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STATED AND REVEALED PREFERENCES TOWARDS BUS TRANSPORT IN SRI LANKA

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ABSTRACT

This study aims to identify the attributes of public transportation buses (PTB) preferred by passengers, which will be perceived as the buses' quality of service. PTB of Sri Lanka faces several issues impacting its quality, efficiency, and modal share. Understanding user perceptions is essential to enhancing service quality and addressing the challenges that deter bus usage. Thirteen shortlisted attributes were rated by 84 (61 Male and 23 Female) respondents, and the top five attributes were selected. The study gathered user preferences towards PTB using Stated Preference (SP) and Revealed Preference (RP) methods for the five chosen attributes. RP data were modelled using a multiple linear regression model with R language. The data set comprised 192 (127 Male and 65 Female) valid responses. SP data showed that the respondents favoured medium-speed buses (51.2%) that were clean and reliable. Time of arrival was the most crucial attribute (30.3%), followed by vehicle condition (24.3%). Segment analysis revealed that gender and vehicle ownership significantly impacted preferences. Both gender and vehicle ownership segments prioritised arrival time and least valued seat comfort. The study emphasises the importance of prioritising punctuality over comfort. The findings of this study could provide valuable insights for policymakers to design more user-centric strategies, potentially enhancing the efficiency and attractiveness of bus services in Sri Lanka.

Keywords: *Bus transport, stated preference, revealed preference, conjoint analysis*

1. INTRODUCTION

Sri Lanka has a well-connected road network, including expressways. It is ranked 40th in terms of road density in the world. Some cities have a higher road density compared to neighbouring countries. For comparison, the road density of South Asian countries such as India, Bangladesh, Nepal and Pakistan stands at 2.04, 2.5, 0.54 and 0.30 km/km2, respectively. For instance, the Western Province's road density exceeds 1.50 km/km2. The land passenger demand for transport in Sri Lanka is primarily met by private vehicles, trains, and buses, with buses being the major contributor to passenger volume. There are over 25,000 public transport buses, of which the government operates about 4,300. The government-operated buses are estimated to have carried 15 billion passenger kilometres [1]. In pre-covid times, private buses carried 28.2% of passenger trips, while government buses carried 6.5% of passengers [2].

The public bus transport sector in Sri Lanka faces several issues that impact its quality, efficiency, and modal share. At the start of the millennium, one major issue was the need for a clear fare policy to eliminate implicit fare policies that hurt the overall quality of bus transportation services [3]. From 2002 onwards, a bus fare policy was implemented. Other issues related to bus transport still exist. For example, bus passengers often encounter delays, overcrowding, and difficulties with manual ticketing procedures, such as the need for exact change [4]. Other service quality issues include inadequate transport facilities, poor handling of customer complaints, extended stoppages, insufficient leg space, longer headways, and varying service quality across different routes [5]. Additionally, the current ticketing mechanism is not optimised for micropayments, impacting the overall service quality of the system [6]. These challenges highlight the need for improvements in service delivery, professionalism, and resource allocation to enhance passenger satisfaction and the overall quality of public bus transport [7].

Sri Lanka is among the few countries that do not publish bus schedules. The lower modal share of public transport buses and an expanding population result in more private vehicles and traffic congestion in cities and suburbs. There is an emphasised need for increased investment and the inclusion of new IT-based solutions in public bus transport [6], [8].

From 2012 to 2017, the number of new motorbike and three-wheeler registrations in Sri Lanka sharply increased. The size and ability of these vehicles to move between small gaps contribute to traffic congestion [9]. This congestion results in time wasted by road users, fuel wastage, money wastage, environmental pollution, and reduced productivity. Motorbikes and three-wheelers have the highest carbon monoxide and carbon dioxide emission values per seat, while public transport buses have the lowest [10].

A proper understanding of user perception is vital in (i) providing better quality services for the increasing number of passengers due to population growth, expected to peak by 2036, and (ii) mitigating traffic congestion and environmental pollution caused by lower modal share of busses. Therefore, developing a service quality measurement method is necessary to identify the most pressing problems that deter people from using public bus transportation.

Transport service quality can be assessed from both the provider's and the user's perspectives, each with its merits. Understanding users' and drivers' service quality perceptions is essential [11]. From the provider side, companies must have high-quality systems to strive for development and improvement [12], [13]. Quality of service from the provider side can be assessed by analysing operational data such as fuel cost and number of passengers carried. On the user side, customer satisfaction and perception of service standards can be measured through customer satisfaction surveys [14]-[17]. User input is essential as their criteria may differ from experts [18], helping design effective and user-friendly facilities [19]. Measuring quality from the user side provides valuable insights for improving service delivery and meeting customer expectations.

