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Research Article

Engineering-Oriented Transit QoS and Perceived Value: Predicting Passenger Satisfaction and Behavioral Intentions in Urban Public Transport

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ABSTRACT

The integration of technology into education has garnered significant interest, particularly for its potential to support environmental sustainability. Urban bus and bus rapid transit (BRT) systems must deliver passenger-centered service quality that is both measurable for operators and meaningful to users. However, service-quality research often relies on generic perceptual scales that are difficult to translate into actionable operational interventions. This study advances an engineering-oriented Stimulus–Organism–Response (S–O–R) framework by conceptualizing Transit Engineering Quality of Service (TE-QoS) as an actionable stimulus and examining its relationships with perceived value, satisfaction, and behavioral intention in the context of urban bus services in Indonesia. Data were collected through an offline intercept survey of Trans Jatim passengers in the Surabaya metropolitan area between June and July 2024, yielding 300 valid responses for analysis. Using CB-SEM (AMOS), the measurement model demonstrated satisfactory reliability and validity. The structural results indicate that perceived value strongly predicts satisfaction (β = 0.698, $p < 0.001$), whereas TE-QoS exerts a positive, though comparatively modest, direct effect on satisfaction (β = 0.122, p = 0.017). Satisfaction, in turn, strongly predicts behavioral intention (β = 0.700, $p < 0.001$). The Model explains 50.2% of the variance in satisfaction and 48.9% of the variance in behavioral intention. These findings suggest that operational improvements in reliability, regularity, travel-time efficiency, access, comfort, information, and safety are more likely to strengthen loyalty-related intentions when passengers perceive them as clear gains in value. Future research should integrate objective operational data and formally examine indirect mediation pathways.

KEYWORDS bus rapid transit • transport integration • public transport accessibility • sustainable urban mobility • sustainable cities • stimulus organism response (SOR) model • travel-time efficiency

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1. INTRODUCTION

Urban public transport systems, particularly bus and bus rapid transit (BRT) services, are increasingly expected to provide reliable, time-competitive, and comfortable mobility in cities experiencing rapid growth, congestion, and intense competition from private vehicles and app-based mobility services. Sustaining ridership, therefore, depends not only on expanding service supply but also on ensuring that passengers perceive the service as sufficiently attractive to continue using it and to recommend it to others [1]–[3]. A substantial body of research has shown that the service attributes most consistently associated with attracting car users and shaping their willingness to shift modes include reliability, frequency, travel time, comfort, safety/security, and information quality [4]–[6].

Despite this broad consensus, a persistent challenge in public transport research and practice is translating the general concept of "service quality" into auditable, actionable indicators that can be improved through operational and infrastructure interventions. Many studies have relied on generalized service quality scales, such as SERVQUAL, which are useful for capturing perceptions across service industries but are less effective in identifying the specific operational levers under the control of transit agencies, such as headway adherence, dwell-time management, load factor, stop design, and information systems [7]–[11]. In the transit domain, methodological reviews have likewise emphasized the diversity of measurement approaches and the need to better align subjective evaluations with the operational realities of service provision [12]–[14]. Although prior studies on public transport satisfaction and loyalty have established robust relationships among perceived service quality, value appraisals, satisfaction, and behavioral intentions, two important limitations remain. First, service quality is often operationalized through broad, industry-generic perceptual scales, making it difficult to translate findings into specific operational and infrastructure levers that transit agencies can monitor and control. Second, although value is frequently theorized as a cognitive mechanism within the Stimulus–Organism–Response (S–O–R) chain, mediation pathways are rarely tested using engineering-oriented quality-of-service attributes grounded in transit performance frameworks, such as reliability or headway regularity, running-time efficiency, access conditions, and crowding.

To address these gaps, this study (1) operationalizes an engineering-oriented Transit Engineering Quality of Service (TE-QoS) construct aligned with established transit quality-of-service dimensions, (2) tests a theory-driven S–O–R model that explicitly evaluates perceived value as a cognitive mechanism linking TE-QoS to satisfaction, and (3) provides evidence from an Indonesian urban bus system, where empirical insights remain limited. The Transit Capacity and Quality of Service Manual (TCQSM) conceptualize quality of service through measurable dimensions such as availability/frequency, reliability, travel time, comfort/crowding, access, and facility quality, explicitly linking performance assessment to both user and operator perspectives [15]. Complementing this framework, service quality standardization efforts such as EN 13816 guide the definition, targeting, and measurement of public passenger transport service quality, with particular emphasis on objective-setting and measurement methods across key domains, including time, comfort, information, and accessibility [16], [17].

The growing availability of archived operational data has strengthened the feasibility of operationalizing engineering-defined quality of service. Guidance from the Transit Cooperative Research Program (TCRP) highlights how automatic vehicle location (AVL) and automatic passenger count (APC) systems support the systematic measurement of reliability, regularity, running time, dwell time, and passenger load, thereby enabling agencies to monitor performance and evaluate improvement strategies continuously. More broadly, TCRP guidance on performance measurement supports the development of agency-level systems that integrate both traditional and nontraditional indicators, including customer-oriented measures and broader community outcomes [18]. Importantly, the passenger experience is also shaped by stop-level environments and access conditions. Engineering guidance on bus stop location and design emphasizes that service quality is not confined to the in-vehicle experience but is also embedded in waiting and access conditions, including safety, comfort, boarding convenience, and information provision [19].

However, engineering-defined indicators alone do not fully explain why measurable improvements in service performance translate into stronger loyalty-related outcomes. A behavioral framework is therefore needed to connect external service cues with internal evaluations and downstream behavioral responses. Originating in environmental psychology, the S–O–R paradigm posits that environmental stimuli shape internal psychological states (the organism), which in turn drive behavioral responses [20], [21]. This paradigm has been widely adopted in services research. It is supported by the servicescape perspective, which holds that physical and operational service environments systematically influence users' cognitive and affective appraisals and, ultimately, their behavior [22], [23].

In public transport, service stimuli can be represented by the attributes passengers encounter throughout the journey, including waiting conditions, punctuality or headway regularity, in-vehicle travel time, crowding, cleanliness, information availability, safety/security, and the quality of stops and terminals. TCQSM and related transit engineering guidance provide a strong basis for defining these stimuli as measurable service attributes [15]. Within the S–O–R chain, such stimuli are processed into organism states, commonly conceptualized as perceived value and satisfaction. Perceived value refers to a cognitive evaluation of benefits relative to sacrifices, such as time, fare, effort, and risk. In contrast, satisfaction reflects an overall affective and cognitive evaluation of the experience relative to expectations. Foundational marketing research conceptualizes perceived value as a trade-off between benefits and sacrifices and demonstrates that price, quality cues, and contextual information shape value perceptions and choice willingness [24], [25]. Satisfaction theory likewise emphasizes expectation-based evaluations and the downstream role of satisfaction in shaping future intentions [26], [27].

