

The Heterogeneity of Transit Perception: How Socio-Demographic Factors Shape Public Bus Service Evaluations in Johor Bahru

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ABSTRACT

Understanding the heterogeneity of passenger needs is essential for increasing public transport ridership in car-dependent urban areas. This study examines the relationship between passenger demographics and perceived service quality of the public bus system in Johor Bahru. By analyzing variables including age, income, and frequency of travel, the research identifies critical disparities in how different community segments experience urban mobility. Statistical analysis confirms that demographic characteristics are crucial predictors of satisfaction, with significant variations found in accessibility, safety, and information provision. The study provides a framework for transportation providers to move toward data-driven, tailored service models. By addressing the specific demands of diverse demographic groups, stakeholders can improve service equity and support the city's goals for sustainable modal shifts. These implications extend beyond transit, offering insights into broader public service management and social engagement strategies.

Keywords: socio-demographic, public transport, public bus, factors, Johor Bahru

INTRODUCTION

Public transportation systems significantly contribute to reducing the environmental impacts associated with private vehicle usage. The shift towards sustainable public transportation, including electric and zero-emission vehicles, plays a crucial role in mitigating climate change and improving air quality. Public transport is widely accessible in principle; however, passengers are not a monolithic group, and marginalized populations frequently struggle to utilize services efficiently. Because service quality is socially differentiated, standardized operational models often fail to meet the heterogeneous demands of all passenger segments. This study argues that recognizing these demographic disparities is critical for fostering equitable transit devotion and ensuring that no group is left behind by inefficient service delivery.

Public transport, specifically bus services, plays a critical role in urban mobility systems globally, and the city of Johor Bahru, Malaysia, is no exception. The city has experienced rapid urbanization and a concomitant increase in traffic congestion, making effective public transport increasingly important in reducing vehicle dependency and improving air quality (Bakar et al., 2022).

The accessibility of public transport also varies significantly along the lines of socio-demographic. As more urban population continues to utilize the public transport, understanding the impact of sociodemographic on public transport is a vital area of the research. The prime objective of this study is to investigate the heterogeneity of passenger perceptions of bus service quality and identify the sociodemographic determinants of satisfaction in Johor Bahru.

LITERATURE REVIEW

Public Transportation in Johor Bahru

Johor Bahru, the capital of the state of Johor in Malaysia, has been evolving its public transportation system to cope with increasing urbanization and cross-border travel dynamics, particularly given its proximity to

Singapore. The public transport infrastructure includes bus services, taxis, and a developing light rail transit (LRT) system, which are essential for facilitating mobility within the city and to neighboring areas.

The public transport system in Johor Bahru is primarily centered around its bus services. Research indicates a need to evaluate the quality of bus services in the city, particularly during peak hours when congestion is at its highest. A study by Bakar et al. emphasizes that daily traffic congestion is exacerbated during the morning and late afternoon periods, showcasing the critical role of bus services in urban mobility (Bakar et al., 2022; . Furthermore, the assessment of service quality reveals notable deficiencies in operational aspects, necessitating specific improvements to cater to the growing urban population (Bakar et al., 2022; Minhans et al., 2020).

Public Bus Services

The primary mode of public transportation in Johor Bahru is the bus system, which is operated by several companies, most notably, Causeway Link and other local providers. These buses serve a crucial role in connecting various districts within the city and providing access to essential services and employment centers. Johor Bahru's bus routes are centered around key hubs, including the JB Sentral bus terminal, which facilitates local and international travel (Bakar et al., 2022).

In Johor Bahru, public bus services are primarily operated by several companies, where one of several main operators being Causeway Link, a part of Handal Indah. Additionally, Johor State Bus (JB) serves local routes, while other private operators may also provide coverage in certain areas, particularly for intra-city connections (Bakar et al., 2022). Several of these buses are included under a scheme recently introduced by Ministry of Transport (myBas). Another operator included is Public Transport Corporation of Johor (PAJ) Sdn. Bhd. which is a private company wholly owned by the Johor State Secretary Incorporation that operates the free bus system which falls under the scheme Bas Muafakat Johor.

Public perception of the bus service is generally poor, especially among lower-income groups, who are often captive users of these services. Minhans et al. found that despite the critical reliance of disadvantaged populations on bus services, the perceived quality remains marginalized, reflecting vast potential for improvement (Minhans et al., 2020). Elements such as punctuality, reliability, and user satisfaction significantly affect ridership levels, indicating multifaceted challenges requiring strategic interventions (Minhans et al., 2020).

Socio-Demographic Factors in Public Bus Service

Socio-demographic status significantly influences dependency on public transportation. Lower-income groups, who typically lack access to private vehicles, rely heavily on affordable public transport options. Yet, their experience is often marred by service inadequacy, leading to frustration and lower patronage. Addressing these socioeconomic disparities is crucial for ensuring equitable access to public transport services.

