

DEVELOPMENT AND VALIDATION OF A PUBLIC BUS SERVICE QUALITY SURVEY IN KUCHING, SARAWAK

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Abstract — A well-structured and validated questionnaire is necessary to guarantee the validity, reliability and relevancy of data gathered. Despite its importance, limited research was done on the methodical creation of survey instruments for public transport studies. This has led to inadequate or irrelevant findings towards bus user perceptions or expectations and probably overlooked the important factor that is governing the service quality of public bus transport in Kuching. To fill the gap, this study adapted a three-phase questionnaire formulation process which entails the development of a survey questionnaire on service quality, validity and reliability of the public bus transport (SQPB) through pilot testing. A thorough procedure was developed in this study to ensure that the survey questionnaire was truly relevant and represented the study area, particularly in Kuching, Sarawak. The objectives of this study were to develop a survey questionnaire that was aimed at assessing the service quality of public transport in Kuching, validate the survey questionnaire through content validation and lastly evaluate the reliability of the survey instrument by using the statistical package for the social science (SPSS) software. The findings were focused on reliability, accessibility, and comfort, as well as safety and security dimensions in the SQPB questionnaire. For reliability testing, SPSS software was used to study the reliability of items. The result of Cronbach's alpha value showed more than 0.7 for every domain, which was categorised as high internal consistency and reliability for the questionnaire. Specifically, the Cronbach's alpha values obtained were 0.707 for reliability, 0.878 for accessibility and 0.770 for the comfort dimension. These findings demonstrated that the SQPB questionnaire that was designed particularly in Kuching is a valid and reliable instrument for estimating the service quality factors that led to lower ridership issues in the city. Therefore, this study had strengthened the underlying factors affecting service quality by focusing on the context of transport assessment, particularly in a developing urban public transport system.

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Keywords: service quality, public bus, user perception, content validity, reliability testing

1.0 INTRODUCTION

Service quality plays a vital role in the public transport sector, influencing both user satisfaction and the overall effectiveness of transport systems. According to TCRP Report 165, service quality is defined as the overall measured or perceived performance of transit service based on passenger opinions [1]. Service quality is identified as a key metric for evaluating the performance of public transport [2]. In the transport field, service quality can be measured by bus users [3] and bus operators [4]. Many studies were conducted worldwide to measure the service quality based on user perceptions through a survey questionnaire. For instance, a study conducted in Dhaka, Bangladesh, revealed that the service quality of mass rapid transit (MRT) underscored a critical role by maintaining a strict schedule, time headway, and ensuring safety, security and regularity to achieve reliability amongst users [5]. The researcher mentioned that the research on the public transport service quality evaluation topic was widely discussed within developed countries, while in developing countries the estimation of service quality by using user perceptions is relatively a new concept, as these indicators can be used more precisely as a service quality estimation [3].

Many studies have been conducted to study the reliability and validity of survey questionnaires, which focused more on medical and health studies [6], science studies [7], and the tourism area [8]. The development of survey questionnaires, particularly on transport, is very limited, especially when it involves validation and reliability of the survey questionnaire. Most previous studies adapted general questionnaires or those from the other countries without making sure if they fit the local context or need, and thus led to inaccuracy of data that did not truly reflect

the real situation in measuring the service quality of public transport. This phenomenon was attributed to potential bias and variability in respondent perceptions, as they came from different socio-demographic backgrounds and service providers. The respondent variations were also governed by the heterogeneity of user preferences, views and values of time in service reliability [9].

This study outlines the important keys to developing a survey questionnaire in the context of validity and reliability testing related to the public transport area and bridging the research gap by developing and testing the survey questionnaire that is suitable for Kuching's public transport system, focusing on what users really think and experience. Designing a questionnaire requires proper planning to ensure that relevant questions and items are considered in a way that reflects the specific constructs to be measured in the research [10]. It starts with selection of parameters or attributes in designing the survey, as the choice determines the direction of research objectives. This can be accomplished by adapting established theories, models, frameworks, or published questionnaires relevant to the research study. For instance, in the context of transport studies, the SERVQUAL model was adapted to explore accessibility and service quality perceptions on local public transport in Thailand based on 10 components which comprised 40 indicators [11]. Unfortunately, SERVQUAL dimensions failed to capture specific attributes, for example, safety, accessibility and staff behaviour. These limitations were highlighted in the study conducted, whereby they emphasised the addition and adaptation of dimensions, such as accessibility, sustainability and technology, to reflect the realities of public transport [12, 13].