In the present context, the final "response" is behavioral intention, defined as the stated likelihood of continued use, increased use, and positive word of mouth. The central role of intention as a proximal predictor of behavior is well established in the Theory of Planned Behavior (TPB) and earlier attitude–intention frameworks, both of which identify intention as the most immediate determinant of action, shaped by evaluative beliefs and attitudes [28], [29]. Services research similarly and consistently demonstrates that quality, value, and satisfaction jointly influence behavioral intentions, including through indirect pathways [30].

Evidence from transit-specific studies supports these relationships. Research in public transport has shown that perceived service quality and perceived value contribute to satisfaction and, in turn, to behavioral intentions [31]. Other studies demonstrate that intention-related outcomes in public transport may be shaped not only by reasoned evaluations but also by habit and considerations of technology acceptance, particularly in mode-switching contexts [32]. Public transport loyalty research has also moved beyond simple satisfaction models by proposing broader attitudinal constructs and decision-making frameworks for understanding loyalty to transit modes [33]. In parallel, large comparative studies confirm that satisfaction with public transport is multidimensional, encompassing factors such as system performance, comfort, staff, and safety, and that it varies across cities, thereby reinforcing the need to represent service stimuli comprehensively [34].

Importantly, the transit literature also highlights two practical issues that motivate an engineering-oriented reformulation. First, users' perceptions of bus service quality vary across user segments and information conditions, suggesting that quality should be captured through attributes that are both meaningful to passengers and traceable to operational performance [35], [36]. Second, studies comparing objective service measures with satisfaction reveal complexities such as the "quality paradox," in which objective improvements do not always translate linearly into higher satisfaction metrics. This pattern underscores the need for careful modeling of the psychological mechanisms through which performance is converted into evaluation [37], [38]. Methodological research further recommends integrating subjective and objective measures to produce a more balanced assessment of transit service quality [39], [40].

Against this background, the present study advances an engineering-oriented S–O–R formulation by reframing the upstream service-quality stimulus as Transit Engineering Quality of Service (TE-QoS), defined as a passenger-oriented evaluation of core, measurable service attributes, including reliability or headway adherence, availability or frequency, travel-time efficiency, comfort or crowding, information quality, access conditions, and the stop or terminal environment. This reframing is grounded in transit engineering frameworks such as TCQSM and EN 13816 and supported by performance measurement and data guidance from TCRP Reports 88, 113, 19, and 47. As a result, the stimulus construct becomes more actionable for agencies because it maps directly onto operational and infrastructure levers [18], [19], [41]–[43]. At the organism level, the Model retains perceived value and satisfaction as the principal cognitive and affective mechanisms through which TE-QoS is translated into a response. In the response layer, behavioral intention captures passengers' stated willingness to continue using and recommending the service, consistent with TPB and the broader loyalty literature.

Building on this integrated perspective, the present study aims to develop and empirically assess a conceptual model linking engineering-defined service performance to passenger behavioral intentions via internal evaluations. The study seeks to (i) operationalize TE-QoS as a passenger-oriented representation of measurable service attributes aligned with established transit engineering and service quality standards; (ii) examine how TE-QoS shapes passengers' perceived value and overall satisfaction with the public transport experience; (iii) assess how perceived value contributes to satisfaction as a core exchange-based evaluation of benefits and sacrifices; and (iv) evaluate how satisfaction strengthens behavioral intention in terms of continued use and positive recommendation. Through these objectives, the study is expected to provide both a clearer theoretical bridge between transit operations and passenger behavior and a practical basis for prioritizing service improvements using indicators that are directly measurable and manageable by transit agencies.

2. LITERATURE REVIEW

2.1. Stimulus–Organism–Response (S-O-R): Behavioral Framework in Public Transport

The Stimulus–Organism–Response (S–O–R) paradigm explains how external environmental cues (stimuli) shape an individual's internal psychological states (organism), which subsequently drive behavioral outcomes (responses) [20], [44]. Originally developed in environmental psychology and later widely adopted in service and consumer behavior research, the S–O–R framework is consistent with servicecape and service evaluation perspectives that link service environments and performance perceptions to cognitive and affective appraisals, and ultimately to downstream behaviors [22]. In public transport, stimuli can be operationalized as the service attributes experienced by passengers, such as reliability and punctuality, travel time, comfort and crowding, cleanliness, access and connectivity, information provision, and stop or station amenities [4]. These service cues are processed into organism states that encompass cognitive evaluations, such as perceived value (benefits relative to monetary and time costs) [45], and affective evaluations, such as satisfaction [7]. In turn, these internal evaluations predict responses in the form of behavioral intentions, including reuse, recommendation (positive word-of-mouth), and loyalty, a pattern that has been repeatedly observed in public transport contexts [31], [46]–[50]. Accordingly, the logic of the Surabaya-based manuscript, in which service quality and perceived value shape satisfaction and, ultimately, behavioral intention, is consistent with the canonical S–O–R sequence.

Building on this foundation, the present study proposes a more engineering-oriented S–O–R model by (i) reframing the broad notion of "service quality" as an engineering-defined transit Quality of Service (QoS) construct and (ii) retaining perceived value and satisfaction as the key psychological mechanisms linking operational performance to intention. Conceptually, this repositioning clarifies that the principal stimuli should be auditable and measurable operational and facility indicators, such as headway adherence or reliability, in-vehicle travel time, load factor or crowding, information availability, access conditions, and stop amenities, rather than purely perceptual labels. This approach is aligned with established transit engineering guidance, most notably the Transit Capacity and Quality of Service Manual (TCQSM), which formalizes QoS measurement from both user and operator perspectives [51], as well as with service quality standardization efforts such as EN 13816, which structures public passenger transport quality domains, including time, comfort, information, accessibility, and safety/security, and emphasizes target-setting and measurement [43], [52]. Within the S–O–R framework, these engineering QoS indicators function as stimuli that shape perceived value and satisfaction (organism), which, in turn, determine behavioral intention (response).

2.2. Transit Engineering Quality of Service (TE-QoS): From Generic Service Quality to Passenger

Research on public transport service quality frequently measures passengers' perceptions across multiple attributes, such as punctuality, cleanliness, and staff behavior [48], [53], [54]. However, from an engineering transport perspective, service quality can be more rigorously grounded in the established concepts of Transit Quality of Service (QoS) and Level of Service (LOS), in which performance is described using measurable dimensions such as availability or frequency, reliability, travel time or speed, comfort or crowding, access, and facility quality. The Transit Capacity and Quality of Service Manual (TCRP Report 165) provide a comprehensive framework for evaluating transit QoS from both passenger and operator perspectives and has become a primary reference for defining transit service performance and passenger-oriented QoS dimensions [15].

Moreover, transit agencies increasingly operationalize QoS using archived operational data, including Automatic Vehicle Location (AVL) and Automatic Passenger Count (APC) data, to quantify reliability, headway regularity, dwell times, and passenger loads. Guidance on collecting and using these data for performance improvement is provided in TCRP Report 113 [42], while broader performance measurement systems are addressed in TCRP Report 88 [18]. In addition, transit accessibility and the passenger experience are strongly influenced by stop and terminal design and placement. TCRP Report 19 offers engineering guidance on bus stop location and design, highlighting that service quality encompasses not only in-vehicle performance but also the stop-level environment [19].

