

Schedule Reliability as the Decisive Factor in BRT Ridership: A Multi-Criteria Prioritization Using CSI-IPA-PGCV in Batam City

Aulia Agung Dermawan

Engineering Management Department, Faculty of Engineering and Technology, Institut Teknologi Batam, Indonesia | Faculty of Engineering Technology, Universiti Tun Hussein Onn Malaysia, Pagoh Higher Education Hub, Pagoh 84600, Malaysia
agung@iteba.ac.id

Hery Sunarsono

Engineering Management Department, Faculty of Engineering and Technology, Institut Teknologi Batam, Indonesia
hery@iteba.ac.id (corresponding author)

Jorvick Steve

Engineering Management Department, Faculty of Engineering and Technology, Institut Teknologi Batam, Indonesia
2112025@student.iteba.ac.id

Received: 22 February 2026 | Revised: 15 March 2026, 28 March 2026, and 20 April 2026 | Accepted: 30 April 2026

Licensed under a CC-BY 4.0 license | Copyright (c) by the authors | DOI: <https://doi.org/10.48084/etasr.18320>

ABSTRACT

The Bus Rapid Transit (BRT) system in Batam City is underused due to persistent service quality failures, including unreliable schedules, inadequate infrastructure, and passenger discomfort. This study evaluates user satisfaction and proposes improvement priorities using an integrated framework of the Customer Satisfaction Index (CSI), Importance-Performance Analysis (IPA), and Potential Gain in Customer Value (PGCV). Data from 101 passengers revealed a CSI score of 52.45%, indicating moderate satisfaction, while IPA identified five important deficiencies: cleanliness, station accessibility, number of stops, interior comfort, and punctuality. Schedule unreliability ("waiting time not matching schedule") yields the highest PGCV score (12.14) and is the decisive factor for intervention. This study provides a replicable decision-support framework that goes beyond diagnosis to prioritized action, offering empirical evidence for BRT systems in developing cities.

Keywords-trans bus Batam; service quality; customer satisfaction index; importance performance analysis; potential gain in customer value

I. INTRODUCTION

Batam City experiences significant population growth coupled with a rapid increase in private vehicle ownership [1, 2]. This has led to traffic congestion and a decline in air quality [3-5]. Many Indonesians rely on private cars and motorbikes as their primary means of transportation, which is becoming unmanageable, and major Indonesian towns, including Makassar, are experiencing traffic congestion as a result [6]. Public transportation is a crucial solution, reducing reliance on private cars and improving urban mobility overall [7, 8]. Despite its strategic importance, the Bus Rapid Transit (BRT) system faces service quality issues that undermine user satisfaction [9, 10], including unreliable schedules, inadequate infrastructure, and discomfort [11]. Authors in [7, 12]

confirmed that mode choice is influenced by service quality, infrastructure, and connectivity, preventing people from switching from private to public transportation [12, 13]. Given the urgency of advancing environmental sustainability and mobility efficiency, both nationally and globally, systematic evaluation of public transportation services has become significant. This study uses three analytical tools: the Customer Satisfaction Index (CSI), Importance-Performance Analysis (IPA), and Potential Gain in Customer Value (PGCV). These methods offer a thorough approach to identifying service gaps and developing actionable strategies to improve service quality and encourage greater use of public transportation in Batam City.

A. Urban Transportation, Sustainability, and the Role of Bus Rapid Transit

Authors in [14] revealed that rapid urbanization can intensify traffic congestion, air pollution, and inequitable access to mobility in developing regions like Indonesia. Public transportation systems can reduce dependency on private vehicles, lower carbon emissions, and improve social equity [15, 16]. BRT systems are a cost-effective mass transit solution due to their dedicated lanes, pre-board fare collection, and platform-level boarding [17, 18]. However, their ultimate impact depends not only on physical infrastructure, but also on providing sustained service quality that meets user expectations.

B. Context and Challenges

Trans Bus Batam is the city's primary BRT system, including nine routes with a fleet of around 65 buses. Despite its strategic role, the system contends with operational constraints common to many Indonesian BRT systems, including an aging fleet, limited coverage, and infrastructural deficits at stations [19], affecting core service quality, including reliability, comfort, and accessibility.

