Preface

PREFACE

The ISCEE2024, our 5th International Symposium on Civil and Environmental Engineering was held successfully on 18th and 19th September 2024 at Hotel Adya, Langkawi, Malaysia. The theme of this symposium is "Embracing New Ideas or A More Sustainable Earth" which is aligns with global sustainable development goals.

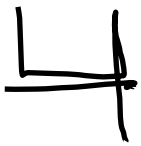
This biannual event was organised by the Faculty of Civil Engineering and Built Environment, Universiti Tun Hussein Onn Malaysia, in collaboration with Universitas Negeri Malang, Indonesia, and aims to gather international delegates from both the academia and the industry for sharing and exchange of current knowledge, ideas and trends in the fields of civil and environmental engineering to mobilise actions towards achieving sustainable development goals. ISCEE2024 reaches the major areas in Civil Engineering including construction and structures, environment and water, building and infrastructure, heritage and built environment.

120 participants attended the conference in the opening ceremony and plenary sessions. They were from Malaysia, Indonesia, Japan and Serbia. At this conference, three keynote speakers were invited, Prof. Ir. Dr. Noridah Mohamad from Universiti Tun Hussein Onn Malaysia, Malaysia, Ts. Rofizlan Ahmad from CIDB E-Construct Services Sdn. Bhd., Malaysia and Prof. Dr. Ignasius D. A. Sutapa from Asia Pacific Centre for Ecohydrology (APCE – UNESCO C2C). Presentations during the ISCEE2024 technical sessions were conducted physically and virtually using Google Meet. There were 5 sub-sessions during the conference namely Environment and Water Research, Construction and Structures, Infrastructure Engineering, and Heritage and Built Environment. All updated news and photos taken during the conference can be found at https://intl-conference.com/iscee2024/index.html#about.

We would like to express our great appreciation to the authors, reviewers, committees and conference organizers for their contribution and hard work to ensure the success of the conference.

“With Wisdom We Explore”

Sincerely,



Ir. Dr. Sallehuddin Shah Bin Ayop
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Peer Review Statement

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- **Number of submissions received:** 90
- **Number of submissions sent for review:** 92
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Attracting New Bus Public Transport Users with the "Bandar Lampung Transqual" Service Quality Model in Indonesia

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Abstract. This research focuses on investigating the quality of Trans Bandar Lampung bus public transport services. The research objective is to find the dominant factors of Trans BL bus service quality in order to attract people to use public transport by adding 3 new criteria to the Bandar Lampung Transqual (BL Transqual) model. The research methodology used quantitative and qualitative approaches. Data was collected through a survey method with a five-point scale electronic questionnaire. Respondents who participated amounted to 526 people. Nonprobability sampling technique with purposive sampling was used to capture respondents with the criteria of men and women who use vehicles or public transport with productive age 15-59 years. The analysis method uses Second Order Confirmatory Factor Analysis from SEM – AMOS. The findings are a model of land public transport service quality with 3 dominant factors: tangible, comfort, security and safety. Practical implications - Public transport managers and stakeholders can use the results of this study in building new urban transportation projects. The BL Transqual service quality model can be used as a reference by other researchers in creating future bus services. The originality of this research is to create a new public transport service quality model, especially buses in Indonesia.

1. Introduction

Bandar Lampung is starting to experience congestion problems like other big cities in general due to urbanization. Urbanization is causing intimidation of transportation services throughout metropolitan cities in the world [1]. High urbanization creates congestion and challenges in providing transportation facilities and infrastructure [2]. The level of private car use will cause increasingly severe congestion in urban areas [3]. To overcome this problem, the Bandar Lampung City Government created a bus rapid transit (BRT) procurement policy in the 2011-2030 Regional Spatial Plan. However, in reality, the operation of the Trans Bandar Lampung (Trans BL) bus experienced many challenges that led to a complete halt due to lack of passengers.

One of the main dimensions of successful urban mobility is ensuring that public transportation is used by private vehicle users [4]. The high number of public transport users who switch to private transport (PV) and online transport (OV) is due to poor service quality from Trans BL buses, such as buses often arriving late, bus stops without cover, inappropriate additions to transit fees, bus staff not discipline, erratic bus departure schedules, no information on the routes that buses take, lack of information on the distribution of bus stops, and there are also complaints about the lack of number of

buses and services on buses when operating [5] ,overtaking each other between city transport and buses, as well as buses that stop in any place. This behavior makes other drivers uncomfortable and endangers them. Conditions like this cause negative impacts and inconvenience for people in carrying out activities, resulting in reduced people's interest in using public transportation modes.