Transit Engineering Quality of Service (TE-QoS) is defined here as passengers' overall evaluation of core, engineering-relevant service attributes, such as reliability, frequency or availability, travel-time efficiency, comfort or crowding, information, and the stop environment, that capture aspects of service performance that can be directly improved through operations and infrastructure interventions, including headway control, fleet allocation, stop design, and information systems. This construct can be measured through passenger surveys as perceived QoS and may also be complemented by operational indicators representing objective QoS, consistent with TCQSM principles [15], [42].

2.3. Perceived Value in Public Transport

Perceived value represents a customer's overall assessment of the utility of a service based on perceptions of what is received relative to what is given. The classic conceptualization defines value as a trade-off between perceived benefits and perceived sacrifices, such as fare, time, effort, and risk [25], [55].

In public transport, perceived value is particularly relevant because travelers compare transit with alternative modes, including private vehicles and ride-hailing services, based on a bundle of costs and benefits, including reliability and time savings. Empirical evidence from the service marketing literature shows that perceived value plays a central role in shaping satisfaction and downstream behavioral intentions when quality and satisfaction are modeled together [30], [56]. Transitfocused behavioral models likewise identify perceived value as a key cognitive mechanism linking service performance to satisfaction and intention, as demonstrated in influential public transport studies [57].

2.4. Passenger Satisfaction and Behavioral Intention (Loyalty) in Public Transport

Passenger satisfaction is typically understood as an overall evaluation of the travel experience relative to expectations. In the transit sector, satisfaction is widely used as an actionable outcome metric because it reflects the combined effect of multiple service attributes in a single appraisal that agencies can monitor and benchmark. Methodological guidance for measuring customer satisfaction and service quality in transit is documented in TCRP Report 47, which reviews customer-defined measures and practical approaches for agencies [41].

Behavioral intention refers to a traveler's stated likelihood of engaging in supportive future behaviors, such as continued use, increased frequency of use, and positive word of mouth. In behavioral theory, intention is a proximal predictor of behavior and is shaped by internal evaluations and attitudes. The Theory of Planned Behavior (TPB) formalizes the role of intention in predicting action, thereby supporting the use of behavioral intention as the response construct in service and transport studies [58], [59].

In public transport, the relationship between satisfaction and loyalty or behavioral intention has received substantial attention because agencies seek strategies to retain riders and reduce dependence on private vehicles. Empirical evidence indicates that improvements in perceived service performance and satisfaction contribute to stronger intentions to continue using and recommending transit [60]–[62]. A broad review further synthesizes that service factors, including reliability, travel time, comfort, information, and safety, consistently influence satisfaction and loyalty outcomes across contexts, thereby reinforcing the importance of focusing on engineering-relevant attributes [63].

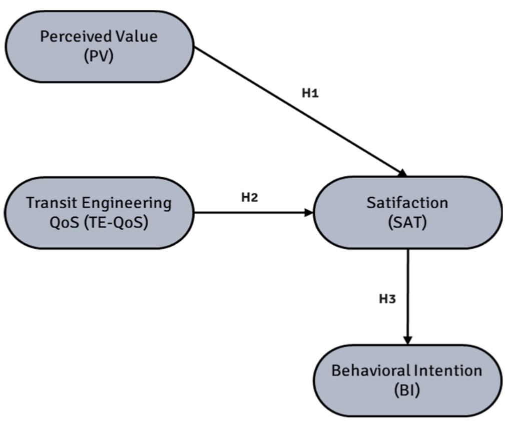

Figure 1. Conceptual S–O–R model linking TE-QoS, perceived value, satisfaction, and behavioral intention.

2.5. Development of Hypotheses

2.5.1. Perceived Value and Satisfaction

Perceived value is a central antecedent of satisfaction because it reflects whether passengers perceive the overall exchange between benefits and costs as worthwhile. The classic value model suggests that higher perceived value leads to more favorable evaluations and greater satisfaction [25]. In service research, perceived value has been shown to contribute to satisfaction when modeled alongside perceived quality [30].

Evidence from the public transport context, including studies conducted in Indonesia, also supports the view that perceived value is a determinant of satisfaction. For example, a study of public transport passengers in Jakarta identifies perceived value as a key factor influencing satisfaction [64]. Thus, when passengers perceive that transit services provide good value relative to time, fare, effort, and comfort, their satisfaction should increase.

H1: Perceived value has a positive and significant effect on satisfaction.

2.5.2. TE-QoS and Satisfaction

Transit satisfaction is strongly shaped by passengers' perceptions of service attributes and operational performance [65], [66]. From an engineering perspective, improvements in reliability, availability, travel time, and comfort should reduce negative experiences, such as lateness, long waits, and overcrowding, and thereby enhance passengers' overall evaluation of the journey. TCQSM emphasizes that passenger-oriented quality dimensions collectively determine perceived service attractiveness, which is closely associated with satisfaction outcomes [15].

Empirical transit studies further show that improvements in perceived service quality attributes increase satisfaction and strengthen transit's attractiveness across different user segments [60], [67], [68]. Accordingly, higher TE-QoS should directly increase passenger satisfaction.

H2: TE-QoS has a positive and significant effect on satisfaction.

2.5.3. Satisfaction and Behavioral Intention

Behavioral intention is commonly modeled as a response to internal evaluations of service experiences. TPB identifies intention as the immediate antecedent of behavior, and intention is strengthened by favorable attitudes and evaluations [59]. In public transport, satisfied passengers are more likely to continue using the service, use it more frequently, and recommend it to others. Empirical evidence from transit loyalty research demonstrates that satisfaction is a consistent driver of behavioral intentions [60]. In addition, loyalty frameworks that integrate satisfaction theory in the transit context identify satisfaction as a key antecedent of loyalty and intention [62], [69].

H3: Satisfaction has a positive and significant effect on behavioral intention.

3. MATERIALS AND METHODS

3.1. Research Design and Conceptual Model

This study employed a quantitative, cross-sectional survey design to examine the hypothesized relationships among latent constructs using covariance-based SEM. Cross-sectional survey designs are appropriate for testing theory-driven associations among unobservable variables measured with multiple indicators in behavioral and service research [70].

The conceptual framework is grounded in the Stimulus–Organism–Response (S–O–R) paradigm, which explains how external stimuli shape internal evaluations that, in turn, drive behavioral responses [16], [40]. In this study, Transit Engineering Quality of Service (TE-QoS) is conceptualized as the primary external service stimulus (auditable operational/performance cues). Perceived Value (PV) and Satisfaction (SAT) represent passengers' internal evaluative states (cognitive/affective appraisals), while Behavioral Intention (BI) represents the response. This positioning is consistent with service and consumer behavior research in which value appraisals and satisfaction function as proximal psychological mechanisms that help explain subsequent intention-based outcomes [21], [67].