C. Service Quality and Customer Satisfaction in Public Transport

Service quality is a multidimensional construct defined by the difference between customer expectations and perceived performance. In public transportation, generic models such as SERVQUAL (tangibles, reliability, responsiveness, assurance, and empathy) are often adapted to domain-specific attributes. Authors in [20-23] determined key parameters of transit satisfaction, such as punctuality/reliability, travel time, comfort, safety, cleanliness, and information availability. For BRT systems, the promise of "rapid" transit makes schedule adherence and predictability of waiting times particularly significant; failures in these areas erode the system's core value proposition [24]. Customer satisfaction, the outcome of perceived service quality, is a key driver of loyalty and intention to repurchase—or, in the context of public transit, to switch from using private vehicles to regularly using the service [25, 26].

D. Analytical Framework

This study uses an integrated, three-part framework to provide a thorough diagnosis:

- The CSI provides a quantitative, summative measure of overall satisfaction. It aggregates performance scores, which are weighted by the importance of each attribute. This yields a single percentage metric that allows for benchmarking and tracking over time [27]. A CSI score offers a macro-level view of system health.
- The IPA [28] is a diagnostic tool that plots service attributes on a two-dimensional grid based on their perceived importance and performance. The resulting matrix identifies strategic priorities. The "concentrate here" quadrant (high importance, low performance) highlights critical deficiencies that require immediate managerial intervention. IPA transforms satisfaction data into actionable visual insights for resource allocation.

- The PGCV model improves prioritization by quantifying the potential improvement in overall customer value for each attribute, calculating the weighted difference between the desired and current performance levels [29]. Attributes with the highest PGCV scores represent investments that are likely to yield the greatest marginal increase in overall user satisfaction and perceived value. This offers a data-driven rationale for sequencing improvements.

Authors in [30, 31] showed that the Bekasi–Manggarai commuter line reported a CSI of 76.11%, stating that passengers dropped from the "very satisfied" to the "satisfied" category (0.66–0.80). Authors in [32] interpreted values in the 0.60–0.80 range as "satisfied" and ≥ 0.81 as "very satisfied." In contrast, authors in [33-35] showed that CSI values around 51–65% are typically labeled "quite satisfied" or "fairly satisfied," which is closer to what many would call "moderate." Although authors in [36] effectively identified service attributes in need of improvement, they failed to provide a clear action plan. PGCV addresses this issue by quantifying the potential value gained from each improvement. However, its integration with CSI and IPA in public transportation research is limited.

II. METHODOLOGY

A. Research Approach

This study uses a quantitative research methodology that incorporates descriptive statistics and gap analysis tools, aiming to identify key performance gaps and provide actionable recommendations for improving Trans Bus Batam services.

B. Population and Sampling

A total of 101 Trans Bus Batam users were purposely sampled at the Tiban bus stop. The sample size was determined using the Lemeshow formula [37]. Tiban was selected because it is a major transit hub with a high passenger volume that serves multiple corridors. Data were collected at different times (morning, afternoon, and evening) across weekdays. Respondents were 17 years of age or older and had used the service at least three times in the past month. The research instrument was a questionnaire consisting of two main components: performance level and importance level. Each component comprised nine questions, which were developed based on the Voice of the Customer (VoC) and adapted from the SERVQUAL dimensions [20-23]. These questions were designed to capture respondents' perceptions of Trans Bus Batam services and were answered using a 5-point Likert scale (1 = very dissatisfied/unimportant, 5 = very satisfied/important), as shown in Table I.

C. Data Collection

Direct observations at the Tiban bus stop during peak and off-peak hours recorded actual waiting times, bus arrivals, and passenger crowding. These observations validated self-reported perceptions and provided context for interpreting IPA and PGCV results, particularly those related to schedule reliability.

D. Data Analysis Techniques

1) Validity and Reliability Tests

Content validity was established through expert review. The reliability of the importance and performance scales was measured using Cronbach's Alpha and yielded scores of 0.87 and 0.83, respectively, indicating good internal consistency.

TABLE I. QUESTIONNAIRE DESIGN

No.	Performance level (X)	Importance level (Y)
1	Are you satisfied with the cleanliness of the waiting area at the Trans Bus Batam bus stop?	Is the cleanliness of the waiting area at the Trans Bus Batam bus stop important to you?
2	Are you satisfied with the current location of the bus stop?	Is having a bus stop close to your residence important to you?
3	Are you satisfied without an estimated bus arrival time display?	Is an estimated bus arrival time display important to you?
4	Are you satisfied with the current number of Trans Bus Batam bus stops?	Is increasing the number of bus stops important?
5	Are you satisfied with the current bus route?	Are dedicated lanes for Trans Bus Batam important for speeding up the delivery process?
6	Are you satisfied with the current passenger space inside the Trans Bus Batam fleet?	Is increasing the passenger space inside the Trans Bus Batam fleet important?
7	Are you satisfied with the current availability of staff at the bus stop?	Is having field staff always present at the bus stop important to you?
8	Are you satisfied with the current bus card purchase system?	Is it important to you if the Trans Bus Batam bus stop provides bus card purchases?
9	Are you satisfied with the bus waiting time?	Is having the bus arrive on schedule (according to the timetable) important to you?