Development of survey questionnaire items can also be generated by utilising literature reviews [14] and examining similar topics in the context of conducting surveys on public transport. For example, the selection of service attributes based on literature and data availability in previous research, such as system safety, cleanliness, passenger comfort, servicing and passenger information [15]. Criteria like population, context and objectives of the existing questionnaire must be considered when adapting the standard or guidelines [16]. The instrument established by previous researchers had provided crucial conceptual foundations for understanding passenger evaluations, especially in public transport service quality. However, these instruments are adapted mostly in high ridership and efficient public transport that has consistent service delivery in place and homogenous user behaviour. In contrast, public bus transport in Kuching experiences low ridership and longer travel time, which has contributed to the new proposed instrument that replicates the Kuching context rather than the existing scales [17, 18].

In the validation process, content validation is to ensure the survey questionnaire truly serves the objectives. The process would include several experts reviewing the questions in the context of suitability and relevance to the study objectives [19]. According to previous research, 13 experts were required to validate the questionnaire for the Malaysian healthier logo [20], 42 experts to develop the personalised exercise questionnaire [21] and 15 experts to be involved in the perceptions study [22]. To proceed with the real survey, the content validation index (CVI) was used to ensure the questions were relevant and served the objectives. The reference value of I-CVI was according to Lynn [22], whereby an item that has an I-CVI value of more than 0.79 will be retained; a value between 0.70 and 0.79 requires revision or modification, and a value below 0.70 shall be eliminated in the study [23]. The value depends on the research expert's judgements on the item by using a Likert scale, which assesses grammatical errors, appropriateness of wording and scoring and necessity of selecting the most crucial and correct content in the instrument [24]. A previous study conducted content validation by using eleven experts and found that about 70%–88% of the questions were questionable, while 69% were rejected due to writing problems, uncertainty, redundancy and conciseness [25].

As for reliability, it will be checked through pilot testing. Cronbach's alpha value is used to determine the inter-item reliability, while ICC and *p*-values are used to find the test-retest reliability. These are used to determine the internal consistency and correlation in the research study [26]. The excellent reliability of Cronbach's alpha value ranges between 0.90 and above; very good strength is between 0.8 and <0.9; good strength is between 0.7 and <0.8; moderate and poor strength are between 0.6 and <0.7 and <0.6, respectively [27]. Cronbach's alpha value is used to measure the consistency or reliability between several items, measurements or ratings [28]. Reliability testing is an important part of survey questionnaire analysis that includes a Likert scale rating scale. It checks how consistent the different parts of the measuring tool are and whether the scale items are in the right place and measure the same thing.

This study systematically describes the development of the survey questionnaire to ensure its contextual suitability and representativeness of the study area, thereby enhancing the validity and reliability of findings. Therefore, this study will highlight these three objectives, which are to develop a survey questionnaire aimed at assessing the service quality of public transportation in Kuching, to assess the validity of the survey questionnaire through content validation and lastly to evaluate the reliability of the survey instrument by using SPSS software. The research findings are to ensure the reliability and validity of the survey questionnaire accurately assess the service quality of public transport, as it guarantees that the collected data are consistent, meaningful and reflective of passengers’ true experiences, by supporting informed improvements and policy decisions.

2.0 MATERIALS AND METHODS

This methodological study used a mixed-method approach to design a survey questionnaire of the service quality of public buses (SQPB) in East Malaysia, Kuching, Sarawak. Public bus transport in Kuching, Sarawak, was selected in this study, as Kuching has a notably low public transportation ridership, which has contributed to worsening traffic congestion in Kuching’s vicinity. This methodology incorporated both qualitative and quantitative approaches. Figure 1 illustrates the division of the questionnaire development process into three distinct phases. Phase 1 was dedicated to questionnaire design, necessitating an exhaustive literature review to facilitate the development of the SQPB questionnaire. To guarantee its relevance and appropriateness, Phase 2 focused on validity assessment, which involved the development of content validity through expert reviews. Phase 3 of the evaluation process involved internal consistency reliability tests to ascertain the sturdiness of the quality components of the SQPB questionnaire.