3.2. Data Collection and Sample Size

The target population comprised passengers of Trans Jatim urban bus services operating in the metropolitan area of Surabaya City, East Java Province, Indonesia. A criterion-based purposive sampling strategy was applied to ensure that respondents had adequate service experience to evaluate the study constructs. Eligibility criteria were: (1) respondents were active Trans Jatim passengers, (2) had used Trans Jatim at least twice, and (3) were at least 20 years old and not currently enrolled as students. Data were collected through an offline intercept survey at key public transport activity points (e.g., stops/terminals and surrounding areas) during June–July 2024, with enumerator support to minimize item non-response.

A total of 332 questionnaires were obtained; after screening, 300 valid responses were retained (75% usable rate). The final sample (N = 300) is appropriate for CB-SEM (AMOS/ML), aligning with Hair et al. [71] (≈150 for simpler/well-measured models, and ≈300 recommended under more demanding measurement conditions), and with general SEM guidance treating it as a large-sample approach (often N > 200 or 5–20 × parameters) [72]–[74]. Simulation/robustness studies also show that adequacy depends on loadings, effect sizes, and data quality, supporting N = 300 for stable estimation [75]–[77] and more reliable fit evaluation [78].

3.3. Survey Procedure and Ethical Considerations

The first page of the questionnaire stated the study objectives. It informed participants that involvement was voluntary, that they could withdraw at any time, and that responses would be treated confidentially and anonymously. Informed consent was obtained prior to survey completion, and the study procedures followed widely accepted principles for ethical research involving human participants, including respect for persons and data privacy protections [79]. To minimize privacy risks, no personally identifying information was collected, and responses were used exclusively for academic purposes.

Socio-demographic information (e.g., age, gender, household location, employment status, household income, and service usage frequency) was also collected to describe the sample and to enable robustness checks (e.g., comparing model stability across key respondent profiles) consistent with standard practice in survey-based behavioral research [80], [81].

3.4. Measures and Instrument Development

All constructs were operationalized using previously validated reflective indicators from the public transport and service research literature. TE-QoS was measured using 8 items adapted from established urban bus service quality measures (capturing operational and engineering-related service attributes such as reliability, comfort, safety, and service performance). Perceived Value was measured using 3 items adopted from prior public transport value studies. Satisfaction was measured using 4 items reflecting overall evaluation of the service experience, and Behavioral Intention was measured using 4 items capturing reuse and recommendation intentions.

All items were rated on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree). To ensure contextual suitability, the questionnaire was reviewed for clarity and wording consistency with the Trans Jatim setting before field distribution.

Table 1. Measurement items and instruments

Constructs	Code	Item Statement (Questionnaire)	Sources
Transit Engineering Quality of Service	TEQ1	Trans Jatim usually arrives/departs on time (according to the schedule).	TRB TCRP 165 (2013) [18]; de Oña
	TEQ2	My waiting time for Trans Jatim is relatively short.	

Constructs	Code	Item Statement (Questionnaire)	Sources
(TE-QoS)	TEQ3	Bus arrivals are relatively regular (no long gaps followed by multiple buses).	(2020, 2021) [8], [43]
	TEQ4	Travel time on the Trans Jatim route(s) I use is efficient.	
	TEQ5	Stops and access to Trans Jatim stops are easy to reach from my activities/locations.	
	TEQ6	The crowding level on Trans Jatim is acceptable/comfortable for me.	
	TEQ7	Information about routes/schedules/service changes is clear and easy to obtain.	
	TEQ8	I feel safe and secure when using Trans Jatim (at stops and on board).	
Perceived Value (PV)	PV1	The fare I pay is worth the benefits I receive from Trans Jatim.	Lai & Chen (2011) [7]; Zeithaml (1988) [22]
	PV2	Considering time, cost, and effort, Trans Jatim provides good value.	
	PV3	Compared with other available travel options, Trans Jatim is a worthwhile choice.	
Satisfaction (SAT)	SAT1	I am satisfied with Trans Jatim services.	Wen et al. (2005) [44]; Sumaedi et al. (2016) [40]; TRB TCRP 47 (1999) [27]
	SAT2	My experience with Trans Jatim meets my expectations.	
	SAT3	Using Trans Jatim is a wise/right decision for me.	
	SAT4	I feel good about my travel experience using Trans Jatim.	
Behavioral Intention (BI)	BI1	I intend to use Trans Jatim again in the future.	de Oña (2020, 2021) [8], [43]; Lai & Chen (2011) [7]; Ajzen (2012) [29]
	BI2	I would recommend Trans Jatim to others.	
	BI3	If possible, I will choose Trans Jatim over other modes.	
	BI4	I intend to maintain or increase my frequency of using Trans Jatim.	

3.5. Data Analysis Strategy

Data analysis followed the two-step CB-SEM procedure: first, the measurement model was validated via Confirmatory Factor Analysis (CFA), and second, the structural Model was tested to estimate the hypothesized relationships [71], [84]. Prior to SEM, the dataset was screened using descriptive statistics and diagnostic checks (missing values, outliers, and distributional assumptions). All CFA and structural analyses were conducted in IBM SPSS AMOS using Maximum Likelihood (ML) estimation, consistent with common CB-SEM practice [85], [86].

Measurement quality was evaluated using standardized loadings (≥0.50; preferably ≥0.70), AVE (≥0.50), and CR (≥0.70) for convergent validity and construct reliability [87], with internal consistency assessed using Cronbach's alpha (≥0.70) and CR [88], [89]. Discriminant validity was assessed using Fornell–Larcker and complemented by HTMT (<0.90) [87], [90]. Model fit was evaluated using multiple indices (CMIN/DF, CFI, TLI, RMSEA) and judged holistically, with commonly applied cutoffs such as CFI/TLI ≥ 0.90, RMSEA ≤ 0.08 [85], [91], [92].

4. RESULTS

4.1. Characteristics of the Respondents

To contextualize the empirical findings and support the interpretation and generalizability of subsequent model testing, this section reports the demographic composition of the study sample using descriptive statistics. Profiling respondents is a common step in survey-based research because it clarifies who the data represent and helps readers assess the appropriateness of drawing inferences from the sample to the target population [93], [94]. Table 2 summarizes the demographic distribution for the 300 valid responses included in the analysis.

Table 2. Demography Respondents (n=300)

Category		Frequency	Percent (%)
Gender	Male	136	45.33
	Female	164	54.67
Age	21 – 30	72	24.00
	31 – 40	126	42.00
	41 – 50	31	10.33
	51 – 60	47	15.67
	> 61	24	8.00
Household location	Metropolitan area	202	67.33
	City center	98	32.67
Occupation status	Professional	23	7.67

Category		Frequency	Percent (%)
	Teacher/lecturer	70	23.33
	Employed	195	65.00
	Retired/Pensioner	12	4.00
Net household income* (IDR)	< Rp. 3.000.000	107	35.67
	Rp. 3.000.001 – Rp. 4.000.000	45	15.00
	Rp. 4.000.001 – Rp. 5.000.000	51	17.00
	Rp. 5.000.001 – Rp. 6.000.000	74	24.67
	> Rp. 6.000.000	23	7.67
Frequency of use (days/week)	1 – 2 times	29	9.67
	3 – 4 times	56	18.67
	5 – 7 times	105	35.00
	> 8 times	110	36.67

*Note: $1 = Rp. 16.000

The respondent profile shows a relatively balanced gender distribution (54.67% female and 45.33% male), thereby reducing the potential for gender-related bias in the model estimation. The sample is dominated by respondents of productive age (66% aged 21–40) and metropolitan residents (67.33%), reflecting the perspectives of an economically active urban population composed primarily of employees (65.00%) and educators. In financial terms, most respondents fall within the low- to middle-income category, particularly those earning below Rp. 3,000,000, a distribution important for assessing value sensitivity under budget constraints. The reliability of the data is further strengthened by the respondents' intensive usage patterns, with 71.67% using the service more than five times per week. This pattern suggests that their evaluations are based on substantial experiential familiarity rather than arbitrary responses.