Therefore, this study is important to carry out in the context of the Bandar Lampung City Government wanting to reactivate bus services. This research aims to investigate the dominant factors of the quality of "Trans BL" services that influence people's interest in using public transportation, while the focus of the research is to investigate the quality of "Trans BL" services by adding three new attributes to the "Bandar Lampung Transqual (BL Transqual) model ” namely: integration, technology, and policy support.

Apart from contributing to filling the gap in the literature on the quality of land public transport services, the results are expected to be a reference in helping bus service managers and stakeholders in planning public transport in the city of Bandar Lampung in particular and large cities that fail to operate bus transport services.

1.1. Public transport

Public transport is one type of group travel system that provides passenger transportation services to the general public. Public transport generally runs on predetermined routes, on a schedule, and charges a fee for each trip. People who do not have access to private cars rely on public transportation to travel. Public transportation also contributes significantly to reducing traffic congestion, air pollution, travel time, and energy use [6]. Maintaining maximum standards of public transportation service quality is essential to attracting new customers and retaining existing customers [7].

1.2. Service quality

One of the key elements that increases the utilization of public transport is service quality. One of the most important elements in assessing the level of service in a public transportation system is customer satisfaction. Improving service quality will increase the number of people using public transportation and contribute to solving problems such as energy consumption, air and noise pollution, and traffic congestion [8]. As noted in the literature, improving the quality of public transportation services is ideally one way to make public transportation more competitive with private vehicles [9]. Positive perception in the community will increase with quality services [10], Thus, public transportation "Trans BL" has an attraction for the community so that it increases people's interest in using it [11], [12].

1.3. “Bandar Lampung Transqual” (BL Transqual) service quality model

There is a lot of research on service quality now. However, there is no definitive agreement on the best and most ideal model available to measure service quality, although there are many models offered from different perspectives and research topic settings [13]. The “Bandar Lampung Transqual” (BL Transqual) Service Quality Model is a modification of the ServQual, RESCA, and EN 1386 models with 10 dimensions, namely; tangibility, responsiveness, accessibility, integration, reliability, convenience, security and safety, technology, policy support, and information.

2. Study area

The research location is in Bandar Lampung City – Indonesia (Figure 1), with an area of 197.22 Km², consisting of 20 sub-districts with a population of 1,209,937 people in 2022 (BPS, 2023) and an average population growth rate of 2.7% per year, and population density of 5,913 people/km^2.

Figure 1. Research location in Bandar Lampung city.

[14] states that the number of people who own motorized vehicles is expected to be very high in the next 15-20 years (2033-2038) as shown in Figure 2 below. According to [15], A city with a population of over 1 million should have mass transit. Therefore, it is appropriate for the Bandar Lampung City Government to consider building reliable public transportation.

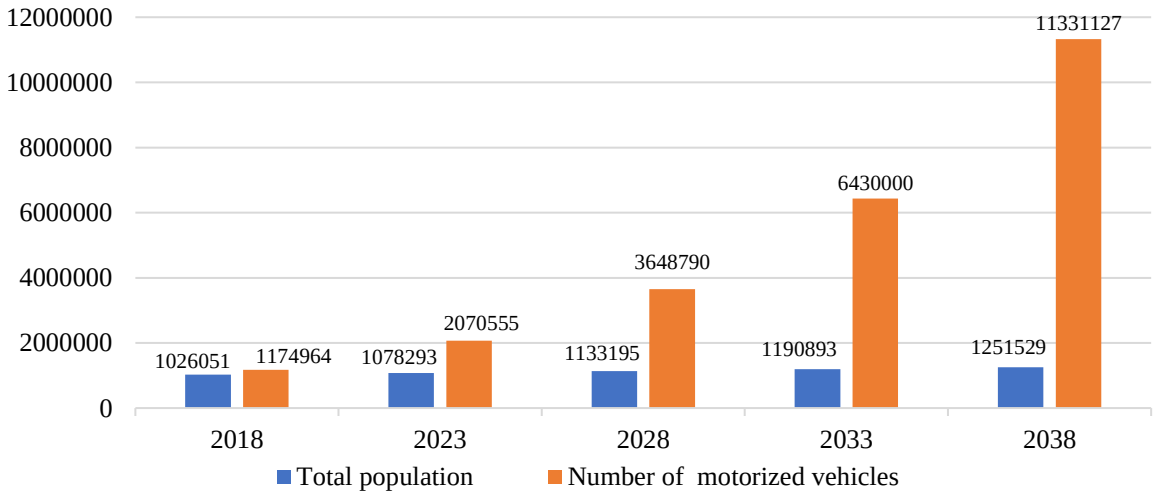

Figure 2. Prediction of the number of population and the number of motorized vehicles in the city of Bandar Lampung [14]**.**

3. Methodology

The research method used is a combination (mixed methods) between qualitative and quantitative research methods. Data was collected by means of a survey by distributing electronic questionnaires through the whatsapp and instagram platforms. The questionnaire contained 68 questions consisting of

2 parts. The first part is about the demographic characteristics of the respondents and the second part is about the quality of the "BL Transqual" service which is assessed on a five-point Likert scale.

