DIJEMSS: Dinasti International Journal of Education Management and Social Science
E-ISSN: 2686-6331
P-ISSN: 2686-6358
https://dinastipub.org/DIJEMSS dinasti.info@gmail.com +62 811 7404 455
DOI: https://doi.org/10.38035/dijemss.v7i6

The Impact of Tariffs, Feeder, and Parking on Customer Engagement With Mediated Customer Satisfaction on Urban Railways

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Abstract: To alleviate congestion in Jakarta, fast and clean public transport has been developed to encourage a modal shift toward environmentally friendly urban rail, namely the Mass Rapid Transit (MRT) and Light Rail Transit (LRT). Currently, the Jakarta LRT, the Jabodebek LRT, and the Jakarta MRT are in operation. The key challenge is persuading users of private cars, motorcycles, and conventional public transport to adopt the LRT and MRT for daily trips, thereby reducing congestion. This study examines the effects of fares, feeder buses, and parking facilities on customer engagement, with customer satisfaction as a mediating variable in Jakarta's urban rail system. Data were analyzed using Structural Equation Modeling with the Partial Least Squares approach (SEM-PLS). The sample comprised 220 LRT and MRT users. The results show that fares and feeder services have positive and significant effects on customer satisfaction but positive yet insignificant effects on customer engagement. Parking exerts a positive and significant influence on both customer satisfaction and engagement. Customer satisfaction also has a positive and significant effect on customer engagement. Furthermore, fares, feeder services, and parking have positive and significant indirect effects on customer engagement through customer satisfaction.

Keywords: Tariffs, Feeder Services, Parking, Customer Satisfaction, Customer Engagement.

INTRODUCTION

Economic development requires an adequate transportation system to facilitate the mobility of goods and people in economic activities (Abbas Salim, 2021). In urban areas, road-based transportation remains the dominant mode. Population growth, urbanization, and increased private vehicle ownership have led to increasingly complex congestion in major cities in Indonesia, particularly in Jakarta and its surrounding areas.

The growth of urban populations increases transportation demand and generates multiple challenges, including longer travel times, higher levels of air pollution, and limited road capacity (Thondoo et al., 2020; Verma et al., 2021). Empirical data indicate that commuter

flows from Bekasi (36.55%), Tangerang (32.37%), and Bogor–Depok (31.08%) significantly contribute to congestion in Jakarta (Aditiya Rendra Riawan & Ervina Ahyudanari, 2020). This situation emphasizes the importance of providing an effective and sustainable public transportation system (Papadakis et al., 2024).

The development of rail-based transportation through Mass Rapid Transit (MRT) and Light Rail Transit (LRT) is a strategic policy in addressing urban transportation issues. Urban rail plays a crucial role in supporting mobility, reducing congestion, and promoting environmental sustainability (Pan, 2024; Ibrahim et al., 2025). MRT and LRT have been shown to shift travel behavior from private vehicles to public transportation (Cervero & Kang, 2019). Investments in rail-based transportation reduce vehicle volumes by 4.6% (Glover & Nash, 2019), while cities operating LRT experience an average 7% reduction in congestion in the three years following operation (Fageda et al., 2021). Furthermore, private car use decreased by 18.4%, and travel time decreased by an average of 11 minutes per day for residents living within a 1-km radius of a metro station (Huang, 2019).

However, previous research has primarily examined service and fare factors, partially without integrating supporting attributes of the transportation system, such as feeder and parking facilities, which play a crucial role in the overall travel experience (door-to-door) (Pan, 2024). The lack of intermodal integration models involving feeder and parking facilities has resulted in a limited and less comprehensive understanding of passenger behavior (Wahab et al., 2025).

The shift in public transportation patterns from road to rail modes is influenced by factors such as fares, feeder availability, and parking facilities at urban rail stations. The integration of feeder systems and connected fare policies can reduce congestion by 5.4% (Nguyen & Tran, 2020; Kang & Lee, 2022), while the implementation of an LRT system coupled with a park-and-ride policy reduces vehicle volume by up to 10% (van der Waerden et al., 2024).