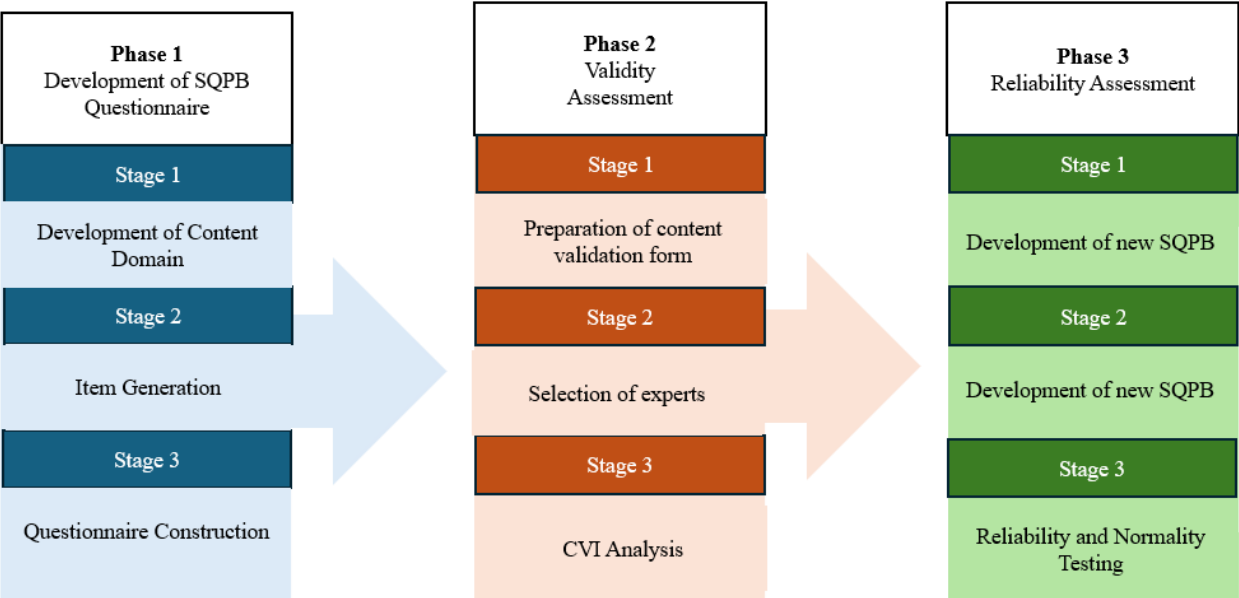


Figure 1 Flowchart of methodology adapted

2.1. Phase 1: Development of SQPB Questionnaire

2.1.1. Stage 1: Development of content domain

This phase adopted a qualitative approach, comprising three key stages: defining content domain, generating items through content sampling and constructing the questionnaire. An extensive literature review established the content domain as the first stage of the process. This review provided a detailed understanding of specific areas related to the variables under investigation, outlining the boundaries, dimensions and components of the target construct. By systematically defining the relevant attributes and characteristics, this foundational step ensured a clear focus on essential aspects of the measured variable. A literature review was conducted to identify validated questionnaires and previous studies on the service quality of public buses.

2.1.2. Stage 2: Item Generation

During this stage, item generation involved selecting items that accurately represent the content domain. To ensure alignment with the research objectives, research questions were revisited, and the items were crafted to directly reflect the core ideas of the study. This process was vital for ensuring that the items were relevant and consistent with the research questionnaire questions. In designing a survey questionnaire to determine the quality of public bus transportation services, a thorough analysis had been carried out to select the attributes or parameters that best represented the actual condition of the case study. This study designed the survey questionnaire based on previous literature that had combined subjective and operational attributes of service quality. The selection was based on a study established by previous studies [3, 10, 15]. They combined attributes that were subjectively and objectively graded. For subjective attributes, most studies examined bus users' perceptions about service quality. The service quality attributes are summarised in Table 1.

Table 1 Service Quality Attributes From Previous Studies

Service Factor	Service Quality Attributes	Reference
Itinerary accuracy		[15]
Route Characteristics	Path	[8,1]
	Number of stops and distance between stops	[8,1]
	Bus stop location	[8]
Service Characteristics	Service Frequency	[8,1,15]
	Daily service time	[8,1]
Service Reliability	Reliability of runs that come on schedule	
	Punctuality (runs that come on time)	
	Travel Time	
Comfort	Bus crowding	[8,1,3]
	Comfort of seats on bus	[8,15]
	Air conditioning on bus	
	Levels of noise and vibrations on bus	
Cleanliness	Availability of shelter and benches at stop	[8]
	Cleanliness of bus interior, seats and windows	[8,3]
	Cleanliness of bus exterior	[8]
Fare	Ticket Cost	[8,15]
Information	Availability of schedule/maps on bus	[8]
	Availability of schedule/maps at stops	[8,15]
	Availability of information by phone, mail	[8,15,3]
Safety and security	Safety and competence of drivers	[8,15]
	Security against crimes on bus	
	Security against crimes at bus stops	[8,15]
Personnel	Personnel appearance	
	Personnel helpfulness	[8,15]
Customer Services	Ease of purchasing ticket	[8,15]
	Administration of complaints	[8]
Environmental Protection	Use of ecological vehicles	

2.1.3. Stage 3: Questionnaire Construction

Finally, a questionnaire construction in Stage 3 entailed refining and organising the generated items into a logical sequence. The items were carefully structured to ensure coherence and ease of use, resulting in a finalised instrument that effectively supported the research objectives and enhanced the reliability of the collected data. The development of the instrument should include clear, unambiguous and understandable statements to the respondents in both negative and positive directions [29].