4.2. Convergent Validity, Construct Reliability and Cronbach's Alpha

Convergent validity refers to the extent to which the indicators of a construct share a high proportion of common variance and, therefore, adequately represent the same underlying concept. In CFA-based assessment, convergent validity is generally supported when standardized factor loadings are sufficiently high and the average variance extracted (AVE) exceeds the recommended threshold, indicating that the construct explains more than half of the variance in its indicators. Construct reliability, commonly assessed using composite reliability (CR), reflects the internal consistency of latent construct measurement beyond that captured by Cronbach's alpha alone [86], [87].

Table 3. Measurement Model Assessment: Standardized Factor Loadings, Composite Reliability (CR), and Average Variance Extracted (AVE)

Construct	Indicators	Loading Factor (λ)	CR	AVE
Transit Engineering Quality of Service (TE-QoS)	TEQ1	0.673	0.922	0.602
	TEQ2	0.739		
	TEQ3	0.982		
	TEQ4	0.747		
	TEQ5	0.748		
	TEQ6	0.645		
	TEQ7	0.671		
	TEQ8	0.930		
Perceived Value (PV)	PV1	0.880	0.849	0.655
	PV2	0.861		
	PV3	0.671		
Satisfaction (SAT)	SAT1	0.956	0.949	0.823
	SAT2	0.916		
	SAT3	0.886		
	SAT4	0.869		
Behavioral Intention (BI)	BI1	0.678	0.841	0.570
	BI2	0.824		

Construct	Indicators	Loading Factor (λ)	CR	AVE
	BI3	0.769		
	BI4	0.741		

Table 4. Internal Consistency of Measurement Scales: Cronbach's Alpha

Constructs	Items	Loading min.	Loading max.	Cronbach alpha (α)
Transit Engineering Quality of Service (TE-QoS)	8	0.645	0.982	0.865
Perceived Value (PV)	3	0.671	0.880	0.843
Satisfaction (SAT)	4	0.869	0.956	0.898
Behavioral Intention (BI)	4	0.678	0.824	0.817

Table 5. Model Fit Indices

Fit index	Rule-of-thumb	Results	Interpretation	Sources
Chi-Square (CMIN/DF)	< 2.00	1.081	Model Fit	[99], [100]
CFI	≥ 0.90	0.987	Model Fit	[91], [101] [100]
TLI	≥ 0.90	0.955	Model Fit	[100], [102]
RMSEA (90% CI)	≤ 0.08	0.002	Model Fit	[91], [100], [103]–[105]

In addition to CR, internal consistency was evaluated using Cronbach's alpha to confirm that the items within each construct consistently capture the same underlying concept. Values of alpha above 0.70 are generally considered acceptable, while values above 0.80 typically indicate good reliability in applied research contexts [88], [96], [97].

Table 3 indicates that the measurement model demonstrates adequate convergent validity and strong construct reliability across all constructs. TEQ shows excellent reliability (CR = 0.922) and acceptable convergent validity (AVE = 0.602), despite several factor loadings falling below 0.70 (0.645–0.982), which remains acceptable when overall validity and reliability are robust [71], [85]. PV also meets the recommended thresholds, with factor loadings ranging from 0.671 to 0.880, CR = 0.849, and AVE = 0.655. SAT exhibits the strongest measurement quality (0.869 – 0.956; CR = 0.949; AVE = 0.823), indicating highly representative indicators and minimal measurement error, whereas BI likewise satisfies the recommended criteria (0.678–0.824; CR = 0.841; AVE = 0.570). All constructs exceed the conventional cutoff values for CR (> 0.70) and AVE (> 0.50), thereby confirming adequate convergent validity and construct reliability and supporting progression to structural model testing [87], [95].

Table 4 shows that all constructs exhibit good to very good internal consistency, with TEQ (α = 0.865), PV (α = 0.843), SAT (α = 0.898), and BI (α = 0.817). These coefficients reinforce the CR results and collectively indicate that the scales used in this study provide stable and consistent measurement of their respective constructs, thereby strengthening confidence in the overall quality of the measurement model.

4.3. Model Fit (Goodness of Fit)

Model fit was assessed to determine how well the hypothesized Model reproduced the observed covariance matrix and to ensure that subsequent parameter interpretations were based on an adequately fitting model (Table 5). Because the chi-square statistic is well known to be sensitive to sample size and minor model misspecification, structural equation modeling (SEM) practice recommends evaluating overall fit using a combination of absolute and incremental fit indices, including the normed chi-square (CMIN/DF), comparative fit index (CFI), Tucker-Lewis index (TLI), and root mean square error of approximation (RMSEA) [85], [91], [98].

The normed chi-square falls well within the recommended range (CMIN/DF = 1.081 < 2.00), indicating only a small discrepancy between the observed and model-implied covariance matrices. Incremental fit was also strong, with CFI = 0.987 and TLI = 0.955, both exceeding the conventional threshold of 0.90, suggesting that the proposed Model substantially improves on the independence model and effectively captures the data structure. Moreover, the RMSEA was extremely low (0.002), far below commonly accepted cutoffs (≤ 0.08 and even ≤ 0.06), indicating a very close approximate fit and negligible residual misfit. Collectively, these results confirm that the Model is adequately specified and suitable for interpreting the measurement properties and proceeding to structural hypothesis testing [106].

4.4. Structural Model (Hypothesis Testing)

Structural Model was evaluated to test the hypothesized relationships among the constructs and to assess the Model's explanatory power. In covariance-based structural equation modeling (CB-SEM), hypothesis testing is typically based on the significance of the estimated paths (e.g., critical ratios and p-values) and the magnitude of the standardized coefficients. In contrast, the Model's explanatory capacity is summarized by the proportion of variance explained (R^2) in the endogenous constructs [107].

4.5.1. Path Estimates

As shown in Table 6 and Figure 2, all hypothesized paths are statistically supported, indicating that the proposed causal structure is consistent with the observed data. Perceived Value (PV) exerts a strong positive effect on Satisfaction (SAT) (β = 0.698, C.R. = 10.440, $p < 0.001$), suggesting that respondents' satisfaction is driven primarily by their perceptions of value. TE-QoS also has a positive and significant effect on Satisfaction, although the magnitude of this effect is substantially smaller (β = 0.122, C.R. = 2.385, p = 0.017). This finding implies that improvements in TE-QoS contribute to satisfaction, but their incremental effect is modest relative to that of perceived value. Satisfaction, in turn, strongly predicts Behavioral Intention (BI) (β = 0.700, C.R. = 9.723, $p < 0.001$), confirming that more satisfied respondents are considerably more likely to exhibit favorable behavioral intentions. Overall, the coefficient pattern indicates that SAT serves as a central mechanism linking evaluative judgments—particularly perceived value—to intended behavior, consistent with SEM-based expectations in attitude-intention frameworks [86], [106].