These factors also influence customer satisfaction, which in turn shapes customer engagement. Increased satisfaction drives loyalty and a tendency to recommend services to others, thus providing long-term benefits for transportation providers (R. Kumar et al., 2020). Customer engagement is conceptualized as customer activities that reflect experiences and intentions to interact with and recommend services (Hopp & Gallicano, 2016; Hollebeek et al., 2016). However, not all forms of customer engagement automatically create value for an organization, necessitating a deeper understanding of the factors shaping such engagement in the context of public transportation (de Oliveira Santini et al., 2020).

Literature Review

1. Fare

Fare represents the monetary cost incurred by passengers in exchange for transportation services and reflects perceived economic sacrifice relative to service benefits. In public transport systems, fare structures are generally designed based on operational costs and regulated profit margins to ensure affordability and sustainability. According to Price Fairness Theory, perceived fairness of fare emerges when users evaluate the price paid as proportional to the service quality received (Xia et al., 2004). Empirical studies demonstrate that fare affordability and transparency significantly influence passenger satisfaction and behavioral intention (De Oña et al., 2016; Pan, 2024). In urban rail contexts, fare is not only assessed in absolute monetary terms but also through its consistency, ease of payment, and alignment with perceived service performance (Ibrahim et al., 2025). Thus, fare constitutes a fundamental determinant of perceived value and user satisfaction in rail-based public transport systems.

2. Feeder

Feeder services function as complementary transport modes that connect residential areas with primary rail stations, addressing first-mile and last-mile accessibility issues. Well-designed feeder systems reduce access time and enhance spatial coverage of rail networks (Vuchic, 2005). Integrated feeder services are essential to improving overall system efficiency and increasing ridership (Cervero, 2013). Several studies report that feeder accessibility, service frequency, and comfort significantly affect passenger satisfaction and willingness to use urban rail systems (Chen et al., 2017; Tirachini et al., 2020). Feeder services therefore serve not merely as supporting infrastructure but as integral components of service quality that shape user experience and satisfaction in multimodal transport environments.

3. Parking

Parking facilities play a strategic role in intermodal transportation systems, particularly in park-and-ride schemes that encourage modal shift from private vehicles to public transport. Adequate parking capacity, safety, pricing, and convenience contribute to perceived accessibility and service quality (Marsden, 2006). Empirical evidence indicates that the availability of secure and affordable parking near rail stations significantly increases public transport usage and user satisfaction (Shiftan et al., 2012; Dell'Olio et al., 2014). Consequently, parking operates not only as a physical facility but also as a policy instrument for managing travel behavior and enhancing public transport attractiveness.

4. Customer Satisfaction

Customer satisfaction is defined as the psychological outcome resulting from the comparison between service expectations and perceived performance (Oliver, 1997). Expectation–Confirmation Theory explains satisfaction as a cognitive evaluation process that leads to emotional responses toward service providers. In public transportation research, satisfaction is commonly measured through indicators such as perceived quality, intention to reuse, and recommendation behavior (De Oña & De Oña, 2015). Prior studies confirm that service attributes such as fare fairness, accessibility, and supporting facilities significantly affect satisfaction in rail systems (Eboli & Mazzulla, 2012; Pan, 2024). Satisfaction thus represents a critical performance indicator for evaluating service effectiveness and policy outcomes.

5.Customer Engagement

Customer engagement refers to a multidimensional psychological state encompassing cognitive, emotional, and behavioral involvement with a service (Vivek et al., 2012). Empirical studies demonstrate that satisfaction is a primary antecedent and mediator in shaping engagement behavior (Brodie et al., 2013; Hollebeek et al., 2014). In transport contexts, fare fairness, effective feeder services, and convenient parking improve perceived value and satisfaction, which subsequently enhance engagement through continued usage and advocacy (Ibrahim et al., 2025; Pan, 2024). Therefore, customer engagement in urban rail systems is largely formed through the indirect effects of service attributes mediated by customer satisfaction.

METHOD

Research Design

This study adopts a quantitative approach with an explanatory research design aimed at examining causal relationships among latent variables based on hypothesis testing. This approach is used to investigate the influence of one variable on another by validating a

theoretical model using empirical data and explaining both direct and indirect (mediated) relationships (Hair et al., 2022; Sekaran & Bougie, 2023).