The total population used was 785,450 people (aged 15 - 59 years). Using the Slovin method, a minimum sample size of 400 people was obtained. A total of 526 people participated in this research survey. The research sample was taken using nonprobability sampling technique with purposive sampling. Respondents were selected with the criteria of men and women who use vehicles or public transportation with productive age 15-59 years.

This study uses one exogenous variable of service quality with 10 dimensions and one endogenous variable of public interest with 3 dimensions. The 10 dimensions of the service quality variable are: tangible, responsiveness, accessibility, integration, reliability, comfort, security and safety, technology, policy support, and information. The 3 dimensions of the public interest variable are attracting new users, changing habits, and recommend. Each dimension of the variable is measured by several indicators, therefore the service quality construct is multidimensional. The latent construct variables and their dimensions can be seen in Figure 3 Trans BL service quality conceptual framework.

The analysis method in this study uses Second Order Confirmatory Factor Analysis from SEM (Structural Equation Modelling) with the AMOS program. SEM is widely used in research and is often used in the field of public transportation [16]. SEM is a simultaneous test that integrates path analysis, factor analysis and structural models. Confirmatory factor analysis, which tests the validity and reliability of the instrument, path analysis, which tests the relationship model between variables, and structural model and regression analysis, which generates the prediction model, are three tasks that SEM can perform simultaneously. The analysis model in SEM consists of two parts: measurement model and structural model. Figure 4 shows the service quality structure model of "Trans BL" with the exogenous latent construct of service quality and the endogenous latent construct of public interest. Confirmatory component analysis (CFA) is used in the measurement model to determine how the manifest variables represent the latent variables to be assessed, thus the validity and reliability of the instrument can be known. Structural models are used to assess the relationship between variables to produce a model suitable for regression analysis predictions. Confirmatory Factor Analysis is a multivariate analysis method to determine whether the measurement model created is consistent with the hypothesis.

In Structural Equation Modeling (SEM), an indicator is said to be valid if the loading factor value is > 0.5, and a construct is said to be reliable if the construct AVE > 0.5 and construct CR > 0.7 [17]. The loading factor value is obtained from the AMOS program output, while the AVE and CR values are calculated manually. The formula for calculating AVE and CR is as follows;

CR Formula :

$$Construct\ Reliability = \frac{(\sum Std\ Loading)^2}{(\sum Std\ Loading)^2 + \sum \varepsilon_j} \quad (1)$$

AVE Formula :

$$Variance\ Extracted = \frac{\sum Std\ Loading^2}{\sum Std\ Loading^2 + \sum \varepsilon_j} \quad (2)$$

After the validity and reliability of the indicators are declared valid, a goodness of fit assessment is carried out. Before creating a complete SEM model, testing will be carried out on the elements that make up each variable. The AMOS program will be used to test the adequacy of the confirmatory factor analysis model, taking into account the results of the accepted goodness of fit parameters.

The data quality test on the pilot study in this study used a validity test with Pearson's Bivariate correlation (Pearson's Product Moment) and a reliability test with the Cronbach Alpha coefficient with the help of the SPSS program. The reliability of a variable formed from a list of questions is declared good if it has a Cronbach Alpha value of $0.80 \leq \alpha < 0.90$ [18].

