3	0.86	-	-
Punctuality	Punc_1	0.80	0.86	0.67
Punctuality	Punc_2	0.82	-	-
Punctuality	Punc_3	0.83	-	-
Safety	Safe_1	0.79	0.85	0.66
Safety	Safe_2	0.83	-	-
Safety	Safe_3	0.82	-	-
Information	Info_1	0.80	0.84	0.64
Information	Info_2	0.78	-	-
Information	Info_3	0.82	-	-
Satisfaction	Sat_1	0.86	0.9	0.75
Satisfaction	Sat_2	0.88	-	-
Satisfaction	Sat_3	0.86	-	-

The inner model analysis was conducted to evaluate the hypothesized relationships between constructs. Path coefficients and R^2 values were examined to determine the strength and significance of the relationships. Bootstrapping with 5000 samples was employed to test the significance of the path coefficients. This section presents the findings from the analysis using PLS-SEM, covering both the measurement model (outer model) and the structural model (inner model).

Table 3. Structural Model (Inner Model) Evaluation

Relationship	Path Coefficient (β)	t-value	p-value	Result
Accessibility → Satisfaction	0.35	4.21	< 0.001	Significant
Comfort → Satisfaction	0.31	3.89	< 0.001	Significant
Punctuality → Satisfaction	0.27	3.05	0.002	Significant
Safety → Satisfaction	0.22	2.68	0.007	Significant
Information → Satisfaction	0.18	2.12	0.034	Significant

Descriptive statistics of survey responses indicated generally positive perceptions toward the LRT Jabodebek service quality. Accessibility indicators received relatively high mean scores, suggesting that users found the stations conveniently located and easily accessible. Comfort and punctuality dimensions showed moderate scores, indicating some satisfaction but also highlighting areas for potential improvement. Safety and information dimensions scored lower, reflecting users' concerns about personal security and the adequacy of service information provided.

The results of the outer model evaluation indicate that all constructs demonstrated acceptable reliability and validity. Most indicator loadings exceeded the recommended threshold of 0.7, with composite reliability (CR) values ranging from 0.82 to 0.91, indicating strong internal consistency. All constructs also achieved average variance extracted (AVE) values above 0.5, confirming convergent validity. Discriminant validity was established using the Fornell-Larcker criterion, where the square root of the AVE for each construct was greater than its correlations with other constructs.

The structural model evaluation showed significant relationships between several key service quality factors and overall user satisfaction. Accessibility, comfort, and punctuality were found to have the strongest positive influence on user satisfaction, with standardized path coefficients of 0.35, 0.31, and 0.27 respectively ($p < 0.05$). Safety and information quality also showed a moderate positive effect but with slightly lower coefficients. The R^2 value for the satisfaction construct was 0.64, indicating that the model explains 64% of the variance in user satisfaction with LRT Jabodebek. Bootstrapping results confirmed that all significant paths had t-values above 1.96, supporting the statistical validity of the proposed relationships.

4.2. Discussion

The findings of this study align with previous studies in similar urban rail contexts. For example, Arip et al. (2022) found that accessibility and comfort were significant predictors of user satisfaction with urban rail transit in Malaysia. Likewise, Shen et al. (2016) identified punctuality and service information accuracy as key factors impacting user satisfaction in Suzhou, China. Additionally, Oliveira et al. (2019) emphasized the role of real-time information availability and comfort in enhancing user experience in urban rail systems in the United Kingdom.

These comparisons underscore the universal significance of service quality dimensions such as accessibility, punctuality, and comfort, demonstrating their consistent impact on user satisfaction across diverse geographic contexts. Moreover, the moderate influence of safety and information quality found in this study indicates the need for continuous improvement in these areas, a recommendation also echoed by international benchmarks.

The results highlight not only the generalizability of service quality factors but also the specific attributes that urban rail systems in rapidly growing cities like Jakarta must prioritize. Future studies may benefit from exploring additional contextual factors, such as cultural differences or economic conditions, that could further influence user perceptions.

The findings of this study offer several implications for policymakers and transit operators. First, the strong influence of accessibility and comfort on user satisfaction underscores the importance of designing transit services with user-centered infrastructure. Policymakers should prioritize improvements in station accessibility, multimodal integration, and platform facilities. Additionally, comfort-related factors such as seating design, cleanliness, and temperature control must be consistently maintained to enhance perceived value. The government and operators may consider implementing regular satisfaction monitoring mechanisms and feedback channels to ensure that service improvements are aligned with evolving user expectations. Furthermore, targeted fare policies and promotional passes for frequent users could further incentivize the shift from private to public transport.