This study emphasised four domains, which were service reliability, service accessibility, comfort and safety and security in the evaluation of service quality of public transport in Kuching. This domain was divided into several sub-domains, as shown in Table 2. Overall, the survey questionnaire was designed with 21 questions which were related to four domains as independent variables and one dependent variable which was to determine the overall service quality experienced by bus riders. The question was arranged based on simplicity and clarity to ensure the respondents understood what questions were about. The questions were designed into three sections, which comprised Section A: Demographic and socio-economic respondents, Section B: Trip and Travel characteristics,

and Section C: Rider's perceptions of service quality of public bus transport. Section C was adapted to a 5-point Likert scale which varied from "Strongly Disagree" to "Strongly Agree" as measurement indicators.

Table 2 Service Quality Attributes From Previous Studies

Item	Statement	Domain
Q1	The existing trip frequency is sufficient	Service reliability of public bus transport
Q2	Daily service time of public bus is sufficient	
Q3	Bus frequently arrives and departs on time	
Q4	Travel time is acceptable to reach to destination	
Q5	Waiting time at the bus stops/stations for bus arrival is acceptable	
Q6	Bus seating capacity is always adequate	Service accessibility of public bus transport
Q7	Bus stops or bus stations is comfortable with benches and shelter provided	
Q8	The location of bus stops is accessible to be reached within a reasonable distance and time	
Q9	The number of existing bus stops and stations is adequate to cover people's demand in using public bus transport	
Q10	Bus ticket fare is reasonable	
Q11	Information regarding bus schedules and maps is always accessible	
Q12	Bus Seating area is comfortable	Comfort of public bus transport
Q13	Air conditioning in the bus is well-functioned	
Q14	Good ventilation in the bus	
Q15	Bus is free from any noise and vibrations	
Q16	Bus cleanliness in a satisfactory condition	
Q17	Bus personnel at the ticketing counter is always helpful	Safety and security of public bus transport
Q18	Bus driver is always dress mannered and presentable	
Q19	Bus users feel secure as the bus travels	
Q20	Complaint box or area is available	
Q21	In overall, I am satisfied with service quality of public bus transport	Overall service quality

2.2. Phase 2: Validity Assessment of the SQPB Questionnaire

2.2.1. Stage 1: Development of content validation form

Before conducting a pilot test, the completed survey questionnaire had undergone a pre-test process for validation purposes. The pre-test adapted in this study was a content validation process, whereby several research experts were selected to validate the questionnaire according to their relevancy and clarity of questionnaire items. Experts were required to rate every item based on its relevancy and clarity in the subject matter of the service quality of public transport in the content of the validation form. The assessment was done by selecting an appropriate scale based on the 4-Point Likert Scale and providing their insights on items in the comment section.

2.2.2. Stage 2: Selection of experts

The process of content validation started with the selection or appointment of research experts from several backgrounds related to public bus transport studies. In this case, the research experts comprised three groups: academicians, civil engineers and management people from service providers who have a minimum of five years of working experience (Table 3). They were required to complete the content validation form and rate the questions based on their relevancy and clarity on a 4-point Likert scale in three weeks' time. Apart from the rating scale, the research experts were also encouraged to include their insights in the comment section, such as comments on grammar and spelling errors, item arrangements based on suitable domains and any error they detected during the validation process.

Table 3 No of Research Experts Required

Research experts background	No of research experts
Academicians (Social Science)	3
Academicians (Transport)	3
Transit Service Provider Management Team	3

2.2.3. Stage 3: Analysis of Survey Questionnaire

Once the content validation form was completed and submitted to the researcher, analysis of the content validation index (CVI) as stated in Equation 1 for clarity and Equation 2 for relevancy was used to determine whether the individual item was relevant, needed revision or was to be eliminated in the research study. Completed data in the content validation form were gathered and tabulated by using Microsoft Excel to proceed with CVI analysis. The 4-point Likert scale in the content validation form was divided into two categories, whereby the Scale of 1 and Scale 2 were in the irrelevant range, which was indicated as 0, while Scale 3 and Scale 4 were categorised under the relevant range, which was indicated as 1. The agreed item was evaluated by summing up all the range of 1, which indicated the research experts had rated the item as Scale 3 or Scale 4 in the Likert scale. From the I-CVI value, the items were interpreted based on the reference adapted by Lynn [22] range (Table 4).