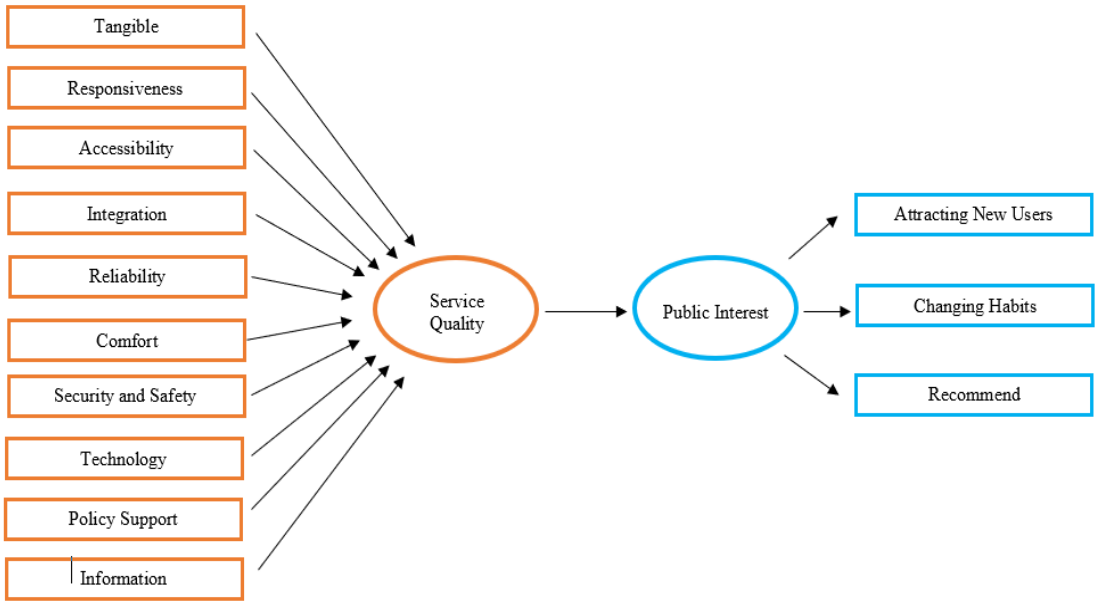

Figure 3. Trans BL service quality conceptual framework.

4. Results and discussion

4.1. Pilot study

Before the actual research began, a pilot study was conducted with the aim of seeing the extent to which the respondents' ability to answer the questionnaire questions distributed. The results of the pilot study were tested for validity and reliability if they met the requirements and it was felt that respondents could answer the questions without difficulty, then the questionnaire was ready to be distributed in the actual research.

The validity test in the pilot study was carried out by means of Product Moment Pearson Correlation with SPSS. This method utilizes the principle of correlation, which connects the overall score obtained from the respondent's questionnaire answer with the item score of each statement. Testing was carried out on 48 statement items. By taking a significance level of 5% and the number of respondents 40 people (n = 40), the degree of freedom (db = n-2) is 38, with a significance level of 5%, the r table value is 0.32. The results obtained for all statement items have r count greater than r table (r count> r table = 0.32). Furthermore, the Sig value. (2-tailed) for all statement items is also smaller than 0.05 (sig. = 0.000 < 0.05) and the Pearson Correlation of all statement items is positive, so it can be concluded that all questionnaire statement items are valid.

To measure the reliability of the instruments in the pilot study, Cronbach's Alpha reliability test was used with the SPSS program. [18] provide practical guidelines for assessing Cronbach's Alpha for Likert scale instruments. The reliability of a variable formed from a list of questions is declared good if it has a Cronbach's Alpha value of $0.8 \leq \alpha <$ than 0.90.

From the data quality test of all statement items in the research questionnaire, it can be concluded that all statement items are valid and reliable for use as measuring instruments in research.

