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Towards better public transport services: Understanding service quality attributes of public transport in states of developing countries

Anita Rosli[1,2+]
Malisah Latip[1]
Aryaty Alwie[1]
Mohamad Ibrani Shahrimin Adam Assim[1]

[1]*Department of Social Science and Management, Faculty of Humanities, Management and Science, Universiti Putra Malaysia Bintulu Campus, 97008, Bintulu, Sarawak, Malaysia.*
[1,2]*Email: anitarosli@upm.edu.my*
[1]*Email: malisah@upm.edu.my*
[1]*Email: aryaty@upm.edu.my*
[1]*Email: ibrani@upm.edu.my*
[2]*Institute of Ecosystem Science Borneo, Universiti Putra Malaysia Bintulu Campus, 97008, Bintulu, Sarawak, Malaysia.*

(+ Corresponding author)

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ABSTRACT

This research investigates the service quality attributes of PT and the influence of the attributes on users' satisfaction. Improving public transport (PT) facilities such as road networks and connectivity systems must align with service quality aspects. This research investigates the service quality attributes of PT and the influence of the attributes on users' satisfaction. A survey was conducted to examine users' perceptions of the service quality of PT in Sarawak, Malaysia. Service quality indicators have been chosen based on service quality attributes in previous research and analyzed using factor analysis (FA) to group the indicators into service quality attributes. Conformity Factor Analysis (CFA) was used to determine which attributes could significantly impact users' satisfaction. Based on the survey results, the service quality of PT services in Sarawak is average, as most of the mean scores for each indicator of service quality and user satisfaction are less than 4.0. Four service quality attributes have been obtained from FA, i.e., vehicle condition, customer service, travel experience, and accessibility. The CFA analysis and structural model results showed that the attributes of vehicle condition, customer service, and accessibility significantly positively impact users' satisfaction. The findings in this research can be used as references for PT providers, policymakers, and the government in improving the service quality of PT in Sarawak State.

Contribution/Originality: This study aims to enhance comprehension of the theoretical framework and contribute to the existing literature on public transport systems in developing nations, specifically focusing on the state of Sarawak. Limited research has been undertaken on this topic in the past.

1. INTRODUCTION

Public transport (PT) facilitates people's mobility from one place to another, such as connecting users to other cities, workplaces, service centers, schools, learning institutes, shopping places, etc. The provision of PT is according to geographical factors, the environment, the function of the areas, and community needs. Based on geographical factors, there are three types of PT, i.e., land, water, and air. The most common type of land transportation in the world is the bus, taxi, and railway, whereas water transportation consists of boats, ferries, and airplanes for air transportation. The diverse types and modes of transport allow the community to choose what suits their needs. PT is essential to society as an alternative to private vehicles and those who do not drive. Besides,

PT also contributes to national income by creating job opportunities, catalyzing economic activities, and growing the surrounding area's economy. The PT sector is the driver of national growth, and a system providing quality transportation is essential to achieving the aspirations of developed countries. It is the government's primary task to provide a transport system that is safe, reliable, affordable, and sustainable (Ministry of Transport Malaysia, 2019).

PT in crowded town areas can avoid traffic congestion, save time and petrol costs, and reduce air pollution. High population density and congested areas such as metropolitan cities and big towns need proper PT systems and various PT options to cater to the community's needs. In Malaysia, Klang Valley is a metropolitan area that covers Selangor and the Federal Territories of Kuala Lumpur and Putrajaya. These areas are also centers of industry and commerce in Malaysia. These areas have high population densities, especially Kuala Lumpur, with 8060 people per km^2; Putrajaya, with 1802 people per km^2, and Selangor, with 865 people per km^2 (Department of Statistic Malaysia, 2022). Selangor will have the highest population in Malaysia in 2022, with 21.6% of the total Malaysian population (Department of Statistic Malaysia, 2022). An integrated transportation system is provided to connect states and cities within the area. Several transportation types are provided to ease traffic movements, such as commuter rail, rapid transit, and bus rapid transit. The number of passengers on rail transports in the Klang Valley areas has increased from 2 35,375,877 in 2018 to 2 60,360,397 in 2019, whereas bus passengers have decreased from 168,709,870 in 2018 to 166,516,196 in 2019 (Ministry of Transport Malaysia, 2019). The statistic shows that rail transport users are higher than bus transport users in Klang Valley areas due to travel time, capacity, comfort, and suitability of the transport to the destination. The rail services offer higher capacity, reduced journey time, and increased travel comfort than the bus services (Avenali, Catalano, Gregori, & Matteucci, 2020). Besides, the increase in PT usage contributes to the sustainability of the environment because it could reduce the number of vehicles, which means lower emissions of pollutants, especially in urban areas. In developing countries such as Malaysia, motorised vehicles are the major contributors to air pollution in urban zones (Brohi, Pillai, Asirvatham, & Ludlow Bushell, 2018). However, the PT in other states in Malaysia differs from Klang Valley areas because other states and cities have less traffic congestion and population density.

Sarawak state is the largest state in Malaysia, and according to the Department of Statistic Malaysia (2022), Sarawak is the third contributor (9.5%) to the Gross Domestic Product (GDP) of Malaysia in 2022, after Selangor (24.8%) and Kuala Lumpur (15.7%). The service sector is the primary driver of Sarawak's economy, representing RM[1]4.7 billion, followed by other sectors such as manufacturing (RM37.2), mining and query (RM27.6 billion), and construction (RM4.5 billion). Meanwhile, utilities, transportation and storage, and communication and information are the second largest contributors to the service sector (21.9%), after wholesale and retail trade, food and beverage, and accommodation (30.1%). The transportation sector contributes to Sarawak's economy and includes PT (land, water, and air transportation) and courier. The composition of average monthly household expenses showed that transportation recorded the third highest (13.3%), after housing, water, electricity, gas, and other fuels (22.7%), and food and beverages (27.5%) (Poket Stats Negeri Sarawak, 2023).

PT choices in Sarawak are domestic buses, inter-district buses, taxis, and e-hailing services. In 2015, a mega road network project of Pan Borneo Highway was launched to improve the intercity highway network in East Malaysia (Sarawak, Sabah, Brunei, and Kalimantan), and the construction of the project has reached 89 percent progress as of October 2022 (Suara Sarawak, 2022). In addition, the Sarawak Government established the Sarawak Public Transport Committee to improve PT services in the state, which gathers information needed to identify appropriate mechanisms or methods to improve PT services (Berita Harian, 2020). Besides, the Sarawak Urban Traffic Management Committee (SUTMAC) is formed to deal with traffic problems in the city and keep pace with the pace of development in the main towns and cities in Sarawak (Astro Awani, 2022). Then the Sarawak

[1]RM refers to Ringgit Malaysia.

government is also working to provide more connectivity between cities in the state (Suara Sarawak, 2022). Sarawak's public land transportation services will be developed with a better road network.