The factors used in measuring the quality of service of public transport buses include accessibility, arrival time fluctuation, average transport speed, availability, bus stop facilities, car ownership, cleanliness, comfort, convenience, crowding, fare, frequency, hygiene, information availability, operational efficiency, reasonable travel expenses, reliability, reliability, responsiveness, safety, security, tangibility, transit personnel attitude, travel time reliability, vehicle condition, and walking distance to bus stops [20]-[25]. Improving public transport service quality involves reducing crowding, increasing operating frequency, enhancing waiting areas, and providing more user information. Current evaluation methods predominantly rely on quantitative measures like speed and price, neglecting qualitative factors such as comfort, convenience, and reliability, ultimately leading to underinvestment in public transport due to undervalued enhancements in transit strategies. [26]. Road length, traffic volume, bus passenger load, PM peak hours, longer headways, increased passenger traffic, and progression along routes significantly reduced the reliability of bus transport [27]-[28]. Table 1 shows the summary of attributes used in studies related to bus transport quality.

Table 1: Summary of Attributes Used in the Literature

Type	Attribute	Hensher, D.A., & Bradley, M [29]	Prioni & Hensher [30]	Hensher et al [31]	Eboli & Mazzulla [32]	Liu & Guo [33]	Javid et al. [34]	Joewono & San Santoso [35]	Ranawana, H.W.M.I.S., & Hewage, D [5]	Herath, E., & Sivakumar, T. [36]
Operational	Reliability		○		○	○	○	○		
	Travel time reliability						○		○	
	Fare	○	○	○	○	○	○		○	○
	Frequency		○	○	○		○		○	
Bus Stop	Safety while waiting		○				○			
	Facilities and environment		○	○	○	○	○	○	○	
	Information availability		○	○	○		○		○	
Travel time components	Access distance		○	○	○	○	○			
	Waiting time	○				○	○		○	○
	Travel time	○	○	○					○	○
	egress Time	○								
Route	Access to the bus		○	○				○	○	
	Transfers	○								
	Route coverage						○	○	○	
Onboard	Comfort level						○			
	Air – conditioning		○	○						
	In bus environment					○				
	Cleanliness in the vehicle							○		
	Safety on board		○					○	○	
	Condition of the vehicle							○	○	
	Cleanliness of seats		○	○	○					
	Seat availability/crowding			○						
	Ticket type			○			○	○	○	
Crew	Driver attitude		○	○	○		○	○	○	
	Driver’s skill							○		

Recent studies underscore measuring and enhancing customer satisfaction to improve service quality in Sri Lanka's bus transportation sector. This improvement is also pivotal for reducing the reliance on private vehicles, a growing concern in the country. However, a significant gap remains in understanding how user characteristics—such as age, gender, income level, and commuting habits—influence customer satisfaction within the Sri Lankan context. Addressing this gap is crucial for developing targeted strategies that cater to the population's diverse needs, ultimately leading to more effective and sustainable public transportation solutions.[37]-[40]

This study aims to identify the attributes of public transportation buses preferred by the passengers, which will be perceived as the quality of services. The specific objectives are to (i) identify the attributes related to the service quality of public bus transport, (ii) identify stated and revealed preferences towards attributes related to public bus transport, and (iii) develop a service quality index for public bus transport.

2. METHODS AND DATA

2.1. Theoretical Framework

Stated preference (SP) and revealed preferences (RP) are the primary methods for determining customer satisfaction levels in transport engineering. RP methods offer advantages such as analysing real-world behaviour, facilitating efficient planning interventions, enhancing modelling accuracy, improving service quality, and incorporating dynamic accessibility considerations for informed decision-making in transport infrastructure development [41]-[45]. Various statistical tools are employed in the analysis of RP, including Principal Component Analysis (PCA) for dimensionality reduction, Analysis of Variance (ANOVA) to compare group means, Descriptive Statistics for data summarisation, Correlation Analysis (Pearson r) to measure relationships, and Regression Analysis to examine dependencies. This study uses conjoint analysis with a multiple linear regression model.