Advantages of Purposive Sampling

According to Taherdoost (2022) and Saunders et al. (2019; latest edition), the advantages of purposive sampling include:

a. Higher efficiency and stronger focus on relevant respondents,
b. Production of more relevant and higher-quality data, and
c. High suitability for perception-based explanatory research.

The analytical method employed in this study is Partial Least Squares–Structural Equation Modeling (PLS-SEM). This method is appropriate because it enables the simultaneous testing of complex causal relationships, supports mediation and prediction analysis, and is suitable for theory development in specific contextual settings (Hair et al., 2022).

Research Location and Period

This study was conducted among users of urban rail services (LRT and MRT) in Jakarta, particularly those associated with feeder services and parking facilities. Data collection was carried out from October 2024 to April 2025.

Population and Sample

a. Population

The population of this study consists of users of urban rail services in Jakarta, namely LRT Jabodebek, LRT Jakarta, and MRT Jakarta.

b. Sampling Technique

The sample was selected using purposive sampling, a non-probability sampling technique in which respondents are chosen based on specific characteristics, limited population accessibility, and relevance to the research objectives (Etikan et al., 2016; Taherdoost, 2022). This approach ensures that the collected data genuinely reflects actual user experiences.

The sampling criteria were as follows: respondents must have used MRT Jakarta, LRT Jakarta, or LRT Jabodebek services at least three times within the last three months, be aged 16 years or older, and have used feeder services and/or parking facilities.

c. Sample Size

The sample size was determined using the “times rule” in PLS-SEM proposed by Hair (2022), which recommends a minimum sample size equal to five times the number of indicators used in the research constructs. As this study employed 27 indicators, the minimum required sample size was 135 respondents. The final sample consisted of 220 respondents, which satisfies the minimum sample size requirement for PLS-SEM analysis.

Data Analysis

Technique (SEM-PLS) Data analysis was conducted using SmartPLS 4 software with the following stages (Hair, 2022):

a. Measurement Model Evaluation (Outer Model)
   The evaluation was conducted to test construct validity and reliability, including Convergent Validity with Outer Loading ≥ 0.70 and AVE ≥ 0.50 criteria. Discriminant Validity with the Fornell-Larcker Criterion and Heterotrait Monotrait Ratio (HTMT)

≤ 0.90. Construct Reliability with Cronbach's Alpha ≥ 0.70 and Composite Reliability ≥ 0.70.

b. Structural Model
Evaluation (Inner Model) is as follows: The assessment includes the R-Square (R^2) value to measure the model's predictive ability, Effect Size (f^2) to measure the strength of the variable's influence, Predictive Relevance (Q^2) using blindfolding, and Collinearity Test with a VIF value <5.

c. Hypothesis Testing
Hypothesis testing was conducted using the Bootstrapping method with a significance level of $\alpha = 0.05$. The criteria were a t-statistic ≥ 1.96 and a p-value ≤ 0.05.

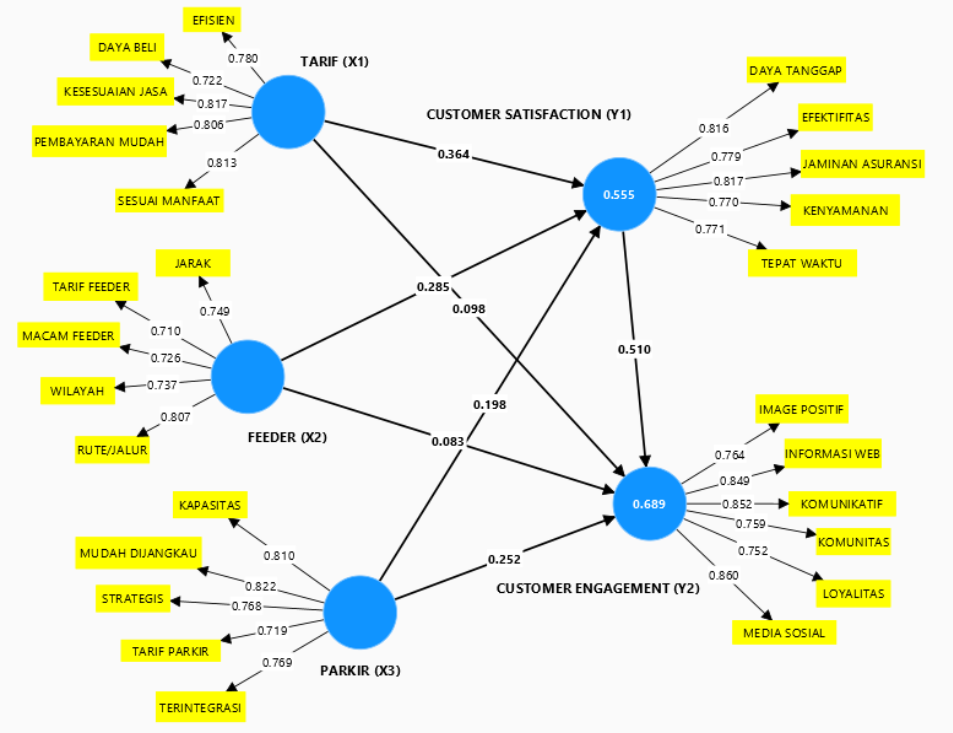
d. Mediation Effect Analysis
The analysis of the mediation effect on Customer Satisfaction was conducted by testing the indirect effect and determining the type of mediation (partial or full) based on the significance of the direct and indirect paths.