However, enhancement to public transport facilities, road networks, and connection systems must meet the standards of service quality. For example, the bus services exhibit characteristics of being rather antiquated or in a state of disrepair, infrequent in their schedules, and lacking in punctuality. According to Resdiansyah (2018), there is a pressing need to rejuvenate the ageing bus fleet by replacing it with newer, more contemporary models. This strategic move is expected to stimulate public interest in utilising public transportation as a viable alternative. Moreover, it has been observed that the level of customer satisfaction with the inter-district bus service in the Central Region of Sarawak is quite poor, as shown by a score of 2.24 (Adler Hilary Laisak, Anita Rosli, & Nurzalikha Sa'adi, 2021). The monitoring and periodic improvement of service quality in PT is necessary due to the dynamic nature of the urbanisation process, economic growth, and regional development. The increasing population, accelerated urbanisation, and economic progress have generated a demand throughout society for travel (Nur et al, 2022). The rise in population has led to a corresponding increase in the number of privatelyowned automobiles traversing roadways. In order to mitigate the adverse effects of heavy traffic congestion, it is imperative that public transport systems be enhanced and made more efficient. According to a report by Dayak Daily (2022), the population of Sarawak was documented to be 2.453 million individuals. The data further indicates that the region experienced an annual growth rate of 0.2 percent between the years 2011 and 2020. According to a report by Utusan Borneo (2023), the population of Sarawak is approximately 2.56 million, but the number of automobiles in the region stands at 1.6 million. In comparison, Singapore, while having a smaller land area than Sarawak, has a population of six million. However, the number of vehicles in Singapore is less than 600,000. This disparity can be attributed to the very efficient public transport system in Singapore, which is widely regarded as one of the best in the world. Moreover, the escalating proliferation of automobiles serves as the primary catalyst for both road accidents and traffic congestion, particularly within urban regions. Hence, an effective approach to mitigating the number of cars on the road would involve an expansion of public transport services and an increased preference for public transport among individuals, leading to a reduction in private vehicle usage. According to a report by Utusan Borneo (2023), there is a pressing need to enhance the public transport (PT) infrastructure in Sarawak in order to address the escalating issue of road accidents. This concern is particularly prominent in major urban centres such as Kuching, Sibu, Miri, and Bintulu.

This paper investigates users' perceptions of the service quality of PT in Sarawak, such as domestic buses, inter-district buses, taxis, and e-Hailing services. Measuring the service quality aspects of PT will help better understand PT performance and users' perceptions. The research findings will provide references for PT providers, the government, and relevant agencies on which components of improvement should be made. Besides, improving PT's service quality benefits people, PT providers (businesses), and its pillars in other economic activities such as the tourism industry. This research uses a survey method to collect information among PT users in Sarawak.

1.1. Objective

This paper aims to investigate the service quality of PT in Sarawak. There are three sub-objectives that have been constructed to achieve the main objective:

a) To identify the perception of PT users towards the service quality of PT.
b) To identify indicators of service quality attributes for PT.
c) To determine which service quality attributes that influence PT users' satisfaction.

2. LITERATURE REVIEW

Services are intangible, as they cannot be seen, felt, heard, or proven until they are acquired (Pena, Silva, Tronchin, & Melleiro, 2023). Service quality describes the performance of service delivery in an efficient manner by

service providers to satisfy customer needs and meet customers' expectations. Service quality is a subjective customer comparison, as people have different attitudes, opinions, and preferences. Besides, the customer also has pre-service expectations for service delivery, which are influenced by feedback from existing customers and word-of-mouth. The service delivery outcome and the quality evaluation are both a part of the service delivery process (Asubonteng, McCleary, & Swan, 1996). Meanwhile, measuring service quality has been the subject of significant discourse in marketing research (Nur et al, 2021). Business needs to identify market needs and expectations of society towards services. Profits are linked to service quality, such as in service operations where the customer plays an active role in service delivery and directly impacts the service provider (Jeyalakshmi & Meenakumari, 2016). The success and sustainability of a business or firm depend on how well services are delivered to customers and satisfy their needs.

The objective of researching service quality is to create and establish service quality features that may be utilized to assess and gauge client satisfaction. The measurement of business performance, customer happiness, loyalty, and profitability has been a significant focus for practitioners, managers, and researchers due to the increasing importance of service quality (Agarwal & Kumar, 2016). The purpose of measuring service quality for managers and academics is to gain an understanding of the various dimensions or aspects that contribute to service quality. This understanding enables the identification of areas for development in order to enhance customer satisfaction and reduce customer switching behaviour (Mohammad, Asaad, & Ihab, 2018). Several models have been developed to assess service quality across different fields and industries. These models include SERVQUAL, put forth by Parasuraman, Zeithaml, and Berry (1988), SERVPREF, introduced by Cronin and Taylor (1992), the Retail Service Quality Scale (RSQS), developed by Dabholkar, Thorpe, and Rentz (1996), and the PCP model (pivotal, core, peripheral), proposed by Philip and Hazlett (1997) and Ighomereho, Ojo, Omoyele, and Olabode (2023). The assessment of service quality is also conducted through the utilisation of the gap analysis model (Parasuraman, Zeithaml, & Berry, 1985), as well as performance measurements including customer satisfaction surveys and internal performance analysis (Ramya, Kowsalya, & Dharanipriya, 2019). Moreover, service quality can be assessed through a range of variables, including service product, service delivery, service atmosphere, interaction quality, physical service environment quality, and outcome quality (Brady & Cronin, 2001; Rust & Oliver, 1994). The SERVQUAL model, developed by Parasuraman et al. (1988), is widely recognised and frequently employed in the field of service quality research.

Service quality studies in public transportation measure the service delivery performance of PT providers. There was an increase in service quality and user satisfaction studies of PT in the 1990s (Felina, Nur, & Abdul, 2022). PT studies have used various service quality attributes or models to measure users' satisfaction. Table 1 shows service quality studies of PT in Malaysia in the recent year (2022-2018). Previous research uses various attributes to conduct studies on the service quality of PT. The SERVQUAL model by Parasuraman et al. (1988) has been applied in a few studies to measure the service quality of PT service in general (Mohd et al, 2020), public bus services (Adler Hilary Laisak et al., 2021; Mohd et al, 2020; Nur et al, 2022) and Electric Train Service (ETS) (Sulaiman, Ibrahim, & Kaltume, 2020) while the several researchers expand the service quality attributes from the basic SERVQUAL such as Sobanah Dhevi, Sai, Vikniswari, Kalai Vani, and Suresh (2022); Mani Kanakeswary (2021); Ha, Wan Ibrahim, Lo, and Mah (2019) and Yi et al. (2018). Most recent studies on the service quality of PT have been conducted in Peninsular Malaysia areas compared to Sarawak state. Nur et al (2022) and Adler Hilary Laisak et al. (2021) employed the SERVQUAL model by Parasuraman et al. (1988) to investigate service quality and customer satisfaction of public buses, while Ha et al. (2019) used additional service quality attributes such as perceived value, comfort, safety, and security to study service quality, customer satisfaction, and customer loyalty towards e-Hailing.