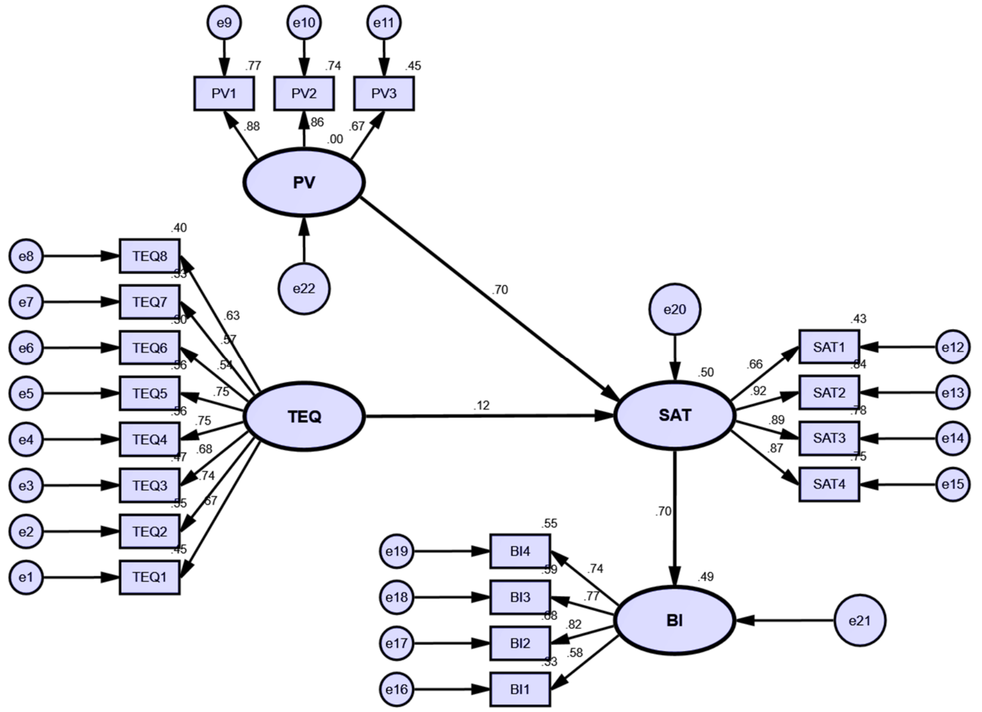

Figure 2. Standardized structural path estimates for the proposed S–O–R model (N=300). Solid lines indicate significant paths (p<.05); values are standardized coefficients (β) (Model fit: CFI=0.987, TLI=0.955, RMSEA=0.002).

Table 6. Structural Path Estimates and Hypothesis Testing Results

Hypothesis	Path	S.E.	C.R.	p	Std. β	Decision
H1	PV → SAT	0.042	10.440	<0.001	0.698	Supported
H2	TE-QoS → SAT	0.055	2.385	0.017	0.122	Supported
H3	SAT → BI	0.061	9.723	<0.001	0.700	Supported

4.5. Explained Variance (R^2)

The Model explains a substantial proportion of variance in the endogenous constructs (Table 7). Satisfaction achieved an R^2 of 0.502, indicating that PV and TE-QoS jointly account for 50.2% of the variance in satisfaction. Behavioral Intention yielded an R^2 of 0.489, implying that satisfaction alone explains 48.9% of the variance in behavioral intention. Taken together, these values indicate moderate to strong explanatory power, supporting the Model's suitability for substantive interpretation of both satisfaction formation and behavioral intention outcomes [108], [109].

Table 7. Explained Variance (Squared Multiple Correlations) for Endogenous Constructs.

Endogenous Construct	Squared Multiple Correlations (R^2)
Satisfaction (SAT)	0.502
Behavioral Intention (BI)	0.489

5. DISCUSSION

5.1. Hypothesis 1: The Effect of Perceived Value on Satisfaction

The hypothesis-testing results indicate support for H1, with the path PV → SAT being statistically significant and substantively strong (β = 0.698; $p < 0.001$). This large coefficient suggests that passenger satisfaction is shaped primarily by perceived value, namely, the judgment that the service is "worth it" based on the perceived trade-off between benefits and sacrifices. In this context, perceived value reflects an overall assessment of service utility derived from comparing what passengers receive (e.g., convenience, usefulness, and trip efficiency) with what they give up (e.g., monetary cost, time, and effort). This finding closely aligns with Zeithaml's [25] conceptualization of value as a benefits-sacrifices trade-off and with subsequent work positioning customer value as a goal-oriented evaluation of service attributes and performance [110].

From a service marketing perspective, the strong PV-SAT relationship is consistent with evidence that perceived value functions as a proximal determinant of satisfaction and often serves as a key mechanism through which service performance translates into favorable customer outcomes. Prior studies have shown that value exerts a direct influence on both satisfaction and behavioral intentions and may constitute a central component of the quality-value-loyalty (or satisfaction) chain [30], [111]. Thus, passengers may evaluate service quality not only in terms of whether it is "good" or "bad," but, more importantly, whether the overall experience justifies the resources expended.

This pattern is well documented in the public transport literature. Research on mass transit users indicates that perceived value significantly enhances satisfaction and, in turn, strengthens behavioral intentions, such as continued use and recommendations [31]. Related evidence from Indonesian public transport contexts likewise identifies perceived value, often alongside perceived sacrifice, as a salient driver of satisfaction [64], [112], [113]. Accordingly, the present finding reinforces the view that value perceptions play a particularly influential role in shaping passengers' overall evaluations of public transport services.

In the context of Trans Jatim, the magnitude of the PV effect may also be interpreted in light of the sample, which is dominated by low- to middle-income passengers and high-frequency users. For these segments, affordability constraints and repeated exposure to the service likely place value judgments at the center of evaluation. Satisfaction is therefore more likely to increase when perceived benefits clearly compensate for the sacrifices incurred. This interpretation is consistent with discussions of transport policy, which suggest that price and affordability are especially salient for lower-income travelers. In contrast, higher-income groups may assign greater weight to other service attributes [114], [115]. In practical terms, even when service quality improves, satisfaction may not rise proportionally unless passengers experience those improvements as meaningful gains in value, for example, if they reduce total perceived travel time, lessen uncertainty (e.g., waiting-time variability), or decrease the overall effort required relative to available alternatives.