E. Mathematical Formulation

The CSI is calculated using:

$$CSI = \frac{T}{5Y} \times 100\% \tag{1}$$

The IPA is calculated using:

1) Conformity Level

$$Performance\ Level\ (Xi) = \sum Xi \tag{2}$$

$$Importance\ Level\ (Yi) = \sum Yi \tag{3}$$

$$Conformity\ Level\ (Tki) = \frac{Xi}{Yi} \times 100\% \tag{4}$$

2) Total Conformity Level

$$Tki\ Total = \frac{\sum Xi}{\sum Yi} \times 100\% \tag{5}$$

3) Grand Mean (Central Point) of Importance and Performance

$$Xi\ mean = \frac{\sum \bar{X}}{\sum m} \tag{6}$$

$$Yi\ mean = \frac{\sum \bar{Y}}{\sum m} \tag{7}$$

4) Mean Importance and Performance for Each Attribute

$$\bar{I} = \frac{\sum I}{n} \tag{8}$$

$$\bar{P} = \frac{\sum P}{n} \tag{9}$$

5) Potential Gain in Customer Value Formulas

a) Actual Customer Value (ACV)

$$ACV_i = P_i \times \bar{I}_i \tag{10}$$

b) Utmost Desired Customer Value (UDCV)

$$UDCV_i = S_{max} \times \bar{I}_i \tag{11}$$

c) Potential Gain in Customer Value (PGCV)

$$PGCV_i = UDCV_i - ACV_i \tag{12}$$

III. FINDINGS AND DISCUSSION

A. Customer Satisfaction Index Results

The overall CSI score was 52.45%. According to Table II, this score falls within the "Satisfied Enough" category, indicating a significant gap between user expectations and actual service performance.

TABLE II. CSI CRITERIA

No	Index value	Criteria
1	81%-100%	Very satisfied
2	66%-80.99%	Satisfied
3	51%-65.99%	Satisfied enough
4	35%-50.99%	Less satisfied
5	0%-34.99%	Not satisfied

B. Importance-Performance Analysis Results

Table III presents the results of the IPA calculation.

TABLE III. IPA CALCULATION RESULTS

No	Performance score (X)	Importance Score (Y)	Mean performance (\bar{X})	Mean importance (\bar{Y})	Performance index (Tki %)
1	260	444	2.57	4.40	58.56
2	242	444	2.40	4.40	54.50
3	269	338	2.66	3.35	79.59
4	260	406	2.57	4.02	64.04
5	313	359	3.10	3.55	87.19
6	222	417	2.20	4.13	53.24
7	315	377	3.12	3.73	83.55
8	288	375	2.85	3.71	76.80
9	234	458	2.32	4.53	51.09

The Table/ Table III depicts the aggregate scores, means, and performance indices for each of the nine service attributes. Figure 1 shows the IPA matrix, which displays the relationship between importance (Y) and performance (X) for the nine service attributes. The grand means of performance and importance serve as the crosshairs, dividing the matrix into four quadrants. These attributes significantly impact satisfaction; yet, they are underperforming, which justifies targeted interventions.

C. Service Attribute Improvement Priority Determination

Service attribute improvement priorities are determined based on the combined results of the IPA and PGCV analyses. The findings, which combine quantitative assessments of both analyses, are outlined in Table IV.

D. Potential Gain in Customer Value Results

As presented in Table V, the PGCV calculation ranks service attributes based on their potential to enhance overall customer value when performance improves. "Bus waiting time not matching the schedule" (attribute 9) yielded the highest

PGCV score (12.14), making it the top priority for service improvement. Next are "Cramped passenger space inside the bus fleet" (attribute 6) and "Accessibility of bus stop (proximity to residence)" (attribute 2).

E. Synthesis of Findings and Theoretical Implications

The CSI score of 52.45% aligns with the 58.7% CSI reported in [38] for Trans Padang bus services, suggesting that achieving moderate user satisfaction is a common challenge for Indonesian BRT systems.