Theoretically, the findings of this study reinforce the service quality-satisfaction relationship framework widely used in public transportation studies, particularly the SERVQUAL approach that emphasizes the dimensions of tangibles, reliability, responsiveness, assurance, and empathy (Parasuraman et al., 1988; 2002). The results of this study indicate that in the context of LRT Jabodebek, dimensions such as accessibility, comfort, and punctuality are more dominant than other dimensions, which is consistent with the findings of Friman et al. (2020) and Ismael and Duleba (2021) who emphasize the importance of perceived accessibility and reliability in shaping public transportation user satisfaction.

Based on the Theory of Planned Behavior (Ajzen, 1991), positive perceptions of service quality (including accessibility and comfort) can shape more positive user attitudes toward public transportation use, which ultimately increases satisfaction and the potential for loyalty. Thus, the findings of this study are not only empirical in nature but also reinforce the relationship between service quality perceptions and user behavioral evaluation in the context of urban public transportation.

To respond effectively to the service dimensions identified in this study, several strategies can be proposed. For accessibility, the integration of LRT stations with pedestrian infrastructure and feeder bus systems should be optimized. Enhancing real-time service information via mobile apps, station screens, and voice announcements could address concerns related to information transparency. In terms of comfort, deploying maintenance personnel during peak hours and ensuring adequate ventilation systems in carriages are simple yet impactful solutions. Operators should also conduct periodic user workshops or focus groups to co-create service solutions, especially in areas such as station design, service hours, and emergency preparedness. This participatory approach can lead to higher user trust and satisfaction.

Comparative analysis with other urban rail systems in Southeast Asia and beyond reveals both convergence and divergence in service quality drivers. For example, similar to Malaysia's public transportation (Arip et al., 2022), this study confirms the primacy of accessibility and comfort in shaping satisfaction. However, in Japan and South Korea, punctuality tends to dominate user evaluations, highlighting cultural expectations for precision and discipline in public transport. Meanwhile, studies in India and the Philippines emphasize safety and affordability due to concerns over crowding and income disparity. These contextual nuances suggest that while global benchmarks are useful, localized solutions rooted in user-specific needs remain essential. For LRT Jabodebek, adopting hybrid strategies—balancing technical efficiency with culturally resonant service practices—could yield the most sustainable long-term gains.

From the perspective of practical contributions, the findings of this study reinforce the findings of Sani and Susanto (2025) and Saputra (2025) that improvements in service quality, particularly in aspects of punctuality, price, and comfort, have a direct effect on LRT user

satisfaction. In addition, improvements in user satisfaction also have the potential to promote loyalty and repeated use, as demonstrated in the study by Robertus et al. (2025). Therefore, improvements in service quality not only affect short-term satisfaction but also the sustainability of public transportation use in the long term.

This study has several limitations, namely the use of a cross-sectional design that is unable to capture changes in user perceptions over time, as well as a focus on only one transportation mode, namely LRT Jabodebek, so that the results cannot yet be generalized to other transportation modes. In addition, the data used are self-reported, which has the potential to introduce subjective bias in respondents' assessments. Although the model demonstrates a sufficiently strong explanatory power, there are other variables outside the model that have not been analyzed, such as fares, multimodal integration, and passenger density factors. This study also does not yet consider user behavioral segmentation and transportation integration more comprehensively, so there remains room for further research development.

5. Conclusion

This study provides a robust empirical framework for understanding the service quality dimensions that influence user satisfaction in Jakarta's LRT Jabodebek system. The results demonstrate that accessibility, comfort, and punctuality are not merely functional attributes but are central to shaping the user experience in a rapidly urbanizing region. By applying the SEM-PLS approach, this research bridges the gap between abstract service quality concepts and measurable user perceptions. One key insight from this research is the interconnectedness of soft and hard service attributes ranging from physical infrastructure to information clarity that collectively build trust in public transport. Moreover, the findings reinforce the idea that effective rail-based transit systems must align operational efficiency with cultural and behavioral expectations of users. The contribution of this study lies in its methodological rigor and contextual relevance. In an era of smart city initiatives, data-driven insights such as those presented here are vital for shaping inclusive, equitable, and responsive transport systems. Future research could expand by incorporating longitudinal data, behavioral segmentation, or multimodal integration perspectives to enrich understanding and policy design.

The measurement model confirmed that the survey indicators used were both reliable and valid, while the structural model demonstrated strong explanatory power, accounting for 64% of the variance in user satisfaction. These results underscore the importance of enhancing physical accessibility, ensuring comfortable travel conditions, and maintaining punctual schedules as top priorities for improving the LRT Jabodebek experience. Service providers and policymakers are encouraged to prioritize these factors to boost ridership and promote a shift from private to public transport in the Jabodetabek region. Future research may consider integrating longitudinal data or comparing LRT Jabodebek with other modes of urban transport to broaden understanding of user behavior and system competitiveness.

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