Conceptually, perceived value can therefore be positioned as a primary cognitive trigger of satisfaction. Passengers synthesize multiple service experiences, such as punctuality, access, information availability, and comfort, into a consolidated value appraisal that strongly influences their final satisfaction judgment. This interpretation is also consistent with the expectancy-disconfirmation perspective, in which satisfaction emerges from evaluative comparisons between experienced performance and reference standards or expectations; under cost- and time-sensitive conditions, value for money and time become particularly dominant comparison criteria [26]. The results indicate that satisfaction with Trans Jatim is driven less by isolated assessments of individual service attributes than by an integrated judgment of whether the service is worth the time, cost, and effort invested.

5.2. Hypothesis 2: The Effect of TE-QoS on Satisfaction

The empirical results also support H2, indicating that TE-QoS → SAT is positive and statistically significant (β = 0.122; $p = 0.017$). However, the effect size is modest relative to the PV-SAT relationship reported for H1. Substantively, this suggests that improvements in engineering-oriented service quality—such as punctuality, waiting time, headway regularity, in-vehicle travel time efficiency, stop accessibility, crowding and comfort, information provision, and perceived safety—do enhance passenger satisfaction. However, their contribution is incremental once perceived value is considered. This pattern is consistent with evidence showing that operational attributes are meaningful drivers of user evaluations. However, their marginal effect on global satisfaction may diminish when more proximal evaluative constructs, such as value appraisals, are included in the Model [63], [65].

From a theoretical perspective, this finding aligns with the S-O-R framework. TE-QoS represents an external stimulus in the form of service cues and operational performance. In contrast, satisfaction reflects a downstream internal evaluation that does not necessarily respond linearly or in a one-to-one manner to objective or attribute-level changes. The S-O-R paradigm posits that environmental or service stimuli shape internal states, which in turn influence evaluative and behavioral outcomes, implying that operational improvements will not always translate proportionally into higher satisfaction unless they alter passengers' internal appraisal processes [20], [21], [116].

Empirical evidence from the transit literature consistently shows that reliability-related and operational attributes—such as travel time, frequency, headway regularity, crowding, and their variability—are associated with passenger satisfaction. Studies using objective and operational indicators demonstrate that experienced speed, frequency, crowding, and reliability, particularly their variability, can significantly shape satisfaction evaluations. At the same time, the literature also highlights nonlinearities in how passengers translate operational conditions into satisfaction, especially under irregular service conditions, where headway variability can cascade into longer or more uncertain waiting times and uneven crowding.

One key explanation for the relatively small direct coefficient is the well-documented "quality paradox" in public transport. Objective or supply-side performance improvements do not always generate commensurate increases in reported satisfaction because satisfaction is filtered through expectations, reference comparisons, and travelers' interpretations of what constitutes "normal" service. In other words, passengers may cognitively code operational improvements as mere compliance with a minimum standard rather than as gains that warrant higher satisfaction ratings, particularly when habitual exposure or comparisons with alternative modes already shape baseline expectations. Evidence from multi-city analyses shows that the relationship between objective performance measures and subjective satisfaction can be weak or inconsistent, underscoring this paradox [37], [117].

Relatedly, the TE-QoS-SAT relationship may exhibit threshold and diminishing-returns effects. Improvements may matter most when they move service from "unacceptable" to "acceptable," whereas further enhancements beyond an acceptability threshold may yield smaller marginal increases in overall satisfaction. Recent methodological work in public transport perception research indicates that several service attributes influence overall evaluations in a nonlinear manner, challenging the common assumption of strictly linear quality-outcome relationships [49], [62], [118]. This provides a plausible behavioral explanation for why TE-QoS remains significant yet comparatively small in a model that simultaneously includes value perceptions.

A second highly plausible mechanism is an indirect pathway through perceived value. In many service settings, service quality affects satisfaction partly by altering customers' value appraisals; once PV is included in the Model, the remaining direct effect of service quality on satisfaction often diminishes [30], [56]. This logic also holds in public transport contexts, where service quality and perceived sacrifice contribute to perceived value, which in turn shapes satisfaction and downstream intentions [31]. In the present context, passengers may interpret TE-QoS improvements—such as shorter waiting times, more regular headways, and better information that reduces uncertainty—as reductions in time and effort costs, thereby increasing value for money and time. It is this value appraisal that may most directly elevate satisfaction. Accordingly, if an indirect pathway through PV exists, the direct TE-QoS → SAT coefficient may appear smaller once PV is modeled concurrently; future studies should test this mechanism formally.

Third, the modest direct effect is consistent with the salience of sacrifice-oriented evaluations in bus-based urban and regional mobility. Public transport passengers often assess their journey through the lens of resources lost such as waiting time, walking or access time, uncertainty, and effort rather than solely through attribute-level quality impressions. Meta-analytic evidence on public transport valuations shows that out-of-vehicle components, such as waiting and walking time, are typically valued more negatively than in-vehicle time, implying that service changes that do not clearly reduce these perceived sacrifices may produce only limited gains in overall satisfaction [119]. Consequently, TE-QoS improvements are most likely to enhance satisfaction when users experience them as tangible reductions in sacrifice—time, uncertainty, and effort—or as clear increases in perceived worthwhileness, thereby reinforcing the dominance of PV in the satisfaction formation process.

The results indicate that TE-QoS remains a necessary operational foundation and a controllable stimulus for operators; however, its effect on satisfaction is likely to be more indirect and contingent on whether operational gains are (i) salient to passengers, (ii) large enough to cross meaningful thresholds, and (iii) translated into an explicit enhancement of perceived value. This interpretation is consistent with critical reviews showing that, although punctuality, frequency, comfort and cleanliness, safety, and information are strongly associated with satisfaction, passengers' broader evaluations and continued support for public transport are often closely tied to value-for-money and value-for-time considerations [63], [120].

5.3. Hypothesis 3: The Effect of Satisfaction on Behavioral Intention

The structural results support H3, indicating that satisfaction (SAT) exerts a very strong and statistically significant effect on behavioral intention (BI) ($\beta = 0.700$; $p < 0.001$). This magnitude suggests that satisfaction is the primary psychological driver of favorable post-consumption responses in the Trans Jatim context. More satisfied passengers are substantially more likely to reuse the service, increase their frequency of use, and recommend it to others—behaviors typically conceptualized as core components of loyalty and advocacy in service settings [121], [122].

From a theoretical standpoint, this result is consistent with the S-O-R framework, in which satisfaction functions as an internal evaluative state (organism) that translates prior service experiences into approach-oriented responses, such as reuse and positive word of mouth [20], [123]. This interpretation is also compatible with the Theory of Planned Behavior (TPB), which posits that behavioral intention is proximally shaped by evaluative components, such as attitudes toward the behavior, alongside social influence and perceived control. In this sense, satisfaction may be understood as a cumulative, experience-based evaluative judgment that strengthens the propensity to act—that is, the intention to continue using and recommending transit [59].

Empirically, the strong SAT → BI relationship is highly consistent with prior evidence in public transport research, which shows that satisfaction is among the most robust predictors of continued use and recommendation intentions. For example, structural models in transit contexts report that satisfaction meaningfully explains passengers' behavioral intentions and loyalty-related outcomes, often outperforming more distal attribute perceptions when modeled simultaneously [60], [67]. Likewise, synthesis studies on public transport satisfaction and loyalty conclude that satisfaction plays a central role in retention and advocacy, reinforcing its strategic importance for ridership sustainability [63]. Complementary evidence from broader loyalty modeling in public transport also supports satisfaction as a key antecedent of loyalty constructs, including reuse and recommendation, often in interaction with confirmation and expectation mechanisms [62], [124].