Conjoint analysis has been applied in designing and analysing experimental data, utilising techniques such as rank order judgment, rating scale judgment, and discrete data conjoint approach, primarily aiming to identify people's preferences and needs across different attributes for each sector's development. The main focus lies in predicting choices and estimating part-worth utilities, with the method's external validity determined through goodness of fit tests [46]. Despite its complexity, SEM (Structural Equation Modelling) is considered the most effective method for evaluating customer satisfaction, as it allows for isolating measurements of estimated and latent variables among interviewees [33].

The origin of studies determining consumer behaviour by choice modelling is attributed to Luce [47], [48]. Developing a service quality index often utilises survey sheets to gauge preferences between current and hypothetical bus services across multiple attributes [32]. Conjoint models with partial factorial design [29]-[31], [49] and complete factorial design [33] have been used to develop quality of service indexes. The conjoint analysis method was chosen to create the questionnaire [33], modelled using the linear regression model following the recommendation of Louviere [50]. Quality of service will be developed by adapting LOS, which was evolved to evaluate the performance of highways and freeways, and later, this method was defined for public transportation [51].

2.2. Expert Survey

Figure 1 shows the overall methodology used in this study. A comprehensive literature review identified 55 unique attributes related to public bus transport. These were further narrowed down to 13 attributes relevant to the Sri Lankan context. These attributes were categorised into human, vehicle, and trip characteristics. Transport engineering experts (61 male, 23 female) in Sri Lanka were requested to rate these on a scale of 0 to 100, and then each attribute's level was rated. The overall rating for each attribute was obtained using Equation 1.

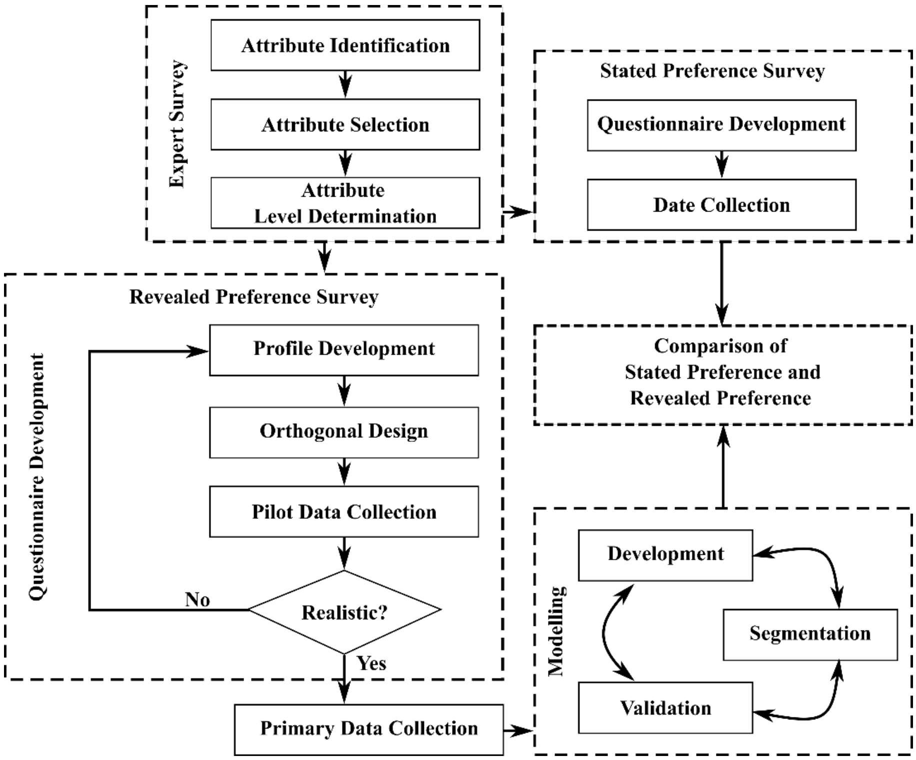

Figure 1: Methodology Used in the Study

$$Overall\ Rate = \frac{1}{n}\sum_{i=1}^{n} Category\ Rate_i \times Attribute\ Rate_i \text{ --------------------(1)}$$

Table 2: Overall Rating and the Ranking of the Attributes

No	Category	Attributes	Overall Rating	Rank	Selection
1	Human	Driver attitude	0.168	1	✓
2		Conductor attitude	0.060	6	
3	Vehicle	Width and level of access/exit	0.056	8	
4		Seat comfort	0.120	3	✓
5		Vehicle condition	0.120	2	✓
6		Air condition	0.060	7	
7	Trip	Available information	0.048	11	
8		Bus stop and environment	0.046	12	
9		Walking distance to a bus stop	0.053	9	
10		Reliability and on-board safety	0.111	4	✓
11		Time of arrival at a bus stop	0.076	5	✓
12		Ticket cost	0.051	10	
13		Payment method	0.031	13	