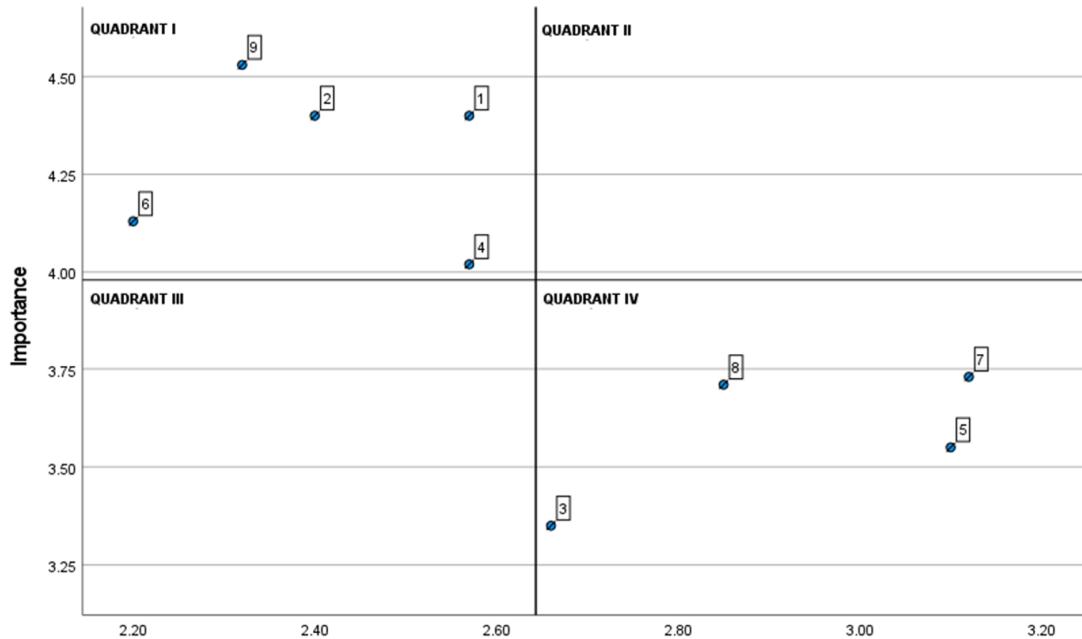


Fig. 1. Matrix IPA results: punctuality of bus arrival (9), comfort of bus interiors (6), accessibility to bus stops (2), cleanliness of bus stops (1), number of stops available (4).

TABLE IV. IMPROVEMENT PRIORITY RANKING BASED ON IPA AND PGCV RESULTS

No .	Attribute description	Performance index (Tki %)	PGCV index	Priority rank
1	Waiting area cleanliness	58.56	10.68	4
2	Accessibility of bus stop (proximity to residence)	54.50	11.47	3
3	Absence of estimated bus arrival time display	79.59	7.84	7
4	Insufficient number of bus stops	64.04	9.75	5
5	Lack of dedicated lanes for Trans Bus Batam	87.19	6.73	9
6	Cramped passenger space inside the bus fleet	53.24	11.58	2
7	Availability of field officers at the bus stop	83.55	7.01	8
8	Availability of bus card purchase at the bus stop	76.80	7.96	6
9	Bus waiting time not matching the schedule	51.09	12.14	1

Similarly, authors in [39] found CSI scores ranging from 55 to 60% for Trans Jogja, which supports the idea that BRT systems in developing cities often do not meet passenger expectations. Second, identifying schedule reliability as the most important attribute corroborates international BRT research. Authors in [24] found that punctuality was the most important factor influencing ridership in Dar es Salaam's BRT system. Meanwhile, authors in [40] reported that successful BRT systems in Latin America, such as Bogotá's TransMilenio and Curitiba's system, are distinguished by rigorous schedule adherence rather than superior infrastructure alone. This cross-cultural consistency underscores that reliability is a universal core value proposition of BRT systems. Third, the multiple high-importance, low-performance attributes identified through IPA (cleanliness, accessibility, and comfort) mirror the findings of other studies in Indonesia. Authors in [20] reported similar concerns regarding public transportation in Tangerang, and authors in [7] found that comfort and accessibility were the main complaints about local transportation in Batam. However, this study's PGCV analysis adds a significant perspective by revealing that not all low-performance attributes are equal. Authors in [41, 42] showed that schedule unreliability