2.1. Conceptual Framework

No new service quality model for public transportation has been developed specifically for the Sarawak State condition. The prior research on service quality PT and customer satisfaction in Sarawak state by Nur et al (2022); Adler Hilary Laisak et al. (2021), and Ha et al. (2019) employed the existing model or framework from past research such as SERVQUAL by Parasuraman et al. (1988). However, this research focused on creating new attributes of service quality for PT that accommodates Sarawak state conditions because different regions or states have different factors. Demographic factors, geographic factors, transportation technology, the areas' functions, and the area's size could influence the service quality indicators and dimensions. Due to those factors, service quality models or attributes may differ in regions or states.

Table 1. Service quality studies of PT in Malaysia.

Author(s) (Year)	State/Area	Type of PT	Attributes of service quality
Nur et al (2022)	Sarawak	Bus	SERVQUAL by Parasuraman et al. (1988): Tangibility, reliability, responsiveness, empathy, assurance
Adler Hilary Laisak et al. (2021)	Sarawak	Bus	
Sulaiman et al. (2020)	Kuala Lumpur	Electric train service (ETS)	
Mohd et al (2020)	Kuala Lumpur	PT services	
Mohd et al (2020)	Kuala Lumpur	Bus	
Felina et al. (2022)	Malaysia	E-Hailing	Perceived ease of use, security, perceived value
Sobanah Dhevi et al. (2022)	Penang	PT services	Reliability, accessibility, safety and security
Ibrahim, Borhan, Osman, Mat Yazid, and Md. Rohani (2022)	Klang Valley	Rail	Signage, comfort, facilities, speediness, ticketing services, staff service, safety, provision information
Shuhairy, Nor Najwa, Muhammad, Wan Ahmad, and Nor Hazwani (2021)	Northern Peninsular	Bus	On-time performance, service frequency, passenger load factor
Mani Kanakeswary (2021)	Selangor	Bus	Tangibility, reliability, responsiveness, empathy, assurance, price
Nur et al (2021)	Selangor	Bus	Reputation, value, quality
Masnita et al (2021)	Kedah	Bus	Attitude of driver, frequency, facilities
Wan et al. (2021)	Klang valley	E-Hailing	Service quality, price, comfort
Wan, Mahshar, Hashim, Anuar, and Muhammad (2020)	Klang valley	E-Hailing	
Nur', Menudin, and Nooraneda (2019)	Klang valley	E-Hailing	Service quality, customer satisfaction, brand image
Ha et al. (2019)	Sarawak	PT services	Accessibility, reliability, perceived value, comfort, safety and security
Yi et al. (2018)	Klang valley	Rail	Comfort, accessibility, safety, responsiveness
Irtema et al. (2018)	Kuala Lumpur	PT services	Core service, physical environment

The conceptual framework of the research is shown in Figure 1. Service quality indicators have been chosen based on service quality attributes in previous research. They will be analyzed using factor analysis to group the indicators into service quality attributes Table 2. Then, those attributes will be tested using Conformity Factor Analysis (CFA) to determine which attributes could significantly influence users' satisfaction with PT in Sarawak. Thus, this paper will produce a new model or framework of service quality attributes of PT that accommodates the Sarawak state context and contributes to the theoretical framework of service quality and customer satisfaction.

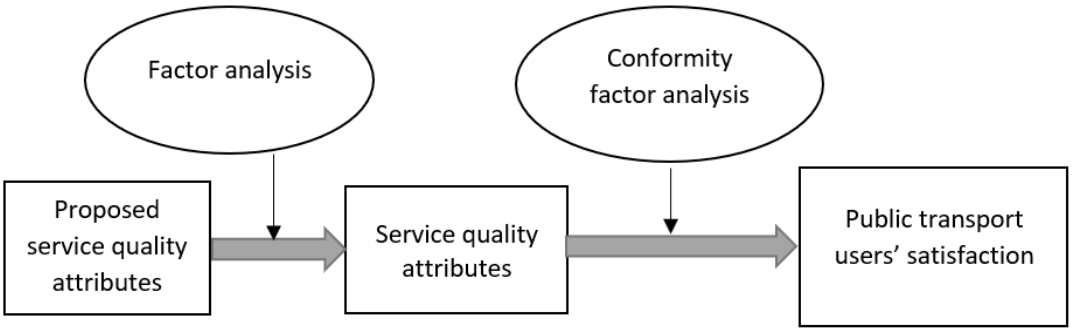

Figure 1. Conceptual framework of the research.

Table 2. Indicators of service quality and satisfaction in PT research.

No.	Indicator	References No.
Service quality		
1.	Vehicles is well maintained	50, 76
2.	Cleanliness of vehicle	1, 15,23, 30, 44, 50, 69
3.	Seat comfort	15, 23, 29, 37, 44, 69
4.	Air conditioning system	15, 29, 30, 37, 44, 69
5.	Space for luggage	44, 3
6.	Ample leg room	1, 69
7.	Seat belt is well-functioned	29, 44
8.	Appropriate speed	29, 37, 44
9.	Security	1, 15, 44, 50, 64, 69
10.	Reasonable fare	23, 30, 74, 76
11.	Information operation	15, 37, 50
12.	Easy access	30, 50, 51, 60, 64
13.	Frequency of services	23, 29, 30, 60
15.	Waiting place	1, 76
15.	Punctuality	1, 30, 44, 50, 60, 64, 76
16.	Waiting time	15, 29, 37, 69, 76
17.	Vehicle is rarely breakdown	1, 50, 76
18.	Driving attitude	1, 50, 69
23.	Readiness to serve	1, 15, 50
20	Responsibility of staff/Driver	1, 15, 45, 46, 50
21.	Number passenger load	29, 60, 76
22.	Courtesy of staff	1, 44, 50
23.	Discount fare	50, 3
24.	Driver attitude	37, 50
25	Payment method for fare	1, 29, 44, 50, 51
Users' satisfaction		
26.	PT condition	15, 37, 30, 45, 46, 50, 76
27.	Journey with PT	46, 50, 69, 76
28.	Overall satisfaction	15, 37, 46, 50, 51, 69, 74, 76,

Note: Refer list of reference.

