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Relation of Service Quality, Load Factors and Tariff on Bus City of Bandung

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ABSTRACT

The purpose of this study is to discuss the relationship between satisfaction with service quality, by determining the number of vehicles and the ideal tariff for passengers. This research was conducted on consumers who use the Bandung City Bus. The relationship between satisfaction and service quality with passenger loyalty using the structural equation modeling (SEM) method, the ideal tariff is seen from the ability and willingness to pay passengers compared to vehicle operating costs, the break-even load factor method is used to calculate the number of vehicles that consider passenger needs, revenue, and operational costs. The results of the calculation of service quality on satisfaction is 6,731, proving that service quality has a significant and positive influence on customer satisfaction. One of the dimensions of service quality is tangible include physical evidence has the higest correlation with satisfaction factors on the service quality dimension affecting passenger loyalty. Service satisfaction is obtained from vehicles are load factors, and tariffs, which are calculated from six non-toll routes in Bandung, with the Ability to Pay vehicle suitable tariffs, only route 6B shows the Willingness to Pay customers below the current tariff.

Keywords: Service Quality; Customer Satisfaction; Load Factors, Tariff
JEL Classifications: L1, L8

1. INTRODUCTION

Globalization is characterized by an increase in the activities of fast-moving societies that bring changes in all fields. This condition requires the community to work and carry out all activities quickly, precisely, and accurately. Transport is very important for the needs of the community in fulfilling its activities (Aminah, 2018), especially public vehicles that are affordable and easily accessible by the community. City Bus is one of the public vehicles that serves as a public transport service provider for the community. In Bandung, Indonesia, its local government provides City Buses is to facilitate community activities, especially elementary schools, junior high schools, and communities that have a considerable distance with minimum costs (Andromeda, 2016), as well as to assist the community for their daily activities.

Preliminary research survey in Bandung showed that public transport provided by the government tend to be abandoned, due to passenger dissatisfaction. This is shown by the decrease of the passengers by 3% in 2017-2018, and continues to decline every year, from 9,715,945 passengers in 2017 to 9,398,112 passengers in 2018. The total bus fleet operating for 11 routes is 175 vehicles, all of which have different fares. Of the total 11 routes, 6 routes travel within the city of Bandung and 5 other routes travel to Bandung Regency areas.

To increase the number of passengers, improving the quality of service needs is a must. Maintaining an uncertain level of passenger satisfaction, which in turn variable satisfaction affects service quality (Aryani and Rosinta, 2011; Carrese et al., 2013) which can affect passenger loyalty using the Structural Equation Modelling (SEM) method (Carrese et al., 2013; Hair et al., 2017; Marcoulides and Schumacker, 2001).

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2. THEORETICAL REVIEW

Service is defined as an action that can be offered by one party to another which is intangible and does not result in ownership of something (Kotler and Armstrong, 2013). It also expresses the perspective of "service" as a system. In this perspective, each service is seen as a system consisting of two main components. The first component is the service operation, where the service input process is carried out and the service product element is created. The second component is service delivery, where service elements are being assembled, completed, and sent to customers.

Customer satisfaction is the level of one's feelings after comparing perceived performance compared to expectations (Al Rasyid, 2015), whereas loyalty means loyalty, that is, people's loyalty to an object (Lynch et al., 2001; Zichermann and Linder, 2010) Customer satisfaction is the level of "perceived" after comparing the performance of perceived compared to expectations (Al Rasyid, 2015; Berry et al., 1988) that there are five dimensions of service quality. The first is tangible aspects related to the attractiveness of physical facilities, equipment, and materials used by the company, as well as the appearance of employees. The second both is reliability dimensions that measure the reliability of a company in providing services to its customers. The third is responsive about the willingness and ability of employees to help customers and how they respond to requests, and inform service time given, and to speed of providing service. Fourth, the assurance of the quality dimension is related to the ability of companies and the behavior of front-line staff in increasing trust in their customers. Fifth, empathy, is seen as how the company understands customer problems and acts in the customer's interests, as well as giving personal attention to customers and having comfortable operating hours. Further that (Berry et al., 1988) there are three indicators to measure customer loyalty. The first is to say positive things about the product or service that has been consumed. The second is to recommend products and services that have been consumed to some friends. Lastly, is to purchase made continuously on the product that has been consumed.