6. Research Hypothesis

H1: Tariffs have a positive and significant effect on Customer Satisfaction.
H2: Feeder services have a positive and significant effect on Customer Satisfaction.
H3: Parking has a positive and significant effect on Customer Satisfaction.
H4: Tariffs have a positive and significant effect on Customer Engagement.
H5: Feeder services have a positive and significant effect on Customer Engagement.
H6: Parking has a positive and significant effect on Customer Engagement.
H7: Customer Satisfaction has a positive and significant effect on Customer Engagement.

Analysis And Discussion

Based on the data from 220 respondents, using SEM-PLS analysis, the following results were obtained:



Evaluation of the Measurement Model (Outer Model)

The evaluation of the measurement model (outer model) was conducted to ensure that the indicators used in this study are valid and reliable in measuring the latent constructs. The assessment of the outer model included convergent validity, discriminant validity, and construct reliability tests. All indicators met the criteria for convergent validity and were therefore retained in the research model (Hair et al. ,2022):

Table 1. Convergent Validity Test

Variable / Construct	Indicator	Outer Loading	AVE	Criteria	Decision
Fare (X1)	Effisiency	0.780	0.622	OL ≥ 0.70	Valid
	Service Suitability	0.817		AVE ≥ 0.50	Valid
	Benefit Suitability	0.813			Valid
	Easy Payment	0,806			Valid
	Purchasing Power	0,722			Valid
Feeder (X2)	Area	0.737	0.558		Valid
	Route/Line	0.807			Valid
	Feeder Rates	0.710			Valid
	Distance	0,749			Valid
	Feeder Type	0, 726			Valid
Parking (X3)	Capacity	0,810	0.606		Valid
	Easy to Access	0,822			Valid
	Parking Rates	0,719			Valid
	Integrated	0,769			Valid
	Strategic	0,768			Valid
Customer Satisfaction (Y1)	Effective	0.779	0.625		Valid
	On Time	0.771			Valid
	Guarantee Insurance	0,817			Valid
	Convenience	0,770			Valid
	Responsiveness	0, 816			Valid
Customer Engagement (Y2)	Community	0.765	0.652		Valid
	Positive Image	0.764			Valid
	Web Information	0.849			Valid
	Communicative	0,859			Valid
	Loyality	0,752			Valid
	Social Media	0,860			Valid

The results of the convergent validity assessment show that all indicators have outer loading values greater than 0.70 and Average Variance Extracted (AVE) values exceeding 0.50. Specifically, the AVE values for each construct were Fare (AVE = 0.622), Feeder (AVE = 0.558), Parking (AVE = 0.606), Customer Satisfaction (AVE = 0.625), and Customer

Engagement (AVE = 0.652). These results indicate that all indicators and constructs satisfy the convergent validity requirements and are therefore valid for inclusion in the research model.