3. RESEARCH METHOD

3.1. Data Collection

Survey research was conducted to collect users' opinions about the service quality of PT in Sarawak using questionnaires. The questionnaire has two main sections, i.e., the respondent's profile and perception towards service quality indicators. Five Likert-scales are used to measure users' perceptions of the service quality of PT, i.e., very poor, poor, average, good, and excellent. There are 11 main divisions involved in this research in Sarawak, and the number of populations for the year 2020 is 1727.3 thousand (Department of Statistic Malaysia, 2022). Referring to Figure 2, the divisions in this study are Kuching, Samarahan, Serian, Sri Aman, Sarikei, Sibu, Mukah, Bintulu, Miri, Limbang, and Betong. However, this research only covers some interior areas, as their primary connectivity is through water transportation, especially in the Kapit division. Due to the pandemic COVID-19 and the movement

control order (MCO) from 2020 to 2021, the questionnaire has been distributed through electronic media such as Facebook and WhatsApp. The questionnaire was distributed and forwarded to people willing to participate in the survey and who have experience using public land transportation modes in Sarawak, such as domestic buses, inter-district buses, taxis, e-Hailing, and rental vehicles (cars and vans).

Figure 2. Sarawak map.

Source: Dow (2021).

However, the number of populations could be a reference to determine the sample size. Calculator.net could calculate the sample size, according to Memon et al. (2020). Based on the assumption of a 5% significance level (95%), a 5% error margin, and 50% of the population proportion, the total sample size needed for this research is 385. This research employed quota sampling (non-probability) to determine the number of samples for each division. Throughout the data collection from November 2020 to July 2021, 524 respondents participated in the survey. The number of samples is larger than the number of samples needed, so the sample size is enough to represent the study population. A sample size of more than 100 and at least 300 are appropriate for factor analysis (Hair & Anderson, 1995; Tabachnick & Fidell, 2001). Table 3 presents the number of target samples and samples obtained for each division:

Table 3. Population and Sample.

Division	Population for 2020 ('000)	Percentage of population for each division (%)	Target sample	Sample obtained
Kuching	609.2	35.3	136	185
Samarahan	128.3	7.4	29	39
Serian	85.3	4.9	19	19
Sri Aman	62.2	3.5	14	14
Sarikei	44.0	2.5	10	12
Sibu	248.1	14.4	55	76
Mukah	42.3	2.4	9	13
Bintulu	178.6	10.3	40	55
Miri	248.9	14.4	55	81
Limbang	45.1	2.6	10	12
Betong	36.3	2.1	8	18
Total	1727.3	100.0	385	524

Source: Population data from Department of Statistic Malaysia (2020).

3.2. Data Analysis

IBM Amos version 28 was utilised to analyse the conformity factor analysis (CFA), while IBM SPSS Statistics version 27 was used for descriptive and factor analysis. In contrast to the standard deviation (SD), which is used to evaluate variation from the mean in distributions, descriptive analysis looks at the frequency and mean values of answers. In contrast to a lesser value of SD, a big SD value denotes greater group score variability (Allen, Bennet, & Heritage, 2019). In order to reduce the enormous number of associated variables to a manageable number and a reasonable number of factors, factor analysis is utilised (Shrestha, 2021; Verma & Abdel-Salam, 2019). CFA is used to test a researcher's or model's presented hypothesis (Hamed, Shamsul, & Neda, 2020). Additionally, CFA is a model-driven methodology that tests if the data fit the suggested model (Tavakol & Wetzel, 2020). The correlations between numerous latent constructs are then examined using structural equation modelling (SEM) methods. Through the use of CFA, the measuring model's psychometric attributes were evaluated. To estimate the model parameters in this work, robust standard errors and maximum likelihood estimation were used. The chi-square test, Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and Root Mean Square Error of Approximation (RMSEA) were used to evaluate the model's fit. The structural model was tested after determining whether the measurement model was adequate. The model was tested using SEM, and the study included assumptions about the correlations between the constructs. The SEM's usefulness was judged using the same goodness-of-fit criteria as in CFA. It also estimated regression coefficients to look into the casual links between constructs.

3.3. Pilot Test

A total of 30 samples are used to conduct a pilot test before the survey research is conducted to measure the consistency or reliability of the indicator variables. The samples for the pilot test are taken randomly from four main divisions in Sarawak, i.e., Kuching (10), Miri (6), Sibu (6), and Bintulu (8). A total of 28 indicator variables and the result of the reliability test are shown in Table 4. Cronbach's alpha for the 28 indicators is 0.980. For most research, Cronbach's alpha above 0.7 is acceptable (Allen et al., 2019). The indicator variables and the data are valid for the research.

Table 4. Reliability test for indicator variables.

Case processing summary				Reliability statistics	
Cases	N	%	Cronbach's alpha	Cronbach's alpha based on standardized items	N of items
Valid	30	100.0	0.979	0.980	28
Excluded	0	0.0			
Total	30	100.0			

4. RESULTS AND DISCUSSION

4.1. Respondents' Profile

Table 5 shows the profile of the respondents to the survey. About 40.27% of males and 59.73% of females are involved in this survey, whereas 63.74% of respondents are in the age category of 21 to 40 years old. Dayak ethnicity recorded the highest participation (38.17%), followed by Malay ethnicity (36.45%) and other ethnicities. Dayak is the highest ethnicity in Sarawak, followed by Malay, Chinese, and other ethnicities (Demographics of Sarawak, 2023). The percentage of respondents represents the population distribution according to ethnicity. Approximately 72% of respondents are upper-six students (38.17%) and diploma holders (34.73%). Based on the type of occupation, 42.94% of respondents are higher education students, and as we know, PT is primary transport for students as most do not have their own transport. Then, according to household income, 67.56% of respondents obtained income of RM3719 and below, which is the lower income group. PT users are usually lower-income groups as they cannot afford to buy their transportation compared to middle- and higher-income groups. However, 63.93% of respondents reported having transportation (either a motorcycle, car, or van).

Table 5. Respondents' profile.