The number of attributes used in a model is always a complex issue. A trade-off exists between the information gained from adding a variable and the induced complexity. The attributes were limited to five to maintain a manageable number of questions in the final questionnaire. Table 2 shows the overall ranking of the attributes. Attributes which scored high ratings from the expert survey were selected for the model while ensuring at least one from each category.

2.3. Questionnaire Development

The chosen attributes were divided into three levels each (see Table 3). This division allowed the creation of 243 unique profiles $= 3^5$. However, collecting ratings for all 243 profiles would be impractical. Therefore, an orthogonal matrix was employed to reduce the number of profiles to 18, ensuring the number of profiles remains manageable while gathering comprehensive data [52]. Respondents rated these profiles on a seven-point scale. The questionnaire was divided into demographic data collection, profile ratings, and preference marking for attribute levels.

Table 3: Levels of Attributes

Attributes	Level	Level names
Driver attitude	1	Drive slow (<60km/h)
	2	Drive medium (=60 km/h)
	3	Drive fast (>60 km/h)
Seat comfort	1	Reclinable seat with headrest
	2	Non-reclinable seat with headrest
	3	Non-reclinable seat
Vehicle condition	1	Clean and in good condition
	2	Not clean and in good condition
	3	Clean and not in good condition
Reliability and onboard safety	1	High reliable and high-safe
	2	High reliable and low safe
	3	Less reliable and high-safe
Time of arrival at a bus stop	1	On-time
	2	5 minutes late
	3	10 minutes late

The term orthogonal indicates that all vectors in the matrix are orthogonal to each other in the nth dimension. Using orthogonal arrays or fractional factorial designs helps systematically vary the levels across different profiles while minimising the number of profiles needed. This efficiency is critical in conjoint analysis, where presenting too many profiles can overwhelm respondents and lead to unreliable data.

In summary, using orthogonal matrices in conjoint analysis is essential for ensuring the independence of attribute levels, enhancing the efficiency of profile creation, and maintaining the statistical validity of the findings. This methodological rigour contributes significantly to the reliability of consumer preference assessments in use satisfaction research [53], [54]. Table 4 shows the orthogonal matrix used in the revealed preference survey design.

Table 4: Final Orthogonal Design with Corresponding Levels

Profile Number	Driver attitude	Seat comfort	Vehicle condition	Reliability and onboard safety	Time of arrival at a bus stop
1	3	3	1	1	1
2	1	2	3	1	1
3	3	1	2	2	1
4	2	1	3	2	1
5	1	2	1	3	1
6	2	3	2	3	1
7	2	1	1	1	2

Profile Number	Driver attitude	Seat comfort	Vehicle condition	Reliability and onboard safety	Time of arrival at a bus stop
8	3	2	2	1	2
9	2	2	1	2	2
10	1	3	2	2	2
11	1	1	3	3	2
12	3	3	3	3	2
13	1	1	2	1	3
14	2	3	3	1	3
15	1	3	1	2	3
16	3	2	3	2	3
17	3	1	1	3	3
18	2	2	2	3	3

2.4. Model Development

R software was used to analyse the collected data, develop models, and validate them. Overall ratings obtained for the profiles were represented as a sum of the part-worth utility of attributes present in a profile and an intercept, shown in Equation 2.

$$U = U_0 + \sum U_{ij} X_{ij} + \epsilon \text{ ---(2)}$$

Where U_{ij} is the part-worth utility of the attribute i at level j, X_{ij} is a dummy variable (1 when level j of the attribute i is present 0 otherwise), and ϵ is the error term. ϵ is assumed to be normally distributed with a mean of zero.