Beyond the transport domain, this finding is also consistent with the broader service and satisfaction literature, which shows that satisfaction systematically increases repurchase intentions, retention, and advocacy, although the strength of this relationship may vary according to competitive conditions and baseline satisfaction levels [125]-[127]. Thus, the present result reinforces the role of satisfaction as a decisive lever for behavioral outcomes, particularly in publicly provided mobility services, where sustained ridership depends on repeat patronage and organic diffusion through recommendations.

Substantively, this finding yields a clear managerial implication for Trans Jatim: if the policy objective is retention and ridership growth, then elevating satisfaction is likely to be the most effective route to strengthening behavioral intention. Because BI captures both continued use (habit reinforcement) and recommendation (social diffusion), improvements in satisfaction may generate compounding returns through higher repeat demand and positive word-of-mouth—two mechanisms emphasized in both transit loyalty research and the broader behavioral intentions literature [60], [67].

5.4. Implicit Mediation and the S-O-R Model

When the three supported hypotheses are interpreted jointly, the observed coefficient pattern is consistent with a coherent S-O-R process. In the proposed Model, TE-QoS represents the upstream stimulus: operator-controllable and auditable service conditions such as reliability, headway regularity, travel time efficiency, crowding and comfort, information provision, accessibility, and safety. These service cues are subsequently processed through internal evaluative states (organism), in which perceived value (PV) captures a cognitive "worth-it" appraisal rooted in benefits-sacrifices trade-offs [25], [110], whereas satisfaction (SAT) reflects a cumulative, global affective-cognitive evaluation [26]. Finally, SAT functions as the proximal driver of behavioral intention (BI), including intentions to reuse, increase usage frequency, and recommend the service, which is conceptually compatible with intention-based behavioral theories such as the TPB [28].

Crucially, the combination of a very large PV → SAT effect and a smaller but significant TE-QoS → SAT effect suggests the possibility of implicit partial mediation. Specifically, improvements in engineering-oriented service performance may contribute to satisfaction primarily as far as passengers interpret those improvements as tangible gains in value for example, reduced perceived total travel time, lower uncertainty, and less effort rather than as isolated attribute enhancements. This interpretation is consistent with services research showing that value often operates as a proximal mechanism through which service performance and quality perceptions are translated into satisfaction and downstream behavioral outcomes, with direct quality-to-outcome effects often attenuating when value-based appraisals are modeled concurrently [30].

The plausibility of this mechanism is reinforced by evidence from public transport research emphasizing that (i) the relationship between objective or operational performance and reported satisfaction is often imperfect, reflecting a "quality paradox," and (ii) loyalty-related outcomes are more tightly coupled with evaluative constructs such as satisfaction and perceived value than with operational indicators alone. Friman and Fellesson's [37] cross-city analysis demonstrates that correlations between objective service performance and perceived satisfaction are far from perfect, underscoring the role of expectations and perceptual filters in satisfaction formation. In parallel, transit loyalty studies and review articles consistently position satisfaction as a central antecedent of continued use and recommendations, while also noting the close connection between perceived value for time and money and loyalty-related outcomes.

From a managerial perspective, these results imply that operational improvements in TE-QoS should be designed and communicated in ways that allow passengers to experience them as concrete value gains—for example, by reducing waiting-time variability through more regular headways, improving real-time information to reduce uncertainty, and easing access and transfer effort. This interpretation is consistent with evidence showing that satisfaction and loyalty in public transport are shaped not only by service attributes themselves but also by passengers' value perceptions and by intention-based definitions of loyalty, such as continued use and willingness to recommend the service.

Methodologically, the observed coefficient configuration motivates a follow-up formal mediation analysis, such as bootstrapped estimation of indirect effects, to determine whether TE-QoS influences satisfaction primarily through PV (TE-QoS → PV → SAT) and whether a serial pathway to BI (TE-QoS → PV → SAT → BI) provides a better explanatory account. Bootstrapping-based approaches are widely recommended for assessing indirect effects, especially in models involving multiple mediators.

5.5. Implications, Limitations and Future Work

This study advances understanding of public transport behavior by integrating engineering-oriented service quality (TE-QoS) into an S-O-R-based model and demonstrating that operational performance translates into intention-based loyalty primarily through passengers' internal evaluations. The findings imply that operators should not only improve service operations but also ensure that such improvements are experienced as clear gains in value, particularly through interventions that reduce perceived sacrifice, such as unreliable service, irregular headways, long or uncertain waiting times, inefficient travel times, and high effort associated with access and transfers. In practice, this requires aligning operational control with customer experience outcomes while recognizing satisfaction as the most strategic performance target because it most directly drives behavioral intention.

Several limitations should be acknowledged. First, the cross-sectional design restricts causal inference. Second, the operational quality construct is measured perceptually and therefore may not fully capture objective service conditions. Third, the findings are specific to a single system, which limits their generalizability. Future research should integrate perceptual data with objective operational measures, formally test indirect pathways (operational quality → value → satisfaction), examine heterogeneity across user segments, and adopt longitudinal or intervention-based designs to capture how perceptions and satisfaction evolve following service changes.

6. CONCLUSION

This study examined how engineering-oriented service performance influences passenger evaluations and intention-based loyalty in an urban bus context. Drawing on the Stimulus–Organism–Response (S–O–R) framework, Transit Engineering Quality of Service (TE-QoS) was conceptualized as an operator-controllable stimulus, while perceived value and satisfaction were modeled as internal evaluations that shape behavioral intention. Based on intercept survey data from Trans Jatim passengers in the Surabaya metropolitan area and analyzed using covariance-based structural equation modeling, the results show that perceived value is the strongest predictor of satisfaction. TE-QoS also positively affects satisfaction, though its direct effect is comparatively weaker once value appraisals are considered. These findings indicate that operational improvements are most effective when passengers perceive them as meaningful value gains.

Satisfaction, in turn, emerged as a strong predictor of intention-based loyalty, including intentions to continue using and recommending the service. In practice, transit agencies should prioritize improvements in reliability, headway regularity, travel-time efficiency, accessibility, comfort, information, and safety, while ensuring that these improvements reduce perceived sacrifice and are communicated clearly to passengers. The study is limited by its cross-sectional design, reliance on perceptual measures of TE-QoS, and single-system focus. Future research should incorporate objective operational indicators, formally test indirect effects, and examine variation across user groups and routes using multi-group or longitudinal designs.

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CONFLICTS OF INTEREST

The authors declare that no conflicts of interest are associated with this study. All aspects of the research were conducted with the utmost integrity and transparency.

DATA AVAILABILITY

The datasets utilized and analyzed during this research are available from the corresponding author upon reasonable request.

ETHICAL STATEMENTS

The authors confirm that the study complied with all applicable local laws, ethical standards, and institutional guidelines, including obtaining approval from relevant ethics committees.

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