Demographic characteristics	Frequency	N (%)	Mean	SD
Gender			1.597	0.490
Male	211	40.27		
Female	313	59.73		
Age category (Years old)			2.251	1.014
20 and below	135	25.76		
21 – 30	192	36.64		
31 – 40	142	27.10		
41 – 50	40	7.63		
51 and above	15	2.86		
Race/Ethnic			2.187	1.337
Malay	191	36.45		
Dayak	200	38.17		
Melanau	41	7.82		
Cina	45	8.59		
Orang ulu	30	5.73		
Others	17	3.24		
Education level			5.2424	1.265
Primary school	5	0.95		
Lower secondary school	63	12.02		
High secondary school	30	5.73		
Upper six	200	38.17		
Diploma	182	34.73		
Bachelor	24	4.58		
Master	10	1.91		
Doctor of philosophy	10	1.91		
Household income			1.40	0.627
B40 (3719 and below)	354	67.56		
M40 (3720 - 8649)	130	24.81		
T20 (more 8649)	40	7.63		
Occupation			4.530	2.052
No occupation/No permanent job	34	6.49		
School students	9	1.72		
High education student	235	42.94		
Housewife	21	4.01		
Private worker	106	20.23		
Government worker	102	19.47		
Self-employed	18	3.44		
Others	9	1.72		
Having personal transport			1.360	0.480
Yes	335	63.93		
No	189	36.07		

4.2. PT Usage

Table 6 presents the usage of PT among respondents. Respondents have used a few types of PT. About 78% of respondents have used e-Hailing, 60.69% have used inter-district buses, 43.89% have used domestic buses, and about 40% have used taxis. Registered rental cars or vans, respectively, and 34.16% have used unregistered rental cars or vans. E-hailing services are popular PT as they are easy to access, flexible compared to buses, and cheaper than a taxi and rental cars or vans. Passengers will book through mobile apps and fetch passengers anywhere as long as the passenger location can be detected in the mobile apps. e-hailing application also eases drivers by allowing passengers to reach their destinations by car, enabling the drivers to instantiate appropriate payment methods, and detecting passengers who are ready to travel (Wan et al., 2020). Regarding the frequency of PT, 48.56% of respondents only used PT once to 3 times per year, while 27.10% have used PT more than ten times per year. The three main purposes of using PT are to travel to other districts (52.10%), go to the airport (50.38%), and not have their transport (41.03%). As Sarawak has a wide area, the inter-district bus is the main option for inter-

district movement because it is cheaper than airplanes, taxis, and e-Hailing services (Adler Hilary Laisak et al., 2021).

Table 6. PT usage.

PT usage	Frequency	Percentage (%)
Type of PT		
Domestic bus	230	43.89
Inter-district bus	318	60.69
Registered rental car or van	213	40.65
Unregistered rental car or van[2]	179	34.16
E-hailing (Grab, maxim, etc.)	410	78.24
Taxi	211	40.27
Frequency using PT in a year		
1 to 3 times	244	48.56
4 to 6 times	93	17.75
7 to 10 times	45	8.59
More than 10 times	142	27.10
Reasons using PT		
Do not have a vehicle	215	41.03
When a personal vehicle breaks down	127	24.24
Avoid traffic congestion	123	23.47
Go to the airport	264	50.38
Travel between districts/Cities in Sarawak	273	52.10
Others	128	24.43

4.3. Users' Perception towards Service Quality of PT

Twenty-eight service quality indicators have been selected for this research. These indicators from previous research are common in measuring PT service quality, such as buses, taxis, and e-Hailing services. The perception of PT users towards selected service quality indicators is presented in Table 7. Based on the mean score, it shows the quality of PT services in Sarawak, including inter-district buses, taxis, and e-Hailing services, either unregistered or registered, is at an average level, as most of the mean score for each indicator of service quality and users' satisfaction is less than 4.0, except payment method for the fare. In conclusion, PT providers in Sarawak must improve the quality of service delivery to be good and excellent.

4.4. Factor Analysis of Service Quality Attributes

Table 8 presents the result of the factor analysis for service quality indicators for public transport. A total of 24 indicators have been grouped into four service quality attributes or factors, except one indicator, discount fare, with a loading value less than 0.3. The factor loadings less than 0.3 will be suppressed as they do not meet the minimum level for structure interpretation (Allen et al., 2019; Tavakol & Wetzel, 2020). The factor loadings of more than 0.4 indicate that they represent the factor (Shrestha, 2018). Thus, this research took indicators where the loadings value was greater than 0.4 to represent the factors. There are service quality attributes obtained i.e., vehicle condition, customer service, travel experience, and accessibility.

The vehicle condition attribute exists based on users' observations of the physical condition of public vehicles. Passenger seats, cleanliness, an air conditioning system, ample legroom, well-maintained vehicles, and luggage space represent the attributes.

[2] Personal vehicles that have not registered as public transport but carry passenger.

Table 7. Users' perception towards service quality and users' satisfaction of PT.

No.	Indicator	Perception					Mean	SD
		Very poor	Poor	Average	Good	Excellent		
Service quality								
1.	Vehicles is well maintained	4	40	174	201	105	3.693	0.902
2.	Cleanliness of vehicle	14	40	160	202	108	3.668	0.974
3.	Seat comfort	7	47	129	207	134	3.790	0.968
4.	Air conditioning system	5	45	134	189	151	3.832	0.973
5.	Space for luggage	6	30	137	209	142	3.862	0.920
6.	Ample leg room	3	52	142	200	127	3.756	0.950
7.	Seat belt is well-functioned	15	36	96	186	191	3.958	1.039
8.	Appropriate speed	6	30	148	211	129	3.815	0.909
9.	Security	3	41	139	202	139	3.826	0.930
10.	Reasonable fare	12	48	148	193	127	3.719	1.000
11.	Information operation	15	39	155	194	121	3.700	0.997
12.	Easy access	9	42	162	184	128	3.725	0.976
13.	Frequency of services	9	35	156	200	124	3.754	0.947
14.	Waiting place	23	39	131	197	135	3.733	1.055
15.	Punctuality	15	53	156	179	121	3.645	1.032
16.	Waiting time	16	64	194	166	84	3.454	0.998
17.	Vehicle is rarely breakdown	9	30	138	181	166	3.887	0.976
18.	Driving attitude	10	32	148	205	129	3.784	0.948
19.	Readiness to serve	4	21	163	204	132	3.838	0.875
20	Responsibility	4	19	162	207	132	3.847	0.867
21.	Number passenger load	23	47	117	159	178	3.805	1.131
23.	Courtesy of staff	8	19	152	212	133	3.845	0.896
23.	Discount fare	57	70	148	138	113	3.343	1.256
24.	Driver attitude	7	29	154	201	133	3.809	0.92
25	Payment method for fare	10	23	107	197	188	4.013	0.9509
Users' satisfaction								
26.	PT condition	4	25	138	234	123	3.853	0.858
27.	Journey with PT	4	21	139	204	156	3.929	0.888
28.	Overall satisfaction	12	25	159	199	129	3.779	0.948

Table 8. Factor analysis of service quality indicators.