Table 2. Construct Reliability Test

Variable / Construct	Cronbach's Alpha	Composite Reliability_a (rho_a)	Composite Reliability _C (rho_c)	Criteria	Decision
Fare (X1)	0,849	0,857	0,891	≥ 0.70	Reliable
Feeder (X2)	0,802	0,812	0,863	≥ 0.70	Reliable
Parking (X3)	0,849	0,857	0,891	≥ 0.70	Reliable
Customer Satisfaction (Y1)	0,911	0,857	0,891	≥ 0.70	Reliable
Customer Engagement (Y2)	0,899	0,907	0,920	≥ 0.70	Reliable

Construct reliability was assessed using Cronbach's Alpha and Composite Reliability (rho_a and rho_c). According to Hair et al. (2022), acceptable reliability is indicated by Composite Reliability values (rho_a and rho_c) greater than 0.70 and Cronbach's Alpha values exceeding 0.70. The results show that all constructs achieved reliability values above the recommended threshold (≥ 0.70), indicating high internal consistency and confirming that each construct reliably measures its respective latent variable. Consequently, all constructs in this study meet the required reliability criteria.

Table 3. Discriminant Validity Test (Fornell–Larcker Criterion)

Construct	Customer Engagement (Y2)	Customer Satisfaction (Y1)	Feeder (X2)	Parking (X)	Fare (X1)
Customer Engagement (Y2)	0,807				
Customer Satisfaction (Y1)	0,784	0,791			
Feeder (X3)	0,657	0,664	0,747		
Parking (X2)	0,677	0,607	0,674	0,778	
Fare (X1)	0,649	0,674	0,674	0,597	0,789

Discriminant validity was evaluated using the Fornell–Larcker criterion, which requires that the square root of the AVE (√AVE) of each construct be greater than its correlations with other constructs. The results demonstrate that the √AVE values for all constructs are higher than the inter-construct correlation values, indicating that each construct is empirically distinct from the others. Therefore, discriminant validity is established according to the Fornell–Larcker criterion.

Table 4. Discriminant Validity Test (Heterotrait–Monotrait Ratio, HTMT)

Construct Pairs	Score HTMT	Criteria (≤ 0.90)	Decision
Fare (X1) ↔ Customer Engagement (Y2)	0.727	≤ 0.90	Valid
Fare (X1) ↔ Customer Satisfaction (Y1)	0.785	≤ 0.90	Valid
Fare (X1) ↔ Feeder (X2)	0,815	≤ 0.90	Valid
Fare (X1) ↔ Parking (X3)	0,708	≤ 0.90	Valid

Construct Pairs	Score HTMT	Criteria (≤ 0.90)	Decision
Feeder (X2) ↔ Customer Engagement (Y2)	0.761	≤ 0.90	Valid
Feeder (X2) ↔ Customer Satisfaction (Y1)	0.796	≤ 0.90	Valid
Parking (X3) ↔ Customer Engagement (Y2)	0.781	≤ 0.90	Valid
Parking (X3) ↔ Customer Satisfaction (Y1)	0,714	≤ 0.90	Valid
Parking (X3) ↔ Feeder (X2)	0,824	≤ 0.90	Valid
Customer Satisfaction (Y1) ↔ Customer Engagement (Y2)	0.885	≤ 0.90	Valid

Discriminant validity was further assessed using the Heterotrait–Monotrait (HTMT) ratio. Discriminant validity is confirmed when HTMT values are below 0.90. All HTMT values obtained in this study were less than 0.90, indicating the absence of discriminant validity problems. Thus, all constructs are empirically distinct from one another and satisfy the HTMT criterion for discriminant validity.

Table 5. Variance Inflation Factor (VIF)

Construct Pairs	VIF	Decision
Customer Satisfaction (Y1) ↔ Customer Engagement (Y2)	2,585	Valid
Fare (X1) ↔ Customer Satisfaction (Y1)	1,968	Valid
Fare (X1) ↔ Customer Engagement (Y2)	2,256	Valid
Feeder (X2) ↔ Customer Satisfaction (Y1)	2,321	Valid
Feeder (X2) ↔ Customer Engagement (Y2)	2,559	Valid
Parking (X3) ↔ Customer Satisfaction (Y1)	1,970	Valid
Parking (X3) ↔ Customer Engagement (Y2)	2,140	Valid

Multicollinearity was examined to ensure that no strong linear relationships existed among the independent variables. The criterion applied was a Variance Inflation Factor (VIF) value below 5 (Hair et al., 2022). The VIF values for all construct relationships were below the critical threshold, indicating that multicollinearity is not present in the structural model. Therefore, the model is free from multicollinearity issues.