The importance given to an attribute by the respondent is measured by the difference between the maximum and minimum part-worth utility recorded for that attribute, as shown in Equation 3.

$$Importance_i = Max[U_{ij}] - Min[U_{ij}] \text{ --(3)}$$

2.5. Model Validation

Model validation ensures that predictive models are accurate, reliable, and fit for their intended purpose. It enhances decision-making and compliance and safeguards against potential operational risks associated with flawed models. Effective model validation involves several techniques, including (i) in-sample validation, which tests the model with data from the same dataset used for training; (ii) out-of-sample validation, Testing the model with a new dataset to ensure it performs well in different conditions; and (iii) back-testing: Comparing model predictions with actual outcomes to assess predictive accuracy. In this study, out-of-sample validation was employed, where four profiles (1, 2, 8, and 9) were not used in the modelling process and were kept as holdout cards for independent validation of the models. The Pearson correlation and Kendall's tau values were used to evaluate the model fit.

2.6. Segmentation Analysis

Segmentation analysis helps identify the segments in the respondents. Segmentation analysis is crucial in understanding and improving user satisfaction in various domains. By dividing users into distinct groups based on their characteristics, behaviours, and preferences, businesses can gain valuable insights that drive better decision-making and enhance the user experience. A practical segmentation analysis in user satisfaction studies helps to provide tailored user experiences, promotes effective resource allocation, and Identifies usage patterns and friction points among the respondents. The T-test is used to evaluate whether there is a difference in the models developed after segmenting the data. A two-tail p-level of 5% was used to assess the significance of the difference.

2.7. Demographic Data

This secondary survey was conducted online, collecting 199 responses, of which seven were removed due to uniform answers across questions. Respondents' characteristics such as gender, education level and mode of frequent transport were collected during the study. A summary of the user characteristics is shown in Table 5.

Table 5: Characteristics of Respondents - Secondary Survey

Characteristic	Group	Response	
		Number	Percentage
Gender	Male	127	66.15
	Female	65	33.85
Educational Qualification	Degree	114	59.38
	Diploma	27	14.06
	G.C.E.(A/L)	40	20.83
	G.C.E.(O/L)	11	5.73
Most used transportation mode	Public transport	136	70.83
	Own vehicle	56	29.17

3. RESULTS

Standardised Cronbach's alpha for the collected data for the 18 profiles and 192 samples was found to be 0.92 (95% confidence interval 0.90-0.94), an alpha value which translates to 'Excellent' internal consistency.

3.1. Stated Preference

When presented individually, the respondents' preferences towards the attributes and levels of attributes are summarised in Table 6. Drive attitude was the most crucial, while seat comfort was the least important attribute. Most preferred a medium-speed bus (51.2%), followed by a bus travelling at more than 60 km/h (40.5%). For seating arrangements, respondents favoured a non-reclinable seat with a headrest, followed by a reclinable seat with a headrest. Regarding vehicle condition, an overwhelming 94 % preferred a clean bus in good condition. High reliability and safety are preferred by 81 % of respondents. For the time of arrival at a bus stop, 85.7 % preferred on-time arrival.

Table 6: Preference for the Level of Attributes

Attribute	Average Importance	Level	Number of Preference	Preference Percentage (%)
Driver attitude	26.6	1	7	8.3
		2	43	51.2
		3	34	40.5
Seat comfort	18.6	1	34	40.5
		2	39	46.4
		3	11	13.1
Vehicle condition	18.5	1	79	94
		2	4	4.8
		3	1	1.2
Reliability and onboard safety	19.3	1	9	10.7
		2	68	81.0
		3	7	8.3
Time of arrival at a bus stop	17.0	1	72	85.7
		2	7	8.3
		3	5	6.0

3.2. Revealed Preference

3.2.1. Model Fit and Validation

A statistically significant relationship between the attributes and user preferences in developed models can be inferred from Pearson's R and Kendall's tau values of 0.93 and 0.78, respectively. The model was validated using the four holdout cards, resulting in Pearson's R and Kendall's tau values of 0.54 and 0.33, respectively, for the holdout cards.

3.2.2. Average Importance Value

The average importance values for the five attributes used in the model are shown in Figure 2. 'Time of arrival at a bus stop' is the most significant attribute with an importance value of 30.34 %, followed by 'vehicle condition' at 24.24 %. 'Seat comfort' showed the least importance at 9.91%.