No.	Factor	Indicator	Symbol	Loadings
1	Factor 1: Vehicle condition (VC)	Seat comfort	VC1	0.852
2		Cleanliness of vehicle	VC2	0.793
3		Air conditioning system	VC3	0.724
4		Ample leg room	VC4	0.703
5		Number passenger load	VC5	0.694
6		Vehicles is well maintained	VC6	0.657
7		Space for luggage	VC7	0.645
8	Factor 2: Customer service (CS)	Courtesy	CS1	0.795
9		Vehicle is rarely breakdown	CS2	0.773
10		Driver attitude	CS3	0.762
11		Responsibility of staff/Driver	CS4	0.624
12		Readiness to serve	CS5	0.620
13		Payment method for fare	CS6	0.517
14	Factor 3: Travel experience (TE)	Appropriate speed	TE1	0.710
15		Driving attitude	TE2	0.683
16		Reasonable fare	TE3	0.678
17		Seat belt is well-functioned	TE4	0.638
18		Security	TE5	0.582
19	Factor 4: Accessibility (AC)	Easy access	AC1	0.774
20		Frequency of service	AC2	0.744
21		Operation information	AC3	0.705
23		Waiting place	AC4	0.627
23		Punctuality	AC5	0.434
24		Waiting time	AC6	0.401

The attribute that public vehicles represent is rarely having a breakdown, staff responsibility, and readiness to serve passengers. Customer service represents service by the driver and staff. The third factor is users' experience traveling with PT, and the attributes are appropriate speed, driving attitude, reasonable fare, security, and seat belt. Even though four indicators are appropriately labeled as safety attributes, such as speed, driving attitude, seat belt, and security, the fare price factor has been grouped into this attribute; thus, this group is labeled as travel experience as it is related to the value of money they spend for the services. Then the fourth factor is accessibility, represented by the frequency of services, availability of information operations, flexible waiting places, punctuality, waiting time, and easy access. Accessibility refers to people's ease of getting to and alighting the vehicle (Felina et al., 2022; Van Lierop, Badami, & El-Geneidy, 2018). The result of the factor analysis provides valuable information for PT providers and policymakers to focus on certain factors in improving the quality of service delivery to users.

4.5. Measurement Model

To get the measuring model to work satisfactorily in this investigation, pooled CFA was used. Browne and Cudeck (1993); Bentler (1990); Bollen (1990) and Marsh and Hocevar (1985) proposed four goodness-of-fit indices: the Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), Normed Fit Index (NFI), and chi-square ($\chi 2/df$) to assess the model's fit. The goodness-of-fit metrics for each variable in the original measurement model are displayed in Table 9. The relative Chi-Square was 2.642, which is below the threshold level of 3.0, while the relative RMSEA result was 0.071, which is below the proposed value of 0.08. The CFI and NFI results were both greater than the advised values of 0.90 and 0.90, respectively. The results of the study of the measurement model are shown in Figure 3. In essence, the initial measurement model showed good fit in all four categories of indices.

Table 9. Result of goodness of Fit for pooled CFA measurement model.

Name of category	Name of index	Recommended value	Result
Absolute fit	RMSEA	RMSEA < 0.08	0.071
Incremental fit	CFI	CFI > 0.90	0.939
	NFI	NFI > 0.90	0.918
Parsimonious fit	Relative chi-square	Chi-sq/Df < 3.0	2.642

As recommended by Hair, Black, Babin, and Anderson (2010), the standardized factor loadings for each item in the models are all greater than the necessary value of 0.60. According to Hair et al. (2010), each construct's Cronbach's alpha value was greater than 0.70. Cronbach's alpha coefficients for the five constructs ranged from 0.809 to 0.915, indicating high internal consistency. Table 10 displays the condensed validity and reliability analysis results.

4.6. Structural Model

The findings of this study's SEM analysis are shown in Figure 4. The relative chi-square index ($\chi 2$ / df) for the structural model was satisfactory, coming in at 2.642 and falling short of Kline (2011) recommended cutoff point of 3.0. Fit indexes with CFI and NFI values greater than 0.90 (Bentler, 1990; Bentler & Bonett, 1980) and RMSEA values less than 0.08 (Browne & Cudeck, 1993) are indicative of good match. In this investigation, it was discovered that CFI was 0.939, NFI was 0.918, and RMSEA was 0.071. These results demonstrate the existence of a good match. The goodness-of-fit indices suggest that the data generally agree with the structural model. According to the graph, accessibility, travel experience, customer service, and vehicle condition account for 69% of the variance in passenger satisfaction ($R2 = 0.69$).