Table 6. Model Fit

Information	Saturated Model	Estimates Model
SRMR	0,067	0,067
D_ULS	2,080	2,080
D_G	0,914	0,914
Chi-square	1.064,177	1.064,177
NFL	0,765	0,765

The model fit indices obtained from the analysis are presented for both the saturated model and the estimated model. The results indicate acceptable levels of model fit, as reflected by the SRMR, d_ULS, d_G, chi-square, and NFI values, which show consistency between the saturated and estimated models.

Table 7. Coefficient of Determination (R^2)

Construct Pairs	R - squared	Category
Customer Engagement (Y2)	0.689	Moderate
Customer Satisfaction (Y1)	0.555	Moderate

The coefficient of determination (R^2) reflects the predictive power of the structural model. Values closer to 1.0 indicate stronger predictive accuracy. In general, R^2 values of 0.75 are considered substantial, 0.50 moderate, and 0.25 weak (Ghozali & Latan, 2015; Hair et al., 2022; Santosa, 2018). The results show that Customer Satisfaction (Y1) has an R^2 value of 0.555, while Customer Engagement (Y2) has an R^2 value of 0.689. These values indicate that both endogenous constructs exhibit moderate predictive power. The R^2 value for Customer Satisfaction (0.555) implies that Fare (X1), Feeder (X2), and Parking (X3) collectively explain 55.5% of the variance in Customer Satisfaction, while the remaining 44.5% is explained by other factors not included in this study. Similarly, the R^2 value for Customer Engagement (0.689) indicates that Fare (X1), Feeder (X2), Parking (X3), and Customer Satisfaction (Y1) together explain 68.9% of the variance in Customer Engagement, while 31.1% is attributable to other unexamined factors.

Table 8. Path Coefficient Test Results for Direct Effects

Construct Pairs	Original Sample	Sample Mean	Standard Deviation	T Statistic	P Value
Customer Satisfaction (Y1) => Customer Engagement (Y2)	0,510	0,513	0,078	6,511	0,000
Tarif (X1) => Customer Satisfaction (Y1)	0,364	0,362	0,066	5,552	0,000
Tarif (X1) => Customer Engagement (Y2)	0,098	0,095	0,065	**1,511**	**0,131**
Feeder (X2) => Customer Satisfaction (Y1)	0,285	0,289	0,080	3,568	0,000
Feeder (X2) => Customer Engagement (Y2)	0,083	0,080	0,071	**1,164**	**0,244**
Parkir (X3) => Customer Satisfaction (Y1)	0,198	0,199	0,075	3,638	0,008
Parkir (X3) =>> Customer Engagement (Y2)	0,252	0,255	0,063	3,987	0,000

Table 9. Path Coefficient Test Results for Indirect Effects

Construct Pairs	Original Sample	Sample Mean	Standard Deviation	T Statistic	P Value
Fare (X1) => Customer Satisfaction (Y1) => Customer Engagement (Y2)	0,178	0,181	0,052	3,415	0,001
Feeder (X2) => Customer Satisfaction (Y1) => Customer Engagement (Y2)	0,151	0,151	0,040	3,755	0,000
Parking (X3) => Customer Satisfaction (Y1) => Customer Engagement (Y2)	0,196	0,197	0,049	3,970	0,000

The results of the path coefficient analysis were used to test the direct effects among latent variables, with the criteria of a t-statistic value ≥ 1.96 and a significance level of p-value ≤ 0.05.

The test results indicate that:

1. **Tariff** has a positive and significant effect on **Customer Satisfaction**, with $\beta = 0.364$; $t = 5.552$; $p = 0.000$;

2. **Feeder** has a positive and significant effect on **Customer Satisfaction**, with β = 0.285; t = 3.568; p = 0.000;
3. **Parking** has a positive and significant effect on **Customer Satisfaction**, with β = 0.198; t = 3.638; p = 0.008;
4. **Tariff** has a positive but not significant effect on **Customer Engagement**, with β = 0.098; t = 1.511; p = 0.131;
5. **Feeder** has a positive but not significant effect on **Customer Engagement**, with β = 0.083; t = 1.511; p = 0.244;
6. **Parking** has a positive and significant effect on **Customer Engagement**, with β = 0.252; t = 3.987; p = 0.000;
7. **Customer Satisfaction** has a positive and significant effect on **Customer Engagement**, with β = 0.510; t = 6.511; p = 0.000.