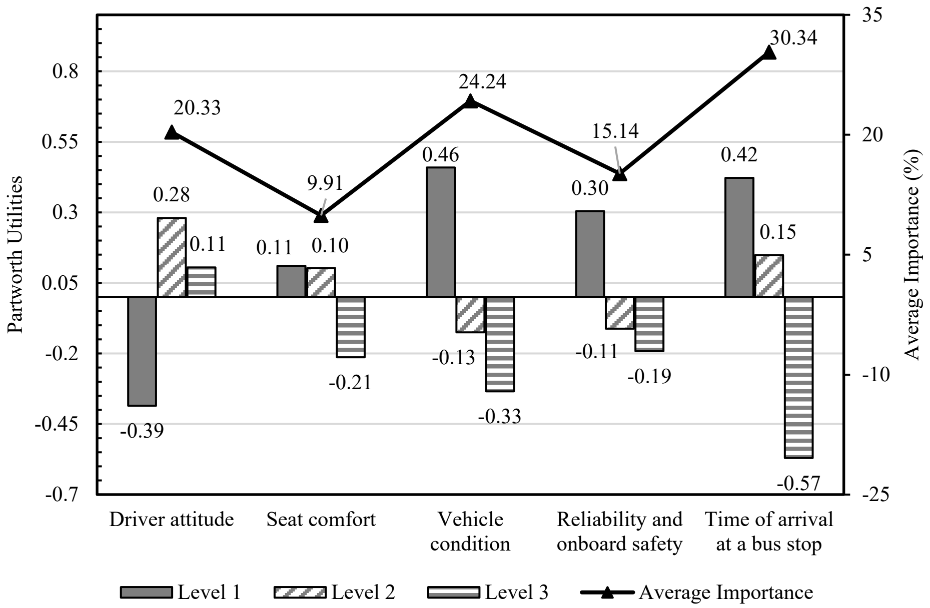

Figure 2: Average Importance and Part-Worth Utility of Attributes

3.2.3. Parth-worth Utility Values

The estimated part-worth utility values for levels of the attributes are shown in Figure 2. Positive part-worth utility values indicate a user's liking, while negative values indicate a user's disliking. Except for driver attitude, level 1 is most preferred for all attributes, followed by level 2 and level 3. For driver attitude, level 2 is the most preferred, followed by Level 3 and 1.

3.2.4. Level of Service Index

The highest and lowest U values for all possible attribute and level combinations are 1.225 and -2.048, respectively. The range between the maximum and minimum U values are divided into three categories: High, Medium, and Low. Table 7 shows the relationship between LOS and the total utility values.

Table 7: Level of Service with Total Utility

LOS	Upper Total Utility	Lower Total Utility
High	1.225	0.134
Medium	0.134	-0.957
Low	-0.957	-2.048

3.3. Segmentation Analysis

Segmentation analysis was carried out based on respondents' gender (male/female), education level (degree holder/non-degree holder), and vehicle ownership (owning a vehicle/ not owning a vehicle). For each segment, conjoint models were developed, and U values for all possible combinations of attributes and levels were calculated. A pairwise T-test was used to determine whether the U values of the segmented model were significantly different from the main model. The results are shown in Table 8, indicating that models developed with gender and vehicle ownership showed a significant difference from the main model, while education levels did not.

Table 8: Model Comparison

Comparison Models	T Value	Probability Value
Main - Male	-10.901	0.00
Main - Female	10.901	0.00
Main - Degree	1.4236	0.16
Main - No degree	-1.4236	0.16
Main - Own Vehicle	-4.369	0.00
Main - Public transport	4.369	0.00

Figure 3 shows the average importance values of the conjoint models developed using segmented data by gender. Both models show similar importance trends, with “Time of arrival at the bus stop” as the most crucial attribute and “seat comfort” as the least important.

Figure 4 shows the average importance values of the conjoint models segmented by vehicle ownership. Respondents in both categories considered “Time of arrival at the bus stop” the most important attribute, while “seat comfort” was the least important.