generates the highest potential value gain. Utility theory explains the primacy of schedule reliability, where users maximize benefits from attributes such as travel time and reliability. Unreliable waiting times widen the utility gap between BRT and private vehicles [43]. Furthermore, motorcycles dominate Indonesian transportation due to their flexibility and convenience, creating entrenched habits. The Theory of Planned Behavior suggests that, without reliable schedules, users lack the perceived behavioral control necessary to switch from private vehicles to BRT. Fourth, the

usage of all three methods (CSI-IPA-PGCV) shows that PGCV can effectively solve the "multiple priorities" problem in ground transportation, where resource constraints are more severe than in aviation. Finally, the physical infrastructure improvements (e.g., clean bus stops, comfortable interiors) exhibit lower potential value gains than operational improvements (e.g., reliable schedules), challenging the common policy tendency in Indonesian cities to prioritize visible infrastructure over service management.

TABLE V. PGCV CALCULATION

No attributes	Performance mean (\bar{X})	Importance mean (\bar{Y})	ACV index	\bar{P}_{max}	UDCV index	PGCV index	Priority
1	2.57	4.4	11.31	5	22	10.68	4
2	2.4	4.4	10.53	5	22	11.47	3
3	2.66	3.35	8.91	5	16.75	7.84	8
4	2.57	4.02	10.34	5	20.1	9.75	5
5	3.1	3.55	11.01	5	17.75	6.73	6
6	2.2	4.13	9.07	5	20.65	11.58	2
7	3.12	3.73	11.64	5	18.65	7.01	9
8	2.85	3.71	10.58	5	18.55	7.96	7
9	2.32	4.53	10.50	5	22.65	12.14	1

F. Managerial and Policy Implications for Sustainable Mobility

The findings offer an important insight for policymakers. Investing in high-tech solutions or aesthetic upgrades before addressing basic reliability issues may result in low ridership returns. For Trans Bus Batam, the highest-priority investment must be in systems that improve schedule adherence, such as bus lane enforcement, real-time dispatch systems, and driver performance incentives. This study provides a quantifiable business case for such investments using the PGCV metric. Furthermore, the study proposes a "service-first" approach to BRT development in mid-sized cities rather than an "infrastructure-only" approach, where budgets are limited, and efficiency gains are essential.

G. Contextualization and Comparative Analysis

The prevalence of punctuality as a significant issue is consistent with findings from other Indonesian BRT systems [43], pointing to a systemic operational challenge that extends beyond Batam. However, when compared to successful BRT systems in Latin America, robust operational management is often the key differentiator rather than superior physical infrastructure [40]. Thus, for Batam and similar cities, the strategic imperative shifts from building more to managing better, with a clear, data-driven focus on reliability.

IV. CONCLUSIONS

This study used an integrated Customer Satisfaction Index (CSI), Importance-Performance Analysis (IPA), and Potential Gain in Customer Value (PGCV) framework to diagnose and prioritize service improvements for Trans Bus Batam, concluding that: CSI valued 52.45% (moderately satisfied), which confirms a significant service quality gap, the IPA identified five critical deficiencies: cleanliness (58.56%), stop accessibility (54.50%), number of stops (64.04%), interior comfort (53.24%), and punctuality (51.09%), PGCV ranks "waiting time not matching the schedule" as the top priority

(12.14), followed by comfort (11.58), accessibility (11.47), and cleanliness (10.68). Schedule reliability is the decisive factor for BRT ridership; operational improvements yield greater customer value than infrastructure investments. This research demonstrates that integrating CSI, IPA, and PGCV transforms the evaluation of service quality from diagnosis to strategic prioritization, solving the "multiple priorities" problem faced by transport operators with limited resources. For Trans Bus Batam, the priority is to establish dedicated bus lanes, implement real-time dispatch systems, and align driver incentives with punctuality targets before investing in aesthetic upgrades. Future research should expand geographically across multiple corridors and transfer hubs, integrate objective data to correlate perceived unreliability with actual schedule deviations, perform analysis via interviews with management, dispatchers, and drivers, and create a digital feedback system.

DECLARATION OF COMPETING INTERESTS

The authors declare no competing interests.

ACKNOWLEDGMENT

This research received no external funding.

DATA AVAILABILITY

Data are available from the corresponding author upon reasonable request.