Furthermore, the SEM-PLS results for the effects of Tariff, Feeder, and Parking on Customer Engagement mediated by Customer Satisfaction as indirect effects are as follows:

1. **Tariff (X1)** has a positive and significant effect on **Customer Engagement (Y2)** through the mediation of **Customer Satisfaction (Y1)**, with β = 0.178; t = 3.415; p = 0.001;

2. **Feeder (X2) has a positive and significant effect on Customer Engagement (Y2) through** the mediation of **Customer Satisfaction (Y1)**, with β = 0.151; t = 3.755; p = 0.000;

3. **Parking (X3)** has a positive and significant effect on **Customer Engagement (Y2)** through the mediation of **Customer Satisfaction (Y1)**, with β = 0.196; t = 3.970; p = 0.000.

Therefore, based on the above findings, the results indicate that Tariff, Feeder, and Parking have positive and significant effects on Customer Engagement and are fully mediated by Customer Satisfaction.

RESULTS AND DISCUSSION

The SEM-PLS analysis reveals that tariffs, feeders, and parking significantly impact customer satisfaction, whereas customer engagement is mainly affected by user satisfaction levels. These results imply that functional service characteristics in urban rail transport systems more successfully promote user engagement indirectly through satisfaction instead of through direct influences.

The results show that tariff has a positive and significant effect on customer satisfaction (β = 0.364; t = 5.552; p = 0.000). This finding confirms that perceptions of fare fairness, affordability, and transparency are critical determinants of user satisfaction. In the context of Jakarta's MRT and LRT systems, fare represents the financial sacrifice incurred by passengers and must therefore be aligned with the perceived quality of service. The implementation of flat fares and integrated payment systems enhances perceived *value for money* and reduces uncertainty related to travel costs. This result supports previous studies emphasizing that tariff is a strategic component of integrated transport systems because it directly influences user satisfaction. Accordingly, H1 is supported.

Furthermore, feeder services have a positive and significant effect on customer satisfaction (t = 3.568; p = 0.000). This finding highlights the importance of feeder modes in shaping the overall travel experience, particularly in addressing first-mile and last-mile problems. Well-integrated feeder services reduce travel time, additional costs, and travel uncertainty, thereby improving perceived convenience and comfort. In Jakarta, synchronization between feeder schedules and train services, along with easily accessible

transfer points, is essential to enhance the attractiveness of MRT and LRT systems. This result is consistent with accessibility theory, which emphasizes that transport service quality depends not only on the main mode but also on the ease of access to and from it. Therefore, H2 is supported.

The analysis also demonstrates that parking has a positive and significant effect on customer satisfaction ($t = 3.638$; $p = 0.008$). Safe, convenient, and strategically located parking facilities provide added value for users who rely on private vehicles to reach rail stations. Within the *park-and-ride* framework, parking functions as a connector between private vehicles and mass transit. Accessible and reasonably priced parking reduces travel stress and enhances overall comfort. In Jakarta, the provision of park-and-ride facilities around MRT and LRT stations contributes to shorter access distances and smoother intermodal transfers, thereby improving user satisfaction. Thus, H3 is supported.

In contrast, tariff does not have a significant direct effect on customer engagement ($\beta = 0.098$; $t = 1.511$; $p = 0.131$), although the relationship is positive. This result indicates that tariff is not a primary determinant of user engagement with MRT and LRT services in Jakarta. Passengers tend to prioritize core service attributes such as reliability, comfort, and accessibility rather than price alone. Moreover, fare integration and price stability reduce variability in fare perceptions among users, limiting its contribution to differences in engagement levels. Hence, H4 is rejected.

Similarly, feeder services do not have a significant direct effect on customer engagement ($\beta = 0.083$; $t = 1.511$; $p = 0.244$). Although the coefficient is positive, its effect is statistically weak. This suggests that feeder services have not yet become a dominant factor in shaping user engagement. Empirically, variations in feeder service quality across routes, limited schedule synchronization, and unpredictable travel times due to congestion may weaken their perceived contribution to the overall travel experience. Theoretically, feeder services primarily enhance accessibility, whose impact on user behavior tends to be indirect through customer satisfaction. Therefore, H5 is rejected.