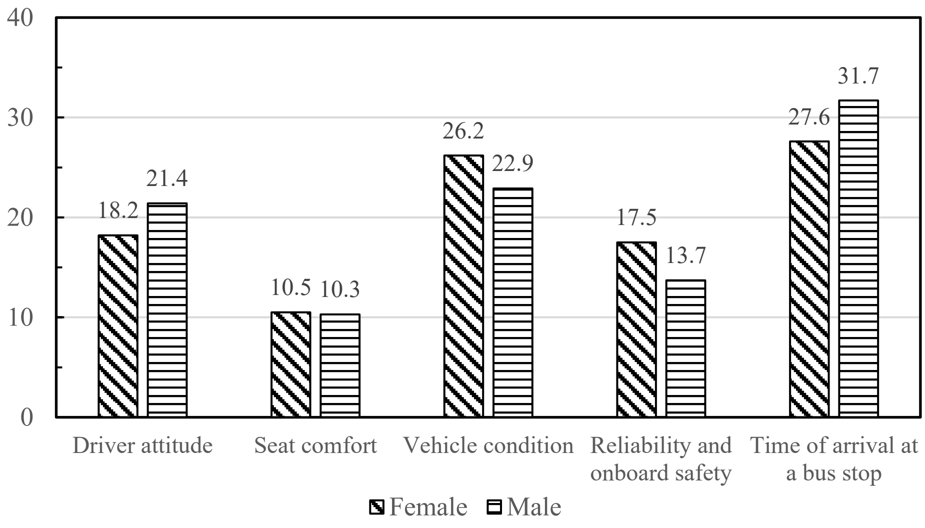

Figure 3: Comparison of male and female consideration of each attribute

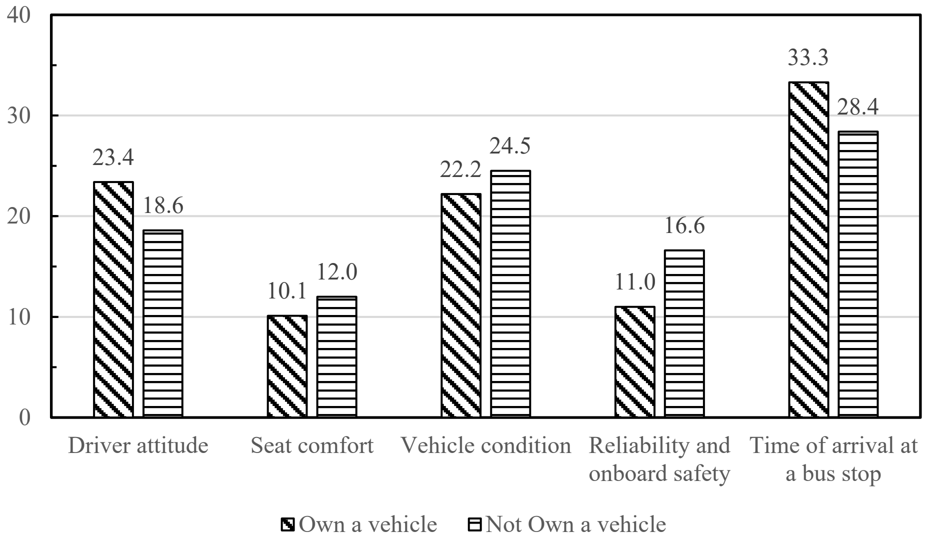

Figure 4: Comparison of own-vehicle users and public transportation users' consideration of each attribute

3.4. Interpretation of Results

The total of all part-worth utilities of an attribute will be equal to zero. The total utility of a bus service profile can be calculated by adding the Partworth utilities of the relevant attributes at respective levels and the intercept. Partworth utilities under different models, as shown in Table 9, can be used to interpret model findings in detail. For example, a bus service profile with all attributes at level 2 will have a utility value of -0.028 for males and -0.118 for females. A lower utility score for female passengers indicates a higher expectation of service quality and low tolerances. By intervention, if the driver attitude attribute could be changed to level 3 and a new bus service profile can be created, utility decreases in both genders, and the new utilities are - 0.252 and -0.197 for males and females, respectively. Females prefer the new bus service profile than males. When considering a bus service profile having the 'time of arrival at a bus stop' attribute at level 1 and all other attributes at level 2, the utilities will increase for both genders to 0.263 and 0.123 for males and females, respectively. These results would indicate that males highly prefer buses arriving on time. Similarly, policymakers and pus service providers can use Table 9 to assess the effect of changes in the attributes to the final utility and provide an effective, user-friendly bus service.

Table 9: Partworth Utilities Obtained by Different Models

Attribute	Level	Main	Male	Female	Public Transport	Own Vehicle
Intercept	--	-0.352	-0.312	-0.431	-0.369	-0.311
Driver attitude	1	-0.385	-0.376	-0.403	-0.359	-0.449
	2	0.280	0.300	0.241	0.257	0.336
	3	0.105	0.076	0.162	0.102	0.113
Seat comfort	1	0.111	0.120	0.092	0.080	0.186
	2	0.103	0.084	0.139	0.159	-0.033
	3	-0.214	-0.204	-0.231	-0.239	-0.153
Vehicle condition	1	0.459	0.443	0.491	0.481	0.405
	2	-0.125	-0.161	-0.055	-0.151	-0.063
	3	-0.334	-0.281	-0.437	-0.331	-0.342
Reliability and onboard safety	1	0.304	0.257	0.398	0.343	0.210
	2	-0.112	-0.079	-0.177	-0.138	-0.051
	3	-0.192	-0.178	-0.220	-0.206	-0.159
Time of arrival at a bus stop	1	0.422	0.431	0.406	0.395	0.489
	2	0.148	0.140	0.165	0.150	0.144
	3	-0.571	-0.570	-0.572	-0.545	-0.632