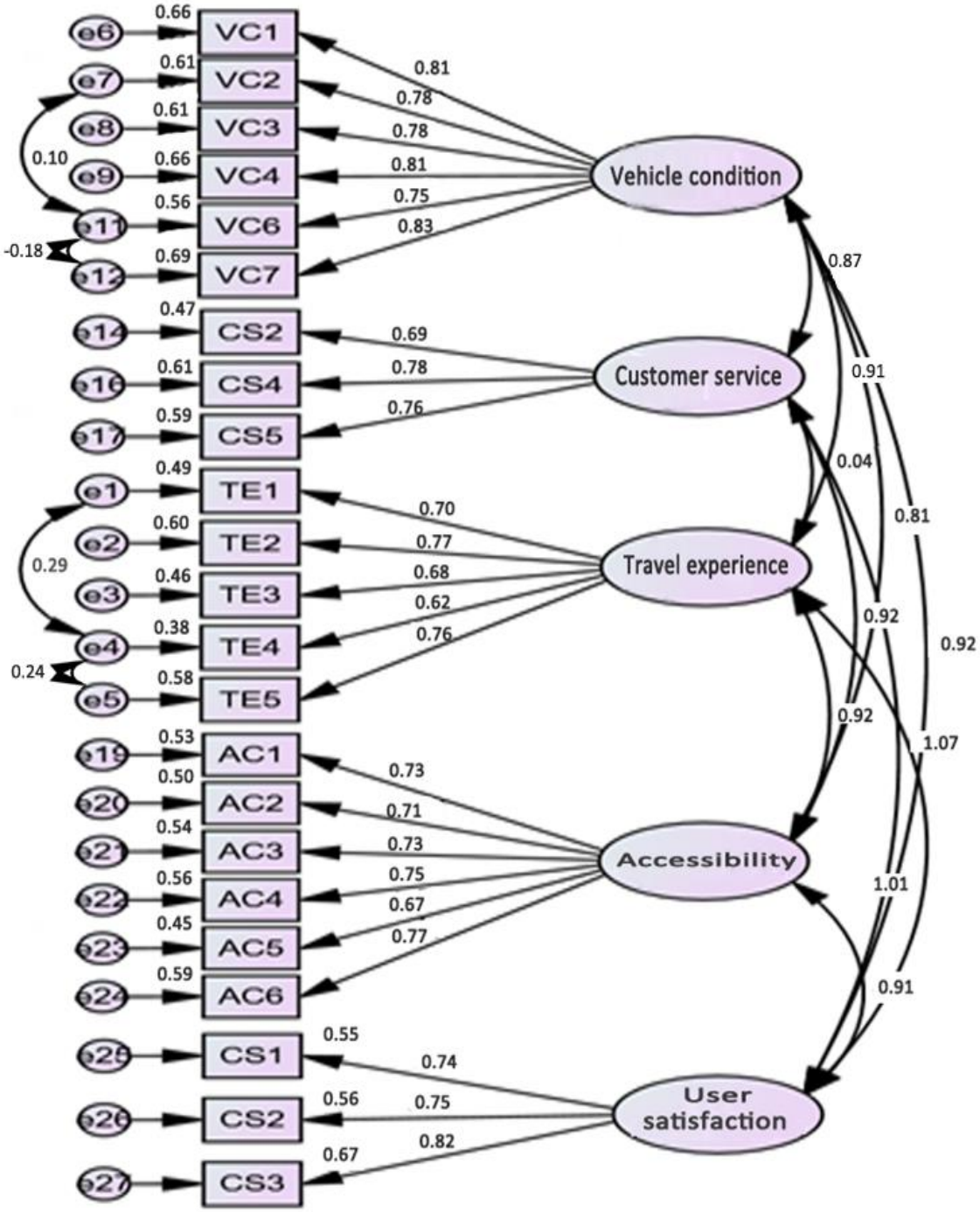

Figure 3. Results of confirmatory factor analysis.

The results of the hypothesis testing are summarised in Table 11. Four hypotheses on the elements affecting public transport customers' happiness in Sarawak state were put to the test. The association between vehicle condition and passenger happiness exhibited significant findings, according to the AMOS text output result (β = 0.339, $p < 0.001$). The impacts of accessibility (β = 0.141, $p < 0.001$) and customer service (β = 0.621, $p < 0.001$) on traveller satisfaction were also highly significant. However, the results of this study's analysis of travel experience are not significant (β = 0.05, $p > 0.001$). As a result, only H1, H2, and H4 were supported. Users' satisfaction with PT in Sarawak would rise because of the rising service quality factors of vehicles.

Table 10. Summary results of CFA for the initial measurement model.

Construct	Items	Factor loading (>0.6)	Cronbach's alpha (> 0.7)
Vehicle condition (VC)	VC1	0.81	
	VC2	0.78	
	VC3	0.78	
	VC4	0.81	0.915
	VC6	0.75	
	VC7	0.83	
Customer service (CS)	CS2	0.69	
	CS4	0.78	0.826
	CS5	0.76	
Travel experience (TE)	TE1	0.70	
	TE2	0.77	0.889
	TE3	0.68	
	TE4	0.62	
	TE5	0.76	
Accessibility (AC)	AC1	0.73	
	AC2	0.71	
	AC3	0.73	
	AC4	0.75	0.880
	AC5	0.67	
	AC6	0.77	
Users' satisfaction	US1	0.74	
	US2	0.75	0.809
	US3	0.82	

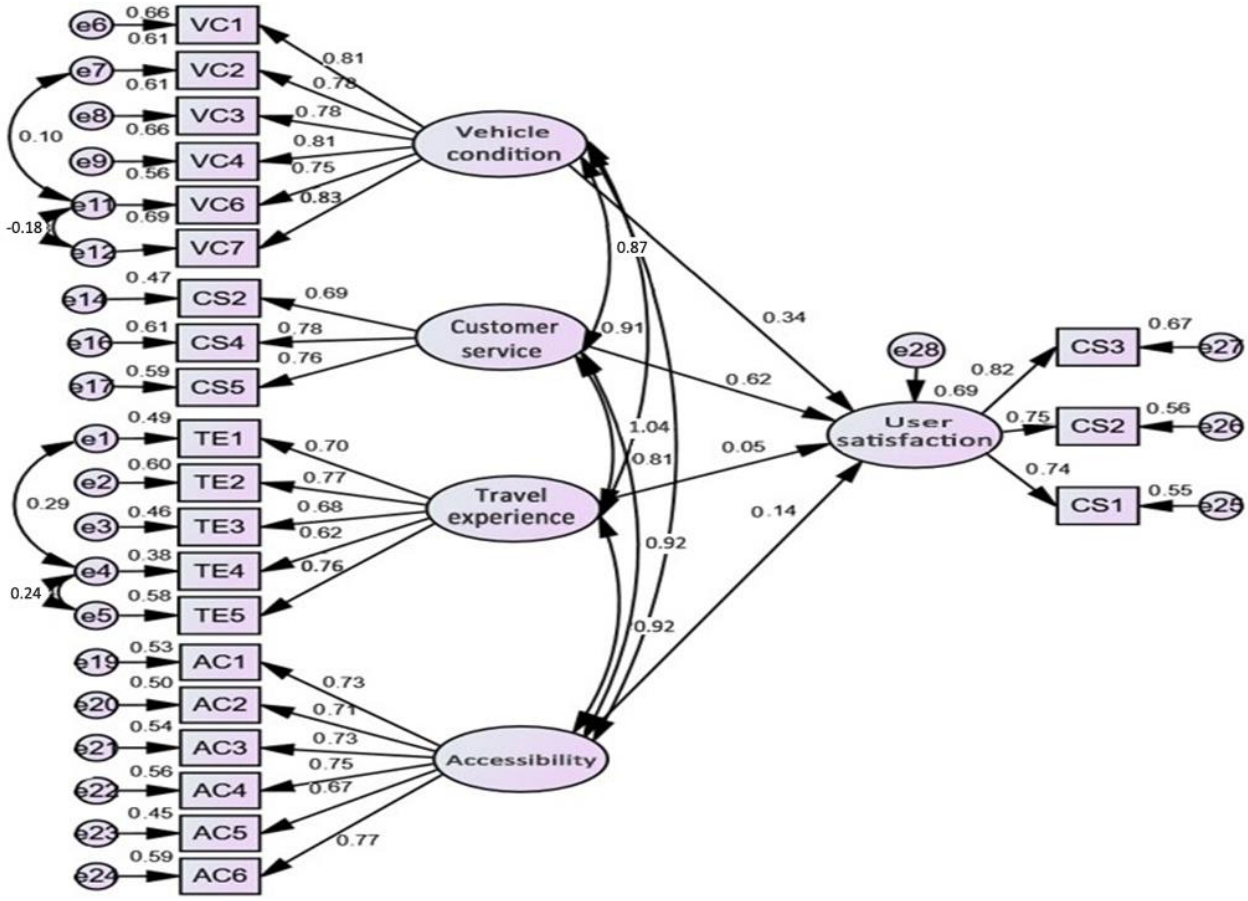

Figure 4. Results of structural equation modeling analysis.