Table 4 I-CVI Value Range Based on Lynn [22]

I-CVI Value Range	Interpretation
0.79	Item is appropriate
0.70-0.79	Item need to be revised
<0.70	Item should be eliminated

$$\text{I-CVI (C)} = \text{Agreed Item (Valued 3 and 4)} / \text{Number of experts} \quad (1)$$

$$\text{I-CVI (R)} = \text{Agreed Item (Valued 3 and 4)} / \text{Number of experts} \quad (2)$$

2.3. Phase 3: Reliability of SQPB Questionnaire

2.3.1. Stage 1: Development of a new survey questionnaire

Once the questions had undergone validation testing, the survey questionnaire during Phase 1 was amended accordingly, whereby 18 questions remained in this study after the elimination of 3 questions. The demographic and trip characteristics of the survey questionnaire remained in the new development of the survey questionnaire. The revised survey questionnaire was used to conduct pilot testing to obtain the primary data. Pilot testing was carried out by distributing 33 survey questionnaires to bus riders as respondents.

2.3.2. Stage 2: Pilot Testing and Data Collection Area

Saujana bus station was selected to distribute the pilot testing questionnaire to aim the City Public Link (CPL) bus riders. The questionnaires were self-administered. Respondents were given ample time to complete the questionnaire, whether in Bahasa or English. Most questionnaires were distributed to respondents who were waiting for the bus to depart, and participation was voluntary. Once the survey questionnaire was collected, data from the questionnaire were extracted and documented in SPSS software to run the reliability testing and normality testing data.

2.3.3. Stage 3: Reliability and data normality testing

Completed data in the survey questionnaire were collected and recorded in Microsoft Excel and SPSS software. Before reliability and data normality testing were done, data were checked to determine any missing values and straight lines. There was no missing value, and three straight-line data were detected in this study and left with 30 valid questionnaires. Demographics information in Section A and trip characteristics in Section B in the questionnaire were analysed to determine respondents' profiles and their percentages. Reliability and data normality testing proceeded with 30 valid items as described in the next section.

3.0 RESULTS AND DISCUSSION

3.1. Validation of survey questionnaire

The process of validations took into consideration qualitative and quantitative analysis from the CVI form. The quantitative was evaluated based on the I-CVI value from I-CVI (R) and I-CVI (C) in individual items and was averaged to determine the I-CVI range. Findings showed data from nine research experts on I-CVI(R) and I-CVI(C), whereby a value of 0 indicated that the research expert rated the questions as 1 and 2, and a value of 1 indicated the research expert rated the items as 3 and 4, as attached in Appendix (Table A1 and Table A2). As a summary, Table 5 presents two items that need to be revised, as I-CVI (avg) falls between 0.70 and 0.79 according to Lynn [22]. The remaining items were relevant, as the CVI value recorded more than 0.79.

Table 5 Summary of Findings from Content Validation Process

Items	I-CVI (R)	I-CVI (C)	I-CVI	I-CVI Range (Lynn [22])	Remark
Q1	1.000	0.889	0.944	Range more than > 0.79 was considered appropriate, 0.70- 0.79 to be revised and < 0.70 should be eliminated	Relevant
Q2	0.778	0.778	0.778		Revision
Q3	0.889	0.889	0.889		Relevant
Q4	1.000	0.889	0.944		Relevant
Q5	0.778	0.889	0.833		Relevant
Q6	0.889	0.778	0.833		Relevant
Q7	0.778	0.778	0.778		Revision
Q8	0.889	0.778	0.833		Relevant
Q9	0.889	0.778	0.833		Relevant
Q10	0.889	0.778	0.833		Relevant
Q11	0.778	0.889	0.833		Relevant

Table 5 Continued

Items	I-CVI (R)	I-CVI (C)	I-CVI	I-CVI Range (Lynn [22])	Remark
Q12	1.000	0.889	0.944		Relevant
Q13	1.000	0.667	0.833		Relevant
Q14	0.889	0.889	0.889	Range more than > 0.79 was considered appropriate, 0.70- 0.79 to be revised and < 0.70 should be eliminated	Relevant
Q15	0.889	0.778	0.833		Relevant
Q16	0.889	1.000	0.944		Relevant
Q17	0.778	0.889	0.833		Relevant
Q18	1.000	0.889	0.944		Revision
Q19	1.000	0.778	0.889		Relevant
Q20	0.889	0.778	0.833		Relevant

The details on Q2 that needed to be revised were adjusted accordingly based on comments from the research experts and are tabulated in Table A3, as attached in the appendix. The questions were rephrased and rearranged from “Daily service time of public bus is sufficient” to “Daily operational hours of bus which start and end their operation are sufficient” for Q2 and “Bus stops or bus stations are comfortable with benches and shelter provided” to “Bus stops or bus stations are comfortable with benches and shelter provided” in Q7.