REFERENCES

- [1] R. Ruslan, S. Sugiarto, R. Anggraini, and S. M. Saleh, "Forecasting private vehicle ownership and its effect on public transportation planning in Banda Aceh, Indonesia," *IOP Conference Series: Materials Science and Engineering*, vol. 917, no. 1, 2020, Art. no. 012040, <https://doi.org/10.1088/1757-899X/917/1/012040>.
- [2] Y. Gao and Z. Jiaying, "Characteristics, impacts and trends of urban transportation," *Encyclopedia*, vol. 2, no. 2, pp. 1168–1182, 2022, <https://doi.org/10.3390/encyclopedia2020078>.
- [3] V. Vendhy, A. I. Rifai, and M. Isradi, "The analysis of road performance on Jalan Gajah Mada Batam, Indonesia," *Indonesian Journal of*

- Multidisciplinary Science*, vol. 1, no. 1, pp. 49–58, 2022, <https://doi.org/10.55324/ijoms.v1i1.322>.
- [4] T. Afrin and N. Yodo, "A survey of road traffic congestion measures towards a sustainable and resilient transportation system," *Sustainability*, vol. 12, no. 11, 2020, Art. no. 4660, <https://doi.org/10.3390/su12114660>.
- [5] W. Huang, X. Huang, Y. Zhang, and H. Zhu, "A hybrid SSA-VMD-GRU model for real-time traffic-related air quality index prediction: Development and validation," *Sustainability*, vol. 17, no. 24, 2025, Art. no. 11233, <https://doi.org/10.3390/su172411233>.
- [6] M. I. Sabil, M. I. Ramli, S. A. Adisasmita, and M. Hustim, "A Study on the Determinants of the Transport Mode Choice of the Civil Servants in the Makassar Metropolitan Area," *Engineering, Technology & Applied Science Research*, vol. 15, no. 6, pp. 30395–30404, Dec. 2025, <https://doi.org/10.48084/etasr.12253>.
- [7] J. Victory, A. I. Rifai, and S. Handayani, "The satisfaction analysis of local public transportation (Carry) services at Batam, Indonesia," *Indonesian Journal of Multidisciplinary Science*, vol. 1, no. 1, pp. 69–80, 2022, <https://doi.org/10.55324/ijoms.v1i1.324>.
- [8] E. Paselle, E. Khairina, M. Taufik, and F. F. Zhan, "Public transport accessibility policy for disabled Batam City in the concept of sustainable transportation," *Soshum: Jurnal Sosial dan Humaniora*, vol. 14, no. 1, pp. 17–27, 2024, <https://doi.org/10.31940/soshum.v14i1.17-27>.
- [9] L. B. Said and I. Syafey, "User acceptance of public transport systems based on a perception model," *International Journal of Transport Development and Integration*, vol. 6, no. 4, pp. 399–414, 2022, <https://doi.org/10.2495/TDI-V6-N4-399-414>.
- [10] S. Moslem and Y. Çelikkbilek, "An integrated grey AHP-MOORA model for ameliorating public transport service quality," *European Transport Research Review*, vol. 12, no. 1, 2020, <https://doi.org/10.1186/s12544-020-00455-1>.
- [11] A. Mohamed, I. A. I. Adwan, A. G. F. Ahmeda, H. Hrtemih, and H. Al-Msari, "Identification of affecting factors on the travel time reliability for bus transportation," *Knowledge-Based Engineering and Sciences*, vol. 2, no. 1, pp. 19–30, 2021, <https://doi.org/10.51526/kbes.2021.2.1.19-30>.
- [12] M. F. A. Bakar et al., "Evaluating the quality of service of bus performance in Johor Bahru," *IOP Conference Series: Earth and Environmental Science*, vol. 971, no. 1, 2022, Art. no. 012016, <https://doi.org/10.1088/1755-1315/971/1/012016>.
- [13] B. Haryadi, E. Damayanti, M. L. Alam, A. Narendra, and A. Purnomo, "Passenger's level of satisfaction with and loyalty to Trans Semarang bus services," *IOP Conference Series: Earth and Environmental Science*, vol. 1203, no. 1, 2023, Art. no. 012024, <https://doi.org/10.1088/1755-1315/1203/1/012024>.
- [14] R. Cervero, "Transport infrastructure and the environment: Sustainable mobility and urbanism," in *The SAGE Handbook of Transport Studies*, London, U.K.: SAGE Publications, 2013.
- [15] B. Hertasning, I. W. Hatta, and A. A. Samudra, "Carbon emission mitigation: A sustainable transportation perspective for reforming the law on highways in Indonesia," *Journal of Law and Sustainable Development*, vol. 12, no. 1, 2024, Art. no. e2827, <https://doi.org/10.55908/sdgs.v12i1.2827>.
- [16] Q. Jing, H. Liu, W. Yu, and X. He, "The impact of public transportation on carbon emissions—From the perspective of energy consumption," *Sustainability*, vol. 14, no. 10, 2022, Art. no. 6248, <https://doi.org/10.3390/su14106248>.
- [17] I. Pechkurov, D. Plotnikov, A. Gorev, T. Kudryavtseva, A. Banite, and A. Skhvediani, "Development of a method for selecting bus rapid transit corridors based on the economically viable passenger flow criterion," *Sustainability*, vol. 15, no. 3, 2023, Art. no. 2391, <https://doi.org/10.3390/su15032391>.