4. CONCLUSIONS

Based on a survey conducted among the transport sector experts in Sri Lanka, this study identified five key attributes influencing the service quality of public bus transport: time of arrival at the bus stop, vehicle condition, seat comfort, driver attitude, and Reliability & onboard safety. Transport experts rated these attributes as high. Furthermore, these attributes were consistently present in the studies into the service quality of bus transport [52], [55]-[57].

The stated preference survey revealed that driver attitude and vehicle condition were the most important attributes, with time of arrival at a bus stop being the least important. In contrast, the revealed preference survey showed that arrival time at the bus stop was the most significant attribute and seat comfort was the least important. Gender and vehicle ownership segmentation analysis revealed similar prioritizations across groups, with vehicle owners placing slightly more importance on time of arrival and driver attitude.

The crucial difference between the two surveys lies in the relative importance assigned to different attributes by respondents. In the stated preference survey, respondents were asked directly about their preferences and values, which led to comfort, cleanliness, reliability, and safety being ranked as the most critical factors in their decision-making. These attributes reflect the ideal conditions users desire when envisioning a perfect travel experience. Comfort and cleanliness, for instance, contribute to a pleasant and stress-free journey, while reliability and safety ensure that passengers feel secure and confident in their transportation choices.

On the other hand, the revealed preference survey, which captures actual behaviour rather than stated intentions, paints a different picture. Here, punctuality emerges as the dominant factor influencing people's choices. This indicates that while individuals may prefer comfort and cleanliness in a hypothetical scenario, their real-world decisions are more heavily swayed by the practical need for timely transportation. In daily life, the ability to reach a destination on time often outweighs the desire for a more comfortable or aesthetically pleasing environment.

This discrepancy between stated and revealed preferences underscores the importance of employing both survey methods to better understand user preferences in public transportation. The stated preference survey reveals the aspirational desires of passengers-what they ideally want from their travel experience—while the revealed preference survey provides insights into the factors that drive their decisions when faced with real-world constraints. By considering both perspectives, transportation planners and policymakers can better design and implement systems that address users' ideal and practical needs, leading to a more effective and user-centred public transportation service.

The Level of Service (LOS) Index, ranging from 1.225 to -2.048, indicates varying degrees of user satisfaction with current public bus services, with the maximum LOS value falling short of the expected +3. This gap underscores the need for improvements in public transportation services to meet and exceed user expectations. Since the time of arrival at a bus stop is valued highly by respondents in the revealed preference survey, it is recommended that a system to disseminate bus arrivals, such as a table or a real-time location app, would significantly improve the quality of the bus service. Since driver attitude is highly valued in the stated preference survey, policymakers and bus providers should invest in driver training significantly to improve their attitude and customer care.

Overall, the study emphasises the importance of punctuality and improving comfort to enhance public bus transportation attractiveness, thereby reducing dependence on private vehicles and contributing to sustainable urban mobility.

5. RECOMMENDATIONS

To enhance the development of Sri Lanka's underdeveloped public transportation system and better identify factors influencing transport mode choice, future studies should employ paper-based surveys for better respondent engagement and direct interaction. Ensuring a large, representative sample across all age groups will provide comprehensive results. A 1-100 measurement scale will help identify outliers and achieve precision. Additionally, applying both linear and logistic regression models will enhance the accuracy and reliability of findings. Implementing these recommendations will yield more robust insights into public transportation preferences in Sri Lanka.

While this study provides valid results, future studies can improve data collection and, hence, the results by employing an open-ended questionnaire at the beginning of the study to identify attributes related to public bus transport. This will alleviate some of the rigidity in the current data collection process. Further, implementing adaptive survey techniques, where questions are tailored based on previous responses, can enhance user engagement and data quality. Additionally, real-time feedback mechanisms, such as in-app surveys or post-interaction prompts, can capture user sentiments immediately after experiences, leading to more accurate data collection.

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