Socio-demographic factors significantly influence public bus service usage in Johor Bahru. These factors include age, income level, gender, education, and residential location among others. Understanding how these factors impact public transport can aid policymakers and service providers in improving public bus services tailored to the needs of the community.

Research indicates that the demographic profile of bus users in Johor Bahru showcases a predominance of younger individuals and females among public bus passengers. A recent study highlighted that over 50% of passengers utilizing services like the Muafakat Johor Bus are young, single individuals, predominantly female, who possess only high school qualifications and do not own vehicles (Zakaria et al., 2025). This demographic is likely to rely on public transportation due to limited financial resources and the need for accessible mobility options.

The educational background of passengers also plays a role in how they perceive and utilize public bus services. Many individuals with higher educational qualifications are assumed to have better employment opportunities, leading them to prefer private transport options over buses, as highlighted in various studies (Zakaria et al., 2025). Those with lower educational attainment, on the other hand, often remain captive users of public

transportation systems, underscoring the need for quality improvements to cater to these populations (Minhans et al., 2020).

Income is another critical factor influencing public bus service usage. Lower-income groups tend to be more dependent on public transport services for their daily commuting necessities. Studies have shown that perceptions of service quality among these users are often marginalized, indicating a significant reliance on buses despite dissatisfaction with service attributes (Bakar et al., 2022). The correlation between income level and reliance on public transport has been substantiated by the fact that individuals from higher income brackets tend to favor private vehicles, reducing their reliance on bus services (Zakaria et al., 2025).

Socio-demographic factors are essential considerations in the optimization of public bus services in Johor Bahru. Age, income, gender, education, and geographic location collectively shape the dynamics of bus usage in the city. Given the ongoing challenges faced by the public transport system, addressing these factors through focused policy-making and service enhancements will be vital for improving public transport's effectiveness and user satisfaction.

Gaps in Literature

While prior studies have identified that socio-demographic factors such as age, gender, income, and education influence public bus usage in Johor Bahru, there is limited understanding of how these factors interact to shape heterogeneous perceptions of service quality. Furthermore, research rarely examines how these differences translate into policy-relevant strategies for service improvement, or considers the contextual factors, such as route type or travel time, that may moderate these perceptions. Addressing these gaps is essential to tailor public bus services to the diverse needs of the population.

METHODOLOGY

This study adopts a quantitative research design to investigate the heterogeneous nature of passenger perceptions regarding public bus service quality in Johor Bahru. The methodology focuses on identifying how specific socio-demographic filters shape the evaluation of transit attributes.

Data Collection

The study area, Johor Bahru, was selected due to its high car-dependency rate and diverse commuter base. Data collection was conducted at major transit hubs, including JB Sentral and Larkin Sentral, ensuring a representative sample of both "captive" and "choice" riders. A total of 384 valid responses were collected from passengers, satisfying the requirements for a 95% confidence level in an urban population of this size.

Table 1 Socio-Demographic Profile of Passengers (N = 366)

Variable	Category	Frequency (N)	Percentage (%)
Age	14 - 18 years	59	16
	19 - 25 years	194	53
	26 - 44 years	33	9
	45 years and above	80	22
Gender	Male	94	25.75
	Female	272	74.25
Monthly Income	Below RM2,000	240	65.60

	RM2,001–RM4,000	63	17.20
	Above RM4,000	63	17.20
Car Ownership	Yes	72	19.70
	No	294	80.30
Total		N = 366	100

Research Design

A structured survey instrument was developed, based on established Service Quality (SQ) frameworks in transportation literature. The questionnaire was divided into two primary sections:

- a) Socio-Demographic Profile: Capturing data on age, gender, education level, occupation, monthly household income, and car ownership status.
- b) Service Quality Dimensions: Passengers rated 24 service attributes across seven dimensions (Reliability, Accessibility, Facilities, Safety, Information, Comfort, and Speed) using a 5-point Likert scale (ranging from 1 = Very Dissatisfied to 5 = Very Satisfied).

Data Analysis

The analysis focused on moving beyond aggregate mean scores to identify variances between passenger segments. Data were processed using SPSS (v.26) through the following statistical stages:

- a) Descriptive Statistics: To profile the demographic characteristics.
- b) One-Way Analysis of Variance (ANOVA): Employed to determine if there were statistically significant differences in service perception across groups with more than two categories (e.g., age groups, income levels, and education).
- c) Mann-Whitney U Test: Used as a non-parametric alternative to compare perceptions between two independent groups, specifically focusing on the divide between Car Owners (Choice Riders) and Non-Car Owners (Captive Riders).