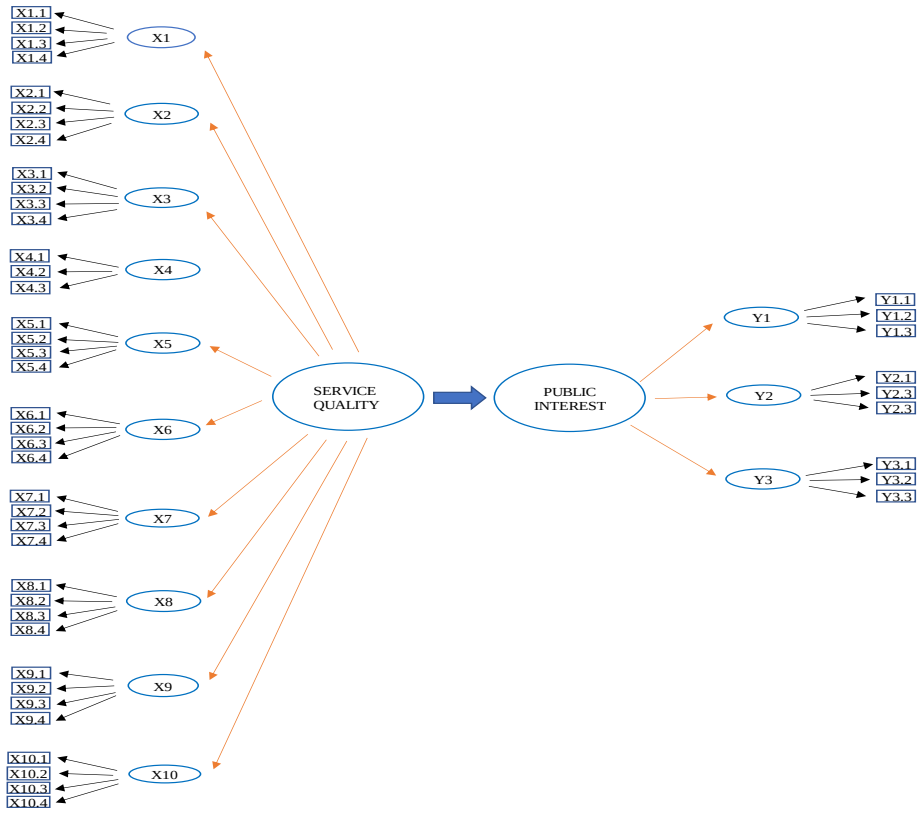

Figure 4. "Trans BL" service quality structure model.

4.2. Respondent description

Based on the results of data collection in the research, Table 1 below is a description of the characteristics of respondents based on gender, age, education, occupation, monthly income, travel destination, weekly use, vehicle used daily and use of the "Trans Bandar Lampung" bus.

Table 1. Descriptive analysis of respondent characteristics.

Characteristics	Category	Frequency	Percentage
Gender	Man	200	38.0
	Woman	326	62.0
Age	< 21 years old	205	39.0
	21 - 30 years old	206	39.2
	31 - 40 years old	49	9.3
	41 - 50 years old	56	10.6
	> 50 years	10	1.9
Education	Elementary school	4	0.8
	Junior High School	10	1.9
	High School/Vocational School	297	56.5
	Undergraduate/Postgraduate	212	40.3
	No school	3	0.6
Work	Student/Students	294	55.9
	Private Employees	88	16.7
	Trader	34	6.5
	Self-Employed	58	11.0
	Civil Servants/Army/Police	52	9.9
Monthly income	Not yet	207	39.4
	< 500,000 IDR	61	11.6

	500,000 – 2,000,000 IDR	91	17.3
	2,000,000 - 3,000,000 IDR	71	13.5
	> 3,000,000 IDR	96	18.3
Travel destination	School/College	263	50.0
	Work/Trade/Business	183	34.8
	Shop	11	2.1
	Family/Friend Visits	7	1.3
	Recreation	4	0.8
	Other	58	11.0
Weekly use	< 3 times	176	33.5
	3 times	61	11.6
	4 times	36	6,8
	5 times	52	9.9
	>5 times	201	38.2
Vehicles used every day	Private Car	71	13.5
	Private Motorbike	304	57.8
	Online Vehicles (*Gojek, Grab, Maxim*)	81	15.4
	Public Transportation (*Angkot*)	28	5.3
	Online Motorcycle Taxi (*Ojol*)	42	8.0
Use of Trans Bandar Lampung	Never	197	37.5
	Once	329	62.5

From the Table 1 above, it is clear that the majority of respondents are women aged 20 to 30 years, with a high school /vocational school education level. The largest occupation of respondents is students and students. Travel purposes are predominantly for school and work. The vehicle used daily by most respondents is a motorbike, used more than 5 times per week. Most respondents said they had ridden the Trans Bandar Lampung bus.

4.3. Confirmatory factor analysis

Measurement model testing is used to test the validity and reliability of indicators in measuring their constructs. In this test, the indicator is declared valid if it has *a loading factor value* > 0.5, and the construct is declared reliable if the construct AVE > 0.5 and construct CR > 0.7 [17].

4.3.1. Exogenous construct of service quality:

The test results show that all exogenous construct indicators have *loading factors* > 0.5, this means that all indicators are valid in measuring exogenous constructs, testing can be continued with further tests, namely construct reliability tests which will be carried out by looking at the CR and AVE values of each construct. Using the CR and AVE calculation formula, Table 2 below is the result of calculating the CR and AVE values of the three exogenous constructs:

Table 2. Reliability of exogenous constructs.