- [18] M. A. Berawi, G. Gunawan, F. A. Iskandar, B. E. Ibrahim, P. Miraj, and M. Sari, "Optimizing land use allocation of transit-oriented development (TOD) to generate maximum ridership," *Sustainability*, vol. 12, no. 9, 2020, Art. no. 3798, <https://doi.org/10.3390/su12093798>.
- [19] M. Rizki, T. B. Joewono, M. Z. Irawan, P. F. Belgiawan, F. F. Bastianto, and D. Prasetyanto, "Investigating influencing factors for ICT adoption that changes travel behavior in response to the COVID-19 outbreak in Indonesia," *Case Studies on Transport Policy*, vol. 11, 2023, Art. no. 100947, <https://doi.org/10.1016/j.cstp.2023.100947>.
- [20] S. Oktavia and H. Dwiatmoko, "Analysis of passenger service satisfaction of public transport in Tangerang City," *Astonjadro*, vol. 11, no. 3, 2022, Art. no. 647, <https://doi.org/10.32832/astonjadro.v11i3.7505>.
- [21] A. N. H. Ibrahim, M. N. Borhan, M. H. Osman, M. R. M. Yazid, and M. M. Rohani, "The influence of service quality on user's perceived satisfaction with light rail transit service in Klang Valley, Malaysia," *Mathematics*, vol. 10, no. 13, 2022, Art. no. 2213, <https://doi.org/10.3390/math10132213>.
- [22] A. Obsie, M. Woldeamanuel, and B. Woldetensae, "Service quality of Addis Ababa light rail transit: Passengers' views and perspectives," *Urban Rail Transit*, vol. 6, no. 4, pp. 231–243, 2020, <https://doi.org/10.1007/s40864-020-00135-2>.
- [23] R. K. Yadav, A. Gupta, P. Choudhary, and M. Parida, "Service quality and personal attitudes as predictors of overall satisfaction with public buses: A case study in Kathmandu, Nepal," *Transportation Research Record: Journal of the Transportation Research Board*, vol. 2679, no. 1, pp. 1785–1801, 2024, <https://doi.org/10.1177/03611981241257256>.
- [24] F. J. Krüger et al., "The bus rapid transit (BRT) in Dar es Salaam: A pilot study on critical infrastructure, sustainable urban development and livelihoods," *Sustainability*, vol. 13, no. 3, 2021, Art. no. 1058, <https://doi.org/10.3390/su13031058>.
- [25] M. Friman, K. Lättman, and L. E. Olsson, "Public transport quality, safety, and perceived accessibility," *Sustainability*, vol. 12, no. 9, 2020, Art. no. 3563, <https://doi.org/10.3390/su12093563>.
- [26] A. Jawed, M. a. H. Talpur, I. A. Chandio, and P. N. Mahesar, "Impacts of In-Accessible and Poor Public Transportation System on Urban Environment: Evidence from Hyderabad, Pakistan," *Engineering, Technology & Applied Science Research*, vol. 9, no. 2, pp. 3896–3899, Apr. 2019, <https://doi.org/10.48084/etasr.2482>.
- [27] C. Fornell, M. D. Johnson, E. W. Anderson, J. Cha, and B. E. Bryant, "The American customer satisfaction index: Nature, purpose, and findings," *Journal of Marketing*, vol. 60, no. 4, pp. 7–18, 1996, <https://doi.org/10.2307/1251898>.
- [28] J. A. Martilla and J. C. James, "Importance-performance analysis," *Journal of Marketing*, vol. 41, no. 1, pp. 77–79, 1977, <https://doi.org/10.2307/1250495>.
- [29] A. Uslu and P. Sahin Kormeçli, "Inclusive landscape design to provide social interaction in urban spaces," in *Sustainable Landscape Planning and Design*, 2017, pp. 9–22.
- [30] A. Rifai and Y. I. Fajriliyani, "Analysis of passenger satisfaction level of service and facilities of electric rail train (KRL) commuter line route Bekasi–Manggarai," *Journal of World Conference*, vol. 2, no. 2, 2020, <https://doi.org/10.29138/prd.v2i2.212>.
- [31] A. Rifai and F. Arifin, "Analysis of the level of passenger satisfaction with services and transport facilities-based integration in Jakarta," *Journal of World Conference*, vol. 2, no. 2, 2020, <https://doi.org/10.29138/prd.v2i2.211>.
- [32] V. Sahfitri, S. Suyanto, and D. Dayi, "Penerapan metode Servqual dan Customer Satisfaction Index (CSI) untuk peningkatan kepuasan pengguna light rail transit (LRT) di Kota Palembang," *Jurnal Ilmiah Matrik*, vol. 25, no. 3, 2024, <https://doi.org/10.33557/jurnal.matrik.v25i3.2866>.
- [33] H. Hermansyah, A. Amsuardiman, and M. Nawawi, "Evaluasi penggunaan moda transportasi bus Trans Metro Deli rute Lapangan Merdeka–Pinang Baris di Kota Medan," *Jurnal Ilmiah Teknik Sipil dan Arsitektur*, vol. 1, no. 2, 2022, <https://doi.org/10.31289/jitas.v1i2.1452>.
- [34] Rini, Devia, and Murniati, "Studi tingkat kepuasan terhadap pelayanan travel rute Palangka Raya–Buntok," *Jurnal Serambi Engineering*, vol. 9, no. 1, 2023, <https://doi.org/10.32672/jse.v9i1.739>.
- [35] S. R. Gustomo, M. D. Asri, N. Ravenska, and I. Kurniawan, "Customer Satisfaction Index (CSI) sebagai alat ukur kepuasan peserta BPJS Ketenagakerjaan Cabang Bandung Suci," *RIGGS: Jurnal Artificial Intelligence and Digital Business*, vol. 4, no. 3, 2025, <https://doi.org/10.31004/riggs.v4i3.2660>.