For qualitative analysis, which is extracted from research experts’ comments, Q10, Q17 and Q20 were eliminated as the measured domain was not included in this study, and Q6, Q13 and Q15 were rephrased to grab respondents’ understanding of the subject matter. The qualitative data can be used to enhance the content validity [24]. The details on the questions were tabulated in Table A4 and Table A5, as attached in the appendix. After a thorough analysis was done through the validation process, the final questions included in survey questionnaires are listed in Table AA6, as attached in the appendix.

3.2. Reliability Testing

After the pre-test was done for the validation process, pilot testing was carried out to determine the reliability of the survey questionnaire. This process adapted the revised survey questionnaire from the validation process and targeted City Public Link (CPL) bus riders. Since this study aims to design a proper survey questionnaire for determining the service quality of public transport in Kuching, all CPL customers were considered as the study population. For pilot testing, 30 respondents were sufficient to examine the reliability test from the pilot testing. The pilot test was a screening process before the actual data collection began, and this author adapted 30 respondents to determine the reliability and validity of the survey questionnaire [17]. Table 6 has summarised the respondent’s profile gathered in reliability testing. There were 33 samples recorded, but 30 samples were used after data cleaning, as three samples were rejected because of straight lining detection.

In this study, Cronbach’s alpha coefficient (α) was adapted to determine the internal consistency of the items included in the questionnaire through a pilot study with 30 respondents (Table 7). The Cronbach’s alpha was 0.876 for the overall domain, 0.707 for the service reliability domain, 0.878 for the service accessibility to PT domain and lastly for the comfort domain was 0.770, and this value was considered satisfactory. The safety and security domain and overall service quality of PT were not included, as the domain only measures a single item. A value of Cronbach’s alpha of 0.7 to 0.9 indicated high internal consistency and reliability in each questionnaire [30]. Therefore, the instrument was reliable and suitable for measuring the intended constructs within the study area.

Table 6 Summary of the Respondent's Profile

	Variables	Respondents	(%)
Gender	Male	11	36.7
	Female	19	63.3
Age	<18 years old	2	6.7
	18-24 years old	4	13.3
	25-34 years old	8	26.7
	35-44 years old	8	26.7
	>45 years old	8	26.7
Race	Malay	19	63.3
	Chinese	3	10.0
	Bumiputra	8	26.7
	Others	0	0.00
Career	Student	3	10.0
	Self-employed	3	10.0
	Government servant	2	6.7
	Private sector	9	30.0
	Unemployed	13	43.3
Status	Single	15	42.2
	Married	15	50.0
Average income	No income	16	53.3
	< RM 1500	6	20.0
	RM 1500 – RM 3000	7	23.3
	>RM 3000	1	3.3
Household sizes	Alone	0	0.00
	2 peoples	1	3.3
	3-5 peoples	24	80.0
	>5 peoples	5	16.7
Vehicle Occupancy	Do not own any car, motorcycles and other	16	53.3
	Own other vehicles such as car, motorcycles and others	14	46.7
Trip purposes	Working	2	6.7
	Education	2	6.7
	Shopping	7	23.3
	Business	1	3.3
	Sight-seeing	13	43.3
	Transit	0	0.00
	Others	5	16.7
Trip frequency	First time user	6	20.0
	Once in a week	5	16.7
	2-3 times in a week	6	20.0
	>5 times in a week	10	33.3
	Once in a month	3	10.0
Main mode of transportation	Bus	29	96.7
	Taxi	1	3.3
	Grabcar, maxim	0	0.0
Reason using PT	No transportation	15	50.0
	Easy to access	5	16.7
	Time saving	1	3.3
	Cost saving	9	30.0
	Comfortable	0	0.00
	Others	0	0.00
Travel time	<30 minutes	5	16.7
	<1 hour	18	60.0
	>1 hour	7	23.3

Table 6 Continued

Variables		Respondents	(%)
Duration of using PT	< a week	4	13.3
	< a month	2	6.7
	< a year	1	3.3
	> a year	23	76.7
Distance from origin to station bus	< 5 meters	14	46.7
	< 10 meters	16	53.3
	< 15 meters	0	0
	> 15 meters	0	0
Time Duration	3-5 minutes	13	43.3
	5-15 minutes	16	53.3
	15-30 minutes	1	3.3
	30-45 minutes	0	0.0
	> 45 minutes	0	0.0

Table 7 Domain with Cronbach's Alpha Value

Domain	Cronbach's alpha
Overall domain	0.876
Overall Service Reliability domain	0.707
Overall Service Accessibility of PT	0.878
Overall Comfort	0.770