DISCUSSION

The findings of this study confirm that public bus passengers in Johor Bahru are not a monolithic group. Instead, their perceptions of service quality are deeply fragmented by socio-demographic "filters." This section interprets how these factors, specifically economic status and mobility alternatives create different lived experiences for transit users.

Socio-Economic Status as a Driver of Expectations

The statistical significance found in Household Income and Education levels suggests that service quality is relative to a passenger's socio-economic standing. Higher-income and more educated passengers consistently reported lower satisfaction in dimensions such as Information and Facilities. This trend indicates an "Expectation-Satisfaction Gap." Passengers with higher financial and educational capital often compare public bus services to the standards of private transport or international transit systems. For this group, the bus is not just a mode of survival but a service that must compete on convenience and professional communication.

The statistical significance identified regarding household income and education levels ($p < 0.05$) suggests that service quality is not an absolute measure but is relative to a passenger's socio-economic standing. Higher-income and more educated cohorts consistently reported lower satisfaction scores, particularly within the

Information and Facilities dimensions. This trend highlights a critical 'Expectation-Satisfaction Gap'; passengers with higher financial and educational capital likely evaluate local bus services against the benchmarks of private vehicle travel or higher-standard international transit systems. For these discretionary riders, public transport is judged not merely on its ability to provide basic mobility, but on its capacity to offer a seamless, professional, and 'choice-competitive' user experience. Consequently, improvements in digital information systems and station infrastructure are essential to prevent these groups from completely disengaging from the public transport network.

Table 2 ANOVA Results for Socio-Demographic Factors and Service Dimensions (Passengers)

Demographic Variable	Service Dimension	F-Value	p-value
Household Income	Information	3.842	0.010
Household Income	Facilities	3.105	0.027
Education Level	Comfort	4.12	0.007
Education Level	Speed	3.568	0.014

The high F-values for Education Level in relation to Comfort and Speed suggest that intellectual and professional demographics prioritize the 'time-cost' and 'physical-environment' of the commute more than other groups. This identifies a clear segment of the population that is currently 'marginalized' by the basic service standards of the Johor Bahru bus network.

The "Choice vs. Captive" Paradox

The results from the Mann-Whitney U tests regarding Car Ownership provide a critical insight into the "Choice vs. Captive" rider divide.

The Captive Rider: Those without cars (often students and low-income workers) showed higher tolerance for service delays. This is not necessarily due to high service quality, but rather a "forced loyalty" where the lack of alternatives leads to a habitual acceptance of current conditions.

Table 3 Impact of Car Ownership on Service Perception (Mann-Whitney U Test)

Hypothesis	Service Dimension	p-value	α	Decision	Result
H ₁	Accessibility	0.03	0.05	Reject H ₀	Significant Relationship
H ₂	Safety & Security	0.01	0.05	Reject H ₀	Significant Relationship

The Choice Rider: Conversely, car owners were significantly more critical of Accessibility and Safety. For these individuals, the "first-and-last mile" connection and the perceived safety of bus stops are the primary deterrents. As long as the perceived "cost" (in terms of safety and accessibility) of taking the bus exceeds the convenience of driving, this group will remain marginalized from the transit network.

The analysis reveals a statistically significant disparity in how car owners (choice riders) and non-car owners (captive riders) perceive the bus system. Specifically, car ownership significantly influences perceptions of Accessibility (p=0.03) and Safety and Security (p=0.01). This suggests that for those who have the option of a private vehicle, the 'barriers to entry' for public transit are not the bus fares or the bus condition, but rather the

physical access to the stops and the perceived safety of the transit environment. To transition Johor Bahru from a car-centric city to a transit-oriented one, interventions must move beyond the bus itself and focus on the 'last-mile' infrastructure and station security.

Life-Stage Priorities: Age and Travel Purpose

While students prioritize Affordability, the lack of diversity in the age of passengers suggests that the system is failing to retain users as they age and their income increases. The transition from a student (captive) to an employed adult (choice rider) usually results in a shift toward private car usage because the current bus system does not evolve to meet the increased demand for Comfort and Reliability associated with professional life.

Table 4 Passenger Distribution by Life Stage and Car Ownership

LIFE STAGE	AGE CATEGORY	FREQUENCY (N)	% OF TOTAL SAMPLE	CAR OWNERSHIP STATUS
STUDENT / ENTRY LEVEL	14 - 25 YEARS	253	69.10	MOSTLY NO (CAPTIVE)
WORKING PROFESSIONAL	26 - 44 YEARS	33	9.00	MOSTLY YES (CHOICE)
SENIOR / RETIREE	45 YEARS AND ABOVE	80	21.90	MIXED
TOTAL		366	100	