- [36] B. B. Irawan, M. Momon, W. Fitria, L. Susdiani, and D. Arian, "Analysis of public transport users' satisfaction using importance performance analysis (IPA) methods: Trans Padang case study," *AIP Conference Proceedings*, vol. 2891, no. 1, 2024, Art. no. 060032, <https://doi.org/10.1063/5.0208034>.
- [37] S. K. Lwanga and S. Lemeshow, *Sample Size Determination in Health Studies: A Practical Manual*. Geneva, Switzerland: World Health Organization, 1991.
- [38] D. van Lierop, M. Badami, and A. El-Geneidy, "What influences satisfaction and loyalty in public transport? A review of the literature," *Transport Reviews*, vol. 38, no. 1, pp. 52–72, 2018, <https://doi.org/10.1080/01441647.2017.1298683>.
- [39] D. Lin and J. Cui, "Transport and mobility needs for an ageing society from a policy perspective: Review and implications," *International Journal of Environmental Research and Public Health*, vol. 18, no. 22, 2021, Art. no. 11802, <https://doi.org/10.3390/ijerph182211802>.
- [40] D. Hidalgo and P. Graftieaux, "Bus rapid transit systems in Latin America and Asia: Results and difficulties in 11 cities," *Transportation Research Record*, vol. 2072, pp. 77–88, 2008, <https://doi.org/10.3141/2072-09>.
- [41] J. Henseler, C. M. Ringle, and M. Sarstedt, "A new criterion for assessing discriminant validity in variance-based structural equation modeling," *Journal of the Academy of Marketing Science*, vol. 43, no. 1, pp. 115–135, 2015, <https://doi.org/10.1007/s11747-014-0403-8>.
- [42] J. de Ona, R. de Ona, and G. Lopez, "Transit service quality analysis using cluster analysis and decision trees: A step forward to personalized marketing in public transportation," *Transportation*, vol. 43, no. 5, pp. 725–747, 2016, <https://doi.org/10.1007/s11116-015-9615-0>.
- [43] M. I. Adelino and M. Fitri, "Integration of CSI, Airqual, IPA, and PGCV to determine prioritisation of service quality on JTA Airlines," *Jurnal Teknologi*, vol. 11, no. 1, pp. 14–19, 2021, <https://doi.org/10.35134/jitekin.v11i1.27>.