Sub Variable	Indicator	Loading Factor (λ)	Validity	Error (e)	Average Variance Extracted (AVE)	Construct Reliability (CR)	Information
X1 Tangible	X11	0.811	Valid	0.365	0.624	0.869	reliable
	X12	0.817	Valid	0.285			
	X13	0.716	Valid	0.365			
	X14	0.720	Valid	0.405			
X2 Responsiveness	X21	0.904	Valid	0.180	0.684	0.892	reliable
	X22	0.935	Valid	0.136			
	X23	0.888	Valid	0.188			
	X24	0.513	Valid	0.763			

X3 Accessibility	X34	0.825	Valid	0.320	0.571	0.838	reliable
	X33	0.831	Valid	0.312			
	X32	0.609	Valid	0.417			
	X31	0.552	Valid	0.486			
X4 Integration	X43	0.859	Valid	0.200	0.723	0.887	reliable
	X42	0.821	Valid	0.336			
	X41	0.845	Valid	0.277			
X5 Reliability	X54	0.617	Valid	0.419	0.717	0.908	reliable
	X53	0.918	Valid	0.188			
	X52	0.896	Valid	0.224			
	X51	0.826	Valid	0.240			
X6 Comfort	X64	0.930	Valid	0.144	0.822	0.949	reliable
	X63	0.886	Valid	0.192			
	X62	0.865	Valid	0.196			
	X61	0.904	Valid	0.163			
X7 Security and Safety	X74	0.812	Valid	0.308	0.790	0.938	reliable
	X73	0.903	Valid	0.159			
	X72	0.907	Valid	0.150			
	X71	0.903	Valid	0.209			
X8 Technology	X84	0.865	Valid	0.234	0.696	0.898	reliable
	X83	0.899	Valid	0.173			
	X82	0.888	Valid	0.183			
	X81	0.543	Valid	0.565			
X9 Policy Support	X94	0.684	Valid	0.360	0.705	0.904	reliable
	X93	0.751	Valid	0.349			
	X92	0.880	Valid	0.176			
	X91	0.875	Valid	0.193			
X10 Information	X101	0.878	Valid	0.016	0.965	0.991	reliable
	X102	0.931	Valid	0.012			
	X103	0.553	Valid	0.054			

Based on the results of calculating the CR and AVE values of the exogenous construct, the CR value of the exogenous construct is obtained > 0.7 and the AVE value of the exogenous construct > 0.5, it is concluded that the exogenous construct has met the required construct validity and reliability criteria.

4.3.2. Endogenous Construct of Public Interest;
In Table 3 below are the results of the calculation of CR and AVE on endogenous constructs as follows:

Table 3. Reliability of endogenous constructs.

Sub Variable	Indicator	Loading Factor (λ)	Validity	Error (e)	Average Variance Extracted (AVE)	Construct Reliability (CR)	Information
Y1 (Attracting New Users)	Y11	0.883	Valid	0.204	0.839	0.940	reliabel
	Y12	0.912	Valid	0.151			
	Y13	0.929	Valid	0.121			
Y2 (Changing Habits)	Y21	0.903	Valid	0.176	0.721	0.885	reliabel
	Y22	0.854	Valid	0.255			
	Y23	0.780	Valid	0.403			
Y3 (Recommend)	Y31	0.880	Valid	0.215	0.810	0.927	reliabel
	Y32	0.898	Valid	0.180			
	Y33	0.902	Valid	0.168			

Based on the results of calculating the CR and AVE constructs in Table 3, the AVE value for all endogenous constructs is > 0.5 and the CR for all constructs is > 0.7; This means that all endogenous constructs have met the required reliability criteria.

4.4. Full Structural Model Analysis

This study uses CFA (Confirmatory Factor Analysis) parameter estimation method with GLS (Generalized Least Squares). The results of the second order confirmatory factor analysis of the measurement of latent variable dimensions in the research model can be seen in Figure 5 below.