3.3. Data Normality

Even though the questionnaire showed the acceptable reliability in Cronbach's alpha analysis, normality testing was still required to examine the appropriate statistical analysis. In this study, data normality was examined by using the Shapiro-Wilk test and skewness statistics. Table 8 represents the result of four constructs, whereby construct reliability satisfied the normality assumption, with a Shapiro-Wilk significance value of 0.050 ($p > 0.05$). Other than that, the constructs of accessibility, comfort and service quality resulted in statistically significant Shapiro-Wilk results ($p < 0.001$). The safety and security construct also demonstrated a normal distribution, as evidenced by a non-significant Shapiro-Wilk result ($p = 0.262$). Given the sensitivity of the Shapiro-Wilk test to sample size, the skewness results were considered a more robust indicator of distributional symmetry. Overall, the data were deemed to exhibit approximate normality and were therefore suitable for the parametric statistical method.

Table 8 Summary of Data Normality

Construct	Shapiro-Wilk		Skewness	Reference Range		Data normality
	Sig. value	Reference				
Reliability	0.050	Null hypothesis	Normally distribute			
Accessibility	<0.001	($p > 0.05$) (5%)	0.256	-1.96 to +1.96		Normally distribute
Safety and Security	0.262		Normally distribute			
Comfort	<0.001		-0.40	-1.96 to +1.96		Normally distribute
Service Quality	<0.001		-0.04	-1.96 to +1.96		Normally distribute

4.0 CONCLUSION

As a conclusion, the development of a survey questionnaire requires a detailed procedure to ensure the questionnaire meets the research objectives. Any irrelevancy, redundancy, unclearness, or clear and grammatical error in survey items are filtered and amended accordingly through the validation and calibration process to ensure the understanding and clearness of the respondents in participating in the survey questionnaire. This study enhanced the methodological development of transportation service quality assessment by undergoing selection of service attributes in questionnaire formulation, content validation and reliability evaluation within the context of public bus transport. The findings obtained in this study can be used as a guideline for transport agencies, transport planners, and policymakers in assessing the service quality of public bus transport, particularly in Sarawak. Nevertheless, this study could be enhanced by adapting the Delphi method in selecting service quality attributes by weighing the consensus from experts through several sessions to generate a survey questionnaire. Although item revisions were informed by expert feedback, a full second-round quantitative content validation shall be conducted to confirm the adequacy of the revised items, thereby ensuring an iterative content validation process.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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APPENDICES

Table A1 Data of CVI for relevance rating I-CVI (R)

Item/Expert	E1	E2	E3	E4	E5	E6	E7	E8	E9	Expert in Agreement	I-CVI
Q1	1	1	1	1	1	1	1	1	1	9	1.000
Q2	1	1	1	0	0	1	1	1	1	7	0.778
Q3	1	1	1	0	1	1	1	1	1	8	0.889
Q4	1	1	1	1	1	1	1	1	1	9	1.000
Q5	1	0	1	0	1	1	1	1	1	7	0.778
Q6	1	1	1	1	1	0	1	1	1	8	0.889
Q7	1	1	0	1	1	0	1	1	1	7	0.778
Q8	1	1	0	1	1	1	1	1	1	8	0.889
Q9	1	1	0	1	1	1	1	1	1	8	0.889
Q10	1	1	1	1	1	0	1	1	1	8	0.889
Q11	1	0	1	0	1	1	1	1	1	7	0.778
Q12	1	1	1	1	1	1	1	1	1	9	1.000
Q13	1	1	1	1	1	1	1	1	1	9	1.000
Q14	1	1	1	0	1	1	1	1	1	8	0.889
Q15	1	1	1	0	1	1	1	1	1	8	0.889
Q16	1	1	1	0	1	1	1	1	1	8	0.889
Q17	1	1	1	0	1	0	1	1	1	7	0.778
Q18	1	1	1	1	1	1	1	1	1	9	1.000
Q19	1	1	1	1	1	1	1	1	1	9	1.000
Q20	1	1	1	1	1	0	1	1	1	8	0.889
Q21	1	1	1	1	1	1	1	1	1	9	1.000

Table A2 Data of CVI for Clarity rating I-CVI (C)