Table 11. Results of hypothesis testing for factors influencing the users' satisfaction toward PT.

Hypothesis statement		ß	S.E.	C.R.	*p*	Results
H1a	Vehicle condition has a positive impact on users' satisfaction.	0.339	0.052	7.062	***	Supported
H1b	Customer service has a positive impact on users' satisfaction.	0.621	0.057	11.724	***	Supported
H1c	Travel experience has a positive impact on users' satisfaction.	0.050	0.044	1.049	0.294	Not supported
H1d	Accessibility has a positive impact on users' satisfaction.	0.141	0.045	2.919	0.004	supported

Note: ß : Standardized beta coefficient.
S.E.: Standard error.
C.R.: Critical ratio.
***: Significant at 0.001 level.

The first significant attribute is vehicle condition. The physical characteristics of public vehicles are considered the first impression of the vehicles and the main thing that users will evaluate because the public vehicles should be appropriate for traveling purposes and passengers should feel comfortable with them. The environment in vehicles has a major impact on public transportation choices (Chen & Li, 2017). Users need PT with proper luggage space, comfortable, ample leg room, good air conditioning, and is well-maintained, especially when passengers need to travel a long distance, such as to other districts or cities. Comfortablility in public vehicles is the most important factor for intercity or interurban passengers (Hansson, Pettersson, Svensson, & Wretstrand, 2019). *Customer service* is the second attribute that significantly impacts users' satisfaction. How a PT user perceives his or her interaction with a PT agency's bus drivers and personnel is an important indicator of overall satisfaction (Grujičić, Ivanović, Jović, & Đorić, 2014; Mouwen, 2015). Poor quality of service experience impacts customer satisfaction and will increase negative attitudes towards the intention to use PT (Muhammad, Irfanullah, Farhatullah, Naseem, & Ahmad, 2014). The third characteristic that significantly affects satisfaction is accessibility. Users' happiness will decrease if PT is late and has lengthy waits. Lai and Chen (2011); Nwachukwu (2014) and Tyrinopoulos and Antoniou (2008), and others have discovered that the standard of the waiting environment affects both general satisfaction and loyalty. However, according to this study, the quality of the trip experience has little effect on how satisfied people are. In Sarawak, users' happiness is unaffected by the standardization of public transportation costs and speeds, particularly for buses. Public bus drivers are subject to compounding up to a maximum of RM300 if they exceed the national speed limit (for Malaysia), which is 90 km/h.

Furthermore, since this study comprises a general assessment of all forms of public land transportation in Sarawak, travel experience may be irrelevant for this study. Each PT has its own characteristics; therefore, travel experiences vary depending on the type of public transportation. Therefore, more research is required to determine the connection between passenger pleasure and particular PT forms of transport.

5. CONCLUSION

5.1. Main Findings

This research has developed a new model or framework for service quality attributes or dimensions of PT that accommodate Sarawak state conditions. The four service quality attributes have been developed from 24 indicators, i.e., vehicle condition, customer service, travel experience, and accessibility (refer to Figure 5). However, the hypothesis showed that vehicle condition, customer service, and accessibility would increase users' satisfaction with PT in Sarawak, as these have significant relationships with users' satisfaction. At the same time, the travel experience dimension does not significantly influence user satisfaction in this study.

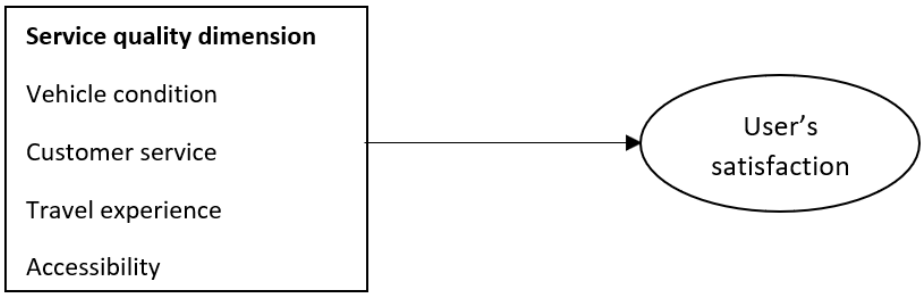

Figure 5. Service quality dimensions and user's satisfaction.

5.2. Theoretical and Managerial Implications

Factor analysis helps categorize large numbers of indicators into minor attributes. There are changes in some indicators and attributes of service quality. For example, speed indicators, driving attitudes, and security are usually grouped into safety attributes. However, in this study, those indicators were grouped with the reasonable fare and seat belt and labeled as travel experience attributes. The service attribute indicators differ in each research study based on the subject and place of the research. Next, specific indicators are omitted to obtain a good measurement model when those attributes are tested using CFA, such as passenger load factor, courtesy, driver attitude, and payment method. The data could influence the measurement model, and the questionnaire preparation is critical to determining the quality of the data collected. Then, in the structural model, three out of four attributes have a significant positive impact on PT users' satisfaction, i.e., vehicle condition, customer service, and accessibility have a significant positive impact on the user's satisfaction. The findings of this study are expected to provide an understanding of the theoretical framework and contribute literature with the empirical testing of service quality attributes and satisfaction hypotheses to academicians and relevant practitioners. Regarding managerial implications, PT providers must ensure that public vehicles have occasional maintenance and improve operation schedules to ensure the vehicles are in good condition and operate efficiently. Besides, public bus providers must provide communication and customer service training to their staff to enhance customer communication skills.

5.3. Research Limitation Dan Recommendations for Future Research

This research only measured service quality in general for all types of PT available in Sarawak. Different types of public vehicles may have different characteristics, such as the size and design of the vehicles and passenger capacity. For example, the bus has different conditions compared to the car, as the bus could load more passengers and have more space for luggage than a car. Nevertheless, using a rental car or taxi is more comfortable than a bus because it is more private for passengers. Thus, the service quality attributes from this research should be applied and tested on other PT studies to evaluate if the model fits with the study's subject and location. Based on the Sarawak state context, the vehicle condition, customer service, and accessibility of PT services significantly impact users' satisfaction. Thus, PT providers, the Sarawak City Traffic Management Committee, and even policymakers should pay attention to these attributes to improve the service quality of PT.

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