As illustrated in Table 4, there is a sharp inverse relationship between age/income and bus dependency. While the 14–25 age group constitutes 69.1% of ridership, this participation rate collapses to just 9% for the 26 to 44 age group. This "Retention Gap" suggests that public transport in Johor Bahru functions as a "transitional" service for students rather than a permanent mobility solution for working professionals. To address these inequities, policy interventions must be twofold. First, the Johor Bahru City Council should prioritize Crime Prevention Through Environmental Design (CPTED) by upgrading bus shelters with high-intensity lighting and transparent surveillance features. It should be explicitly stated that these CPTED measures are primarily aimed at addressing the low safety scores of choice riders specifically car owners and working professionals to alleviate the perceived risks that currently hinder a mode shift. Second, the implementation of demand-responsive feeder services is essential to bridge the accessibility gap for captive riders in the urban outskirts. By evolving from a "survival-based" service into a secure, professional, and digitally integrated network, Johor Bahru can transform public transit into a competitive alternative to private car ownership, ensuring the current youth majority is retained as lifelong transit users.

Addressing the "Inefficiency" for Marginalized Groups

As noted in the problem statement, marginalized groups are unable to utilize the service efficiently when planners assume all users have the same needs.

Information Inequity: The dissatisfaction regarding "Information" among diverse groups suggests that a single channel of communication is insufficient.

Physical Barriers: For those in large households or with physical constraints, the "Facilities" and "Comfort" scores indicate that the physical environment of the bus system is a significant barrier to efficient usage.

Table 5 Comparison of Perception by Car Ownership

Dimension	Category	Mean Score	p-value	Result
Accessibility	Car Owner	4.06	0.03	Significant
	No Car	3.96		
Safety & Security	Car Owner	3.74	0.01	Significant
	No Car	3.92		

The findings present a unique paradox in Johor Bahru’s transit landscape. While car owners perceive Accessibility more positively (M= 4.06) than non-car owners (M =3.96), they simultaneously report significantly lower satisfaction with Safety and Security (M=3.74 vs M=3.92). This suggests that for the 'Choice Rider,' the barrier to using the bus is not its location or proximity, as they likely live near well-connected main roads, but rather a psychological and physical safety concern. For these individuals, the 'cost' of the bus is not the fare, but the perceived risk. Conversely, for the 'Captive Rider' (non-car owners), the lower score in accessibility reflects the daily struggle of 'last-mile' connectivity in residential outskirts. Their higher safety score may indicate a 'habitual desensitization' or a lack of alternative standards for comparison, whereas car owners evaluate bus stop safety against the controlled, secure environment of a private vehicle.

Toward a Segmented Service Strategy

To increase transit devotion and achieve Johor Bahru’s modal split targets, the "one-size-fits-all" approach must be abandoned. Operators should consider that a "good" service for a student (low fare, basic reliability) may be an "unacceptable" service for a middle-income professional (needs real-time data, air-conditioned facilities, and speed). Improving accessibility and safety specifically near residential areas will target "Choice Riders," while upgrading basic reliability and facilities will improve the quality of life for "Captive Riders”.

CONCLUSION

This study has identified a critical disconnect in the Johor Bahru public bus system through the lens of socio-demographic segmentation. The statistical analysis of 366 respondents reveals that the bus system currently functions as a "transitional service" rather than a sustainable urban mobility solution. With a ridership base dominated by youth (69.1%) and a massive drop-off in participation among workingage adults (9%), the system is struggling to retain users as they experience upward social mobility and gain access to private vehicles.

The core of this transition is defined by a unique "Convenience-Safety Paradox" identified through Mann-Whitney U testing. While car owners reported significantly higher satisfaction with Accessibility (M = 4.06, p = 0.03) than non-car owners (M = 3.96), they simultaneously reported the lowest scores for Safety and Security (M = 3.74, p = 0.01). This indicates that for "Choice Riders," the barrier to entry is not the proximity of the bus stop, but a profound lack of confidence in the security of the transit environment. Conversely, the lower accessibility scores among "Captive Riders" highlight a failure in "last-mile" connectivity for those who depend on the system most, particularly in residential peripheries.

To address these inequities, policy interventions must be twofold. First, the Johor Bahru City Council should prioritize Crime Prevention Through Environmental Design (CPTED) by upgrading bus shelters with high-intensity lighting and transparent surveillance features to mitigate the safety concerns of car owners. It should be explicitly noted that these CPTED measures are primarily aimed at addressing the low safety scores of choice riders, such as car owners and working professionals, to effectively encourage a mode shift. Second, the implementation of demand-responsive feeder services is essential to bridge the accessibility gap for captive riders in the urban outskirts. By evolving from a "survivalbased" service into a secure, professional, and digitally integrated network, Johor Bahru can transform public transit into a competitive alternative to private car ownership, ensuring that the current youth majority is retained as lifelong transit users.

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