Item/Expert	E1	E2	E3	E4	E5	E6	E7	E8	E9	Expert in Agreement	I-CVI
Q1	1	1	1	0	1	1	1	1	1	8	0.889
Q2	1	1	1	0	1	1	1	0	1	7	0.778
Q3	1	1	1	0	1	1	1	1	1	8	0.889
Q4	1	1	1	1	1	1	1	0	1	8	0.889
Q5	1	1	1	0	1	1	1	1	1	8	0.889
Q6	1	1	1	1	1	0	1	0	1	7	0.778
Q7	1	0	1	1	1	0	1	1	1	7	0.778
Q8	1	1	1	0	1	1	1	0	1	7	0.778
Q9	1	0	1	0	1	1	1	1	1	7	0.778
Q10	1	1	1	0	1	0	1	1	1	7	0.778
Q11	1	1	1	0	1	1	1	1	1	8	0.889
Q12	1	1	1	0	1	1	1	1	1	8	0.889
Q13	1	0	1	0	1	1	1	0	1	6	0.889
Q14	1	1	1	0	1	1	1	1	1	8	0.889
Q15	1	1	1	0	1	1	1	0	1	7	0.778
Q16	1	1	1	1	1	1	1	1	1	9	1.000
Q17	1	1	1	1	1	0	1	1	1	8	0.889
Q18	1	1	1	0	1	1	1	1	1	8	0.889
Q19	1	1	1	0	1	1	1	0	1	7	0.778
Q20	1	1	1	0	1	0	1	1	1	7	0.778
Q21	1	1	1	1	1	1	1	1	1	9	1.000

Table A3 Existing comments on item Q2 and Q7

Existing Item/ Expert	Comments	
	Existing Item Q2: Daily service time of public bus is sufficient	Existing Item Q7: Bus stops or bus stations is comfortable with benches and shelter provided (service accessibility of PT)
E1	NIL	Availability of OKU seat, influence to use PT
E2	NIL	NIL
E3	NIL	NIL
E4	NIL	NIL
E5	The statement is confusing. What actually is daily service time is being measured	Item should be under comfort measure
E6	NIL	This item can be categorized under Passenger Comfort and Amenities
E7	NIL	NIL
E8	Rephrase: Frequency of bus service per day is sufficient	This item falls under comfort
E9	The daily operational period of public buses is sufficient.	The seats provided for passengers waiting at the bus station are adequate.
Actions Taken	Revised Q2: Daily operational hours of bus which start and end their operation is sufficient (Rephrase)	Revised Q7: Bus stops or bus stations is comfortable with benches and shelter provided (To be put under Comfort domain)

Table A4 Elimination of Item Q10, Q17 and Q20

Existing Item/Expert	Items		
	Existing Item Q10: Bus ticket fare is reasonable	Existing Item Q17: Bus personnel at the ticketing counter is always helpful	Existing Item Q20: Complaint box or area is available
E5	This has nothing to do with accessibility. Should be under affordability or fare	This question has nothing to do with comfort of public transportation. Should be under service quality	
E6	Ticket fare can be put under one main categories e.g: fare system or fare structure, ticketing and payment	This item can be categorized under other main categories e.g Customer service support	This item can be categorized under other main categories e.g Customer service support. Placing a complaint box for public bus transport under the category of safety can be somewhat misleading because safety typically refers to measures taken to protect passengers from physical harm or danger during their journey
Actions Taken	Items will be eliminated in survey questionnaire		

Table A5 Rephrasing of Items Q6, Q13 and Q15

Existing Item/Expert	Comments		
	Existing Item Q6: Bus seating capacity is always adequate	Q13: Air conditioning in the bus is well-functioned	Q15: Bus is free from any noise and vibrations
E8	Number of seatings are adequate	Air-conditioning of the bus is functioning well	Level of noise and vibration is acceptable
E9	Bus seating capacity is adequate.	The bus's air conditioning is functioning well.	The bus is free from any noise and vibrations.
Actions Taken	Number of seatings are adequate	The bus's air conditioning is functioning well.	Level of noise and vibration is acceptable

Table A6 Revised items to be adapted in survey questionnaire

Items	Statement	Domain
Q1	The existing trip frequency is sufficient	Service reliability of public bus transportation
Q2	Daily operational hours of bus which start and end their operation is sufficient	
Q3	Bus frequently arrives and departs on time	
Q4	Travel time is acceptable to reach to destination	
Q5	Waiting time at the bus stops/stations for bus arrival is acceptable	
Q6	Number of seatings are adequate	
Q7	The location of bus stops is accessible to be reached within a reasonable distance and time	
Q8	The number of existing bus stops and stations are adequate to cover people's demand in using public bus transportation	Service accessibility of public bus transportation
Q9	Information regarding bus schedules and maps is always accessible	
Q10	Bus stops or bus stations is comfortable with benches and shelter provided	Comfort of public bus transportation
Q11	Bus Seating area is comfortable	
Q12	Air conditioning in the bus is well-functioned	
Q13	The bus's air conditioning is functioning well.	
Q14	Bus is free from any noise and vibrations	
Q15	Level of noise and vibration is acceptable	Safety and security of public bus transportation
Q16	Bus stops or bus stations is comfortable with benches and shelter provided	
Q17	Bus users feel secure as the bus travels	Overall service quality
Q18	In overall, I am satisfied with service quality of public bus transportation	