Conversely, parking has a positive and significant effect on customer engagement ($\beta = 0.252$; $t = 3.987$; $p = 0.000$). This finding confirms that parking facilities are an integral component of the travel experience, particularly within the park-and-ride context. Secure, available, and affordable parking increases the likelihood of repeated use and strengthens user loyalty. From a theoretical perspective, parking influences the initial decision of private vehicle users to shift to public transport, which subsequently shapes long-term engagement. Thus, H6 is supported.

Finally, customer satisfaction has a positive and significant effect on customer engagement ($\beta = 0.510$; $t = 6.511$; $p = 0.000$). This result emphasizes that satisfaction is the primary determinant of user engagement in Jakarta's MRT and LRT systems. Positive travel experiences and fulfilled service expectations foster emotional attachment, active participation, and reuse intentions. Moreover, the mediation analysis reveals that tariff, feeder, and parking affect customer engagement indirectly through customer satisfaction. This indicates that these functional attributes become influential in enhancing engagement only when they first improve satisfaction. This finding aligns with expectancy-disconfirmation theory, which posits that service attributes influence satisfaction before shaping subsequent attitudes and behavioral outcomes such as loyalty and engagement. Therefore, H7 is supported, and customer satisfaction serves as a key mediator in the proposed model.

CONCLUSION

This study provides empirical evidence that tariff, feeder services, and parking facilities significantly affect customer satisfaction in Jakarta's urban rail system, while customer engagement is primarily determined by satisfaction rather than by these service attributes

directly. The results indicate that tariff and feeder services do not exert significant direct effects on customer engagement, whereas parking facilities have a significant direct influence. Most importantly, customer satisfaction demonstrates a strong and significant effect on customer engagement and functions as a key mediating variable between service attributes and user engagement.

These findings contribute to the theoretical understanding of user behavior in urban rail transportation by confirming that functional service attributes influence engagement mainly through the formation of satisfaction. This supports expectancy–disconfirmation theory and service-dominant logic, which posit that service characteristics shape satisfaction prior to generating attitudinal and behavioral outcomes such as loyalty and engagement. Thus, customer satisfaction operates as a central mechanism that translates improvements in service attributes into sustained user involvement.

The study further highlights that supporting systems surrounding MRT and LRT operations—namely fare systems, feeder integration, and parking provision—are integral components of the overall service experience rather than peripheral elements. Improvements in these attributes without ensuring user satisfaction are unlikely to produce strong engagement effects. Consequently, an integrated perspective that combines core rail services with complementary access and pricing policies is essential for strengthening long-term user attachment to urban rail systems.

Policy Implications

Several policy implications emerge from these findings. First, fare policy should prioritize perceived fairness, affordability, and transparency rather than focusing solely on price reductions. Simplified and integrated tariff structures across transport modes can enhance perceived value and reduce cost uncertainty, which in turn strengthens customer satisfaction and indirectly promotes engagement. Transport authorities should therefore maintain stable and easily understood fare schemes as part of broader urban mobility policies.

Second, feeder service development should emphasize operational integration rather than merely physical network expansion. Synchronization between feeder schedules and train timetables, route reliability, and standardized fare systems are critical to reducing first-mile and last-mile barriers. Policies that target the quality and predictability of feeder services will be more effective in increasing satisfaction than isolated investments in fleet size or route coverage.

Third, parking facilities should be treated as a strategic instrument within urban rail policy, particularly in the context of park-and-ride systems. The significant influence of parking on both satisfaction and engagement suggests that secure, accessible, and affordable parking can facilitate modal shift from private vehicles to public transport and encourage repeated usage. Local governments and operators should therefore integrate parking provision into station-area development and intermodal transport planning.

Finally, transport policy should adopt a customer satisfaction–oriented approach in evaluating urban rail performance. Beyond operational indicators, performance assessment should incorporate user-based measures such as perceived fairness, convenience, and comfort. By positioning customer satisfaction as a primary policy objective, improvements in tariff systems, feeder integration, and parking services can be more effectively transformed into sustained customer engagement, increased ridership, and long-term system sustainability.

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