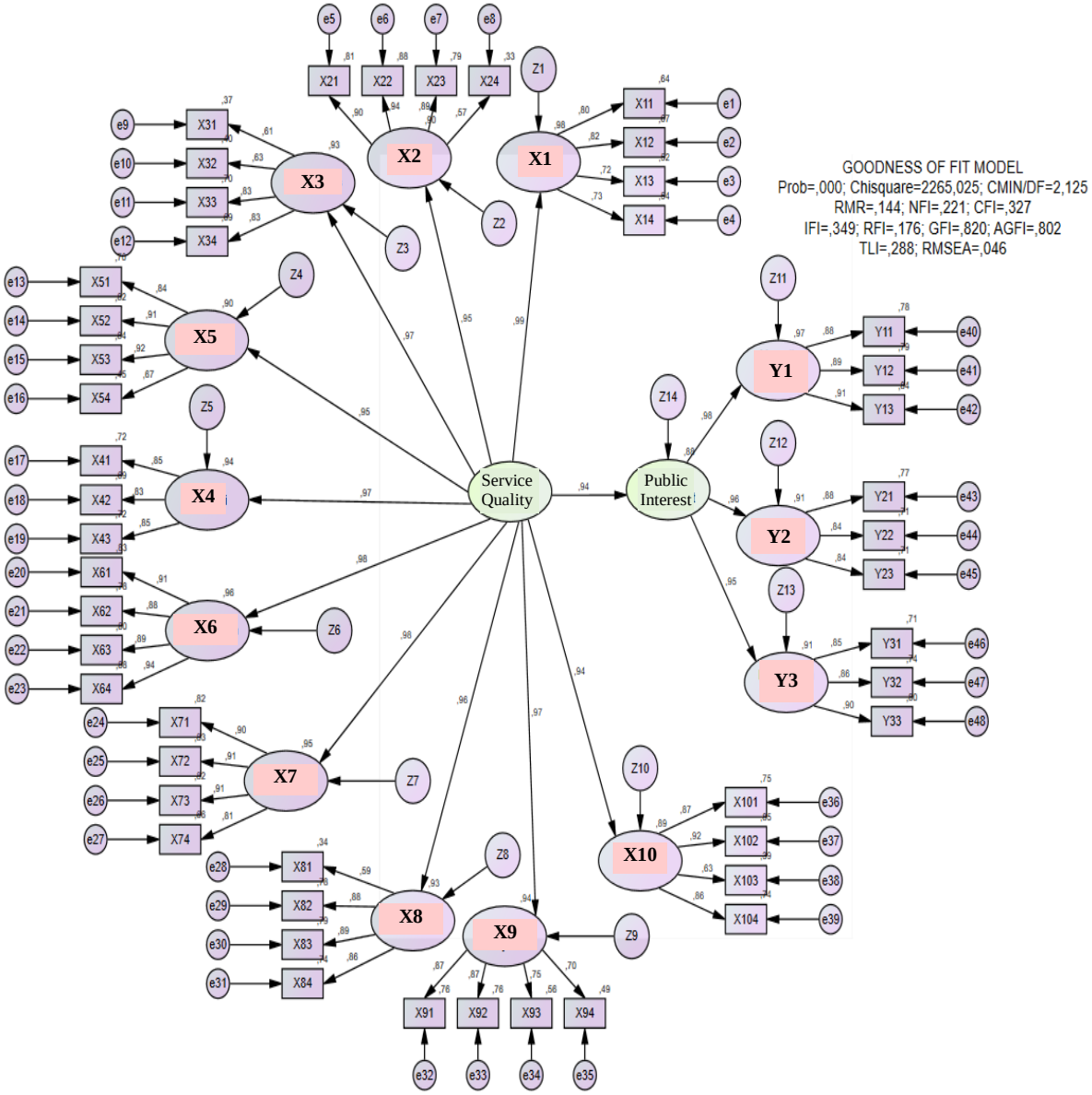

Figure 5. SEM model estimation results.

The SEM model estimation results show that the SEM model has met the required goodness of fit model criteria, namely by looking at the cmin / df value < 3.00 and rmsea < 0.08. The results of testing the goodness of fit model as a whole can be seen in Table 4 below:

Table 4. Goodness of fit model test results.

Goodness of Fit Index	*Cut-off Value*	Analysis Results	Model Evaluation
CMIN/DF	≤ 3.00	2,125	Good
GFI	≥ 0.90	0.820	Marginal
AGFI	≥ 0.90	0.802	Marginal
RMSEA	≤ 0.08	0.046	Good

In this study, BL Transqual service quality has 10 sub variables (dimensions). To find out the most dominant dimension in showing service quality, the loading factor value of each sub variable can be seen. The loading factor value of each dimension of the service quality variable can be seen in Table 5. The analysis results in Table 5 below show that among the 10 dimensions of service quality measurement, the 3 most dominant dimensions are obtained, namely; tangible (X1), comfort (X6) and security and safety dimensions (X7). Figure 6 shows the 10 dimensions of service quality "BL Transqual" with their respective loading factor values.

Table 5. Loading factor sub-variable standardized regression weights: (Group number 1 - Default model).

			Estimate
X1	<---	X	,991
X2	<---	X	,947
X3	<---	X	,965
X4	<---	X	,950
X5	<---	X	,970
X6	<---	X	,981
X7	<---	X	,976
X8	<---	X	,965
X9	<---	X	,970
X10	<---	X	,941

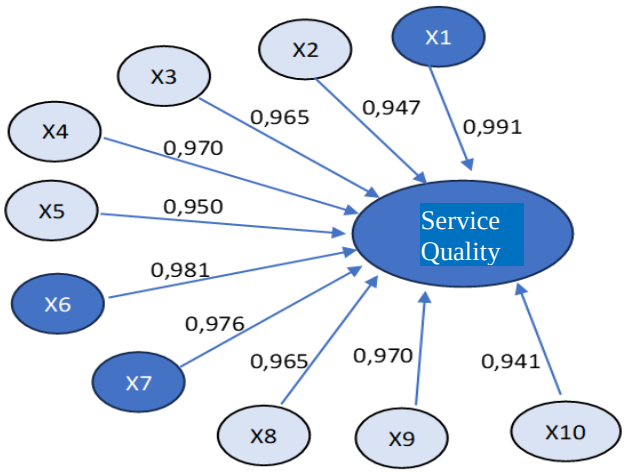

Figure 6. Dominant factors of service quality.

4.5. Discussion

The tangible dimension (X1) has the greatest influence on BL Transqual's service quality with a loading factor of 0.991. This is due to several factors, including: Good physical facilities including extra services such as special seats for pregnant women, people with disabilities and children. Well-dressed bus drivers and conductors, WiFi, electric charging, and reliable travel information. These services not only increase comfort, but make people happier to go about their routine while traveling.

People usually prefer to use buses as a means of transportation when these dimensions of physical facilities are fulfilled because they can offer a more pleasant, safe, and efficient travel experience. Therefore, to attract and maintain people's interest in using bus transportation, it is important for bus service providers to consider these factors and make improvements.

Previous studies such as [19] research found that customer satisfaction is influenced by the dimensions of empathy and environmental and tangible performance. [20] show that the top priority in BRT services is the tangible dimension.

Comfort dimension (X6) is the second dominant dimension with a loading factor of 0.981. Reason Convenience is one of the most important factors for a successful passenger journey. A well-designed bus with comfortable seats, good air conditioning, less noise pollution, and maintained cleanliness will make the trip more enjoyable. Consistent behavior in bus services, in terms of availability, cleanliness, facilities, and maintenance, can foster trust and loyalty among customers.

According to [21] ride safety and enhanced comfort levels are the most important service features. This makes buses a reliable choice for daily or routine travel. Similarly, [22] said that people will switch to private transport if public transport services are low or less convenient.

With a load factor value of 0.976, the security and safety dimension (X7) is ranked third as the dominating dimension for the following reasons: Passengers prioritize security and safety above all else in choosing a means of transportation. Good safety features on buses, such as efficient braking systems, seat belts and other passenger safety features, as well as speed management systems, can make passengers feel safer and lower the likelihood of accidents. By using buses that are well-maintained and operated by skilled drivers, the journey can be guaranteed to be safe and free from things that can endanger the safety of passengers.

[23] state that the key factor for passenger satisfaction is the level of safety and security. According to [24], respondents gave positive opinions towards safety and security services on buses based on the application. Passengers prefer bus services with a solid track record in terms of safety compared to those without, as this shows the service provider's dedication to passenger safety. Thus, the safety and security dimension of bus transportation service quality not only dominates the variables that influence people's decision to use buses, but is also an important feature that service providers should prioritize to increase customer satisfaction and trust.

5. Conclusions and recommendations

This study found 3 dominant dimensions of bus public transportation service quality that respondents chose to attract them to the Trans Bandar Lampung bus service, namely; tangible, comfort, security and safety. The contribution of these findings can be a reference for transportation managers and stakeholders in re-operating the "Trans BL" bus service which will soon be activated. In addition, this research also contributes to the addition of public transportation service quality literature by adding 3 new dimensions to the "Bandar Lampung Transqual" model, namely; integration (X4), technology (X8) and policy support (X9).

This study motivates future research to further explore the influence of the strength of the dimensions of policy support, integration and technology on public interest in public transport in major cities in the world that have experienced operational decline in public transport services.

In order to improve the quality of public transport services, it is recommended that; i. Prioritize the maintenance and repair of physical facilities such as clean, comfortable and well-maintained buses. Invest in improving the quality of bus services in facilities for passenger comfort, such as air conditioners (AC), ergonomic seats and accessibility for the disabled; ii. Organize frequent training sessions to ensure excellent service standards; iii. Efficiency and user convenience can be improved by integrating technology into daily bus operations, examples include fast and simple electronic payment systems and interaction with other public transport programs; iv. Customer satisfaction will increase if clear and transparent travel information is available, such as precise bus schedules, travel updates, and service policy information; v. Conduct surveys for immediate feedback through social media platforms.

It is hoped that by putting these ideas into practice, public transportation service providers will be able to improve their overall service quality, gain market share, and increase trust in public transportation as the best option for urban mobility.

6. References

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