The instrument used in this study was questionnaires with Likert scale (Parasuraman et al., 2005), the Guttman scale (Rosow and Breslau, 1966), the ratting scale, and the sematic differential scale (Dawes, 2008). The sampling methods were probability sampling (Miller et al., 2010) and non-probability sampling (Tansey, 2007). Probability sampling consists of simple random sampling, systematic sampling, stratified random sampling, and simple cluster sampling (Goodman & Kish, 1950). Non probability sampling consists of quota sampling, haphazard/accidental/convenience sampling, purposive sampling/expert choice/judgment sampling, voluntary sampling, and snowball sampling (Daniel, 2011).

Testing of the measuring instruments was done with several steps, namely the validity test and reliability test with the aim of measuring the accuracy of the instruments used in a study (Cook and Beckman, 2006; Radhakrishna, 2007). Reliability is an index that shows the extent to which a measuring instrument can be trusted or reliable if a measuring device is used twice to measure the same symptoms (Preston and Colman, 2000).

Structural equation modeling (SEM) (Acock, 2013; Schumacker and Lomax, 2004) is one of the multivariate statistical techniques that is able to examine a series of dependent relationships simultaneously in order to obtain statistically efficient and be able to describe unobserved concepts and can carry out measurement errors in the process (Byrne, 2013).

The tangible aspects related to the attractiveness of physical facilities, equipment, and materials used by the company, as well as the appearance of the employees (De Oliveira and Ferreira, 2009) in city bus services including load factors and tariffs (Widayanti and Karunia, 2014; Wu et al., 2019), (Deb and Filippini, 2011; Wu et al., 2019).

A load factor smaller than one states that transportation is less loaded with passengers (Delgado et al., 2012). A load factor greater than one indicates that it exceeds the capacity of the vehicle (Leiva et al., 2010; Li and Hensher, 2013). The company will benefit more if the load factor is greater because more passengers are transported, the company will get more profit (Salzborn, 1972). However, this condition is not recommended because passengers will be uncomfortable (Handschin and Dornemann, 1988).

Vehicle operation cost (VOC) data processing (Watanatada et al., 1987) is data processing carried out by calculating the financial needs to operate a vehicle. VOC consists of two aspects of costs, namely indirect costs and direct costs. Direct costs are all costs directly charged to transport services thus it can operate to carry out its functions (Novirani, 2007; Wulansari et al., 2017).

3. RESULTS

There are two types of variables in SEM, namely latent variables and observed variables. The stages carried out in SEM are model specifications, identification, estimation, overall model fit test, measurement model fit, structural model fit, respesification, and proposed service quality variables.

3.1. Model Specification

This study analyses the effect of service quality on customer satisfaction (Agyapong, 2011), service quality variables are dimensions of service quality. The variables are service quality (Y) and customer satisfaction (Y1) as the dependent variable. The independent variable used consisted of the dimensions of service quality (Caruana, 2002). Service quality dimension variables are tangible (X1), reliability (X2), responsiveness (X3), guarantee (X4) and empathy (X5). The first step is to conduct an analysis with SEM, which is a specification of the model by determining the model to be estimated. Model specifications are made to represent the problem to be checked. The path diagram is shown in Figure 1.

3.2. Model Identification

Model identification is undertaken to identify whether the analysis of the model can be further carried out. Model identification criteria can be seen from the degree of freedom. Degree of freedom is the amount of data known minus by the parameters to be estimated. Thus, the value of degree of freedom is: Df = 180-24 = 156. In this study, it was found that the resulting value is positive, so the model

can be specified as Over-Identified Model. SEM analysis (Ullman, 2006) can be done if the model obtained is over identified to avoid the Under-Identified model so that the data can be analyzed.

3.3. Model Estimation

After model identification, parameter estimation is done from the model to be searched. This stage produces parameter values using one of the available estimation methods. The choice of estimation method used is often determined based on the characteristics of the variable being analyzed. The parameters to be estimated can be seen in Figure 2.

3.4. Overall Model Fit Test

This stage checks the level of compatibility of the data with the model. This stage includes the evaluation of measurement models and evaluation of structural models. Evaluation on the measurement model consists of testing Goodness of Fit, Convergent Validity, and Construct Reliability (Parasuraman, 2002). Structural model evaluation consists of testing hypotheses, parameter coefficients, and the value of the coefficient of determination. The results of the calculation of goodness of fit can be seen in Table 1.

Goodness of fit test produces chi-square value as a benchmark of significant requirements for a model. The smaller the chi-square value produced, the better the fit in the model with a P ≥ 0.05. The p value obtained from the calculation that is equal to 0.00 is not good model compatibility. But P-value is not the only basis for determining the suitability of the model being built. In the calculation results there are five GOF criteria (Marsh et al., 2005)

Figure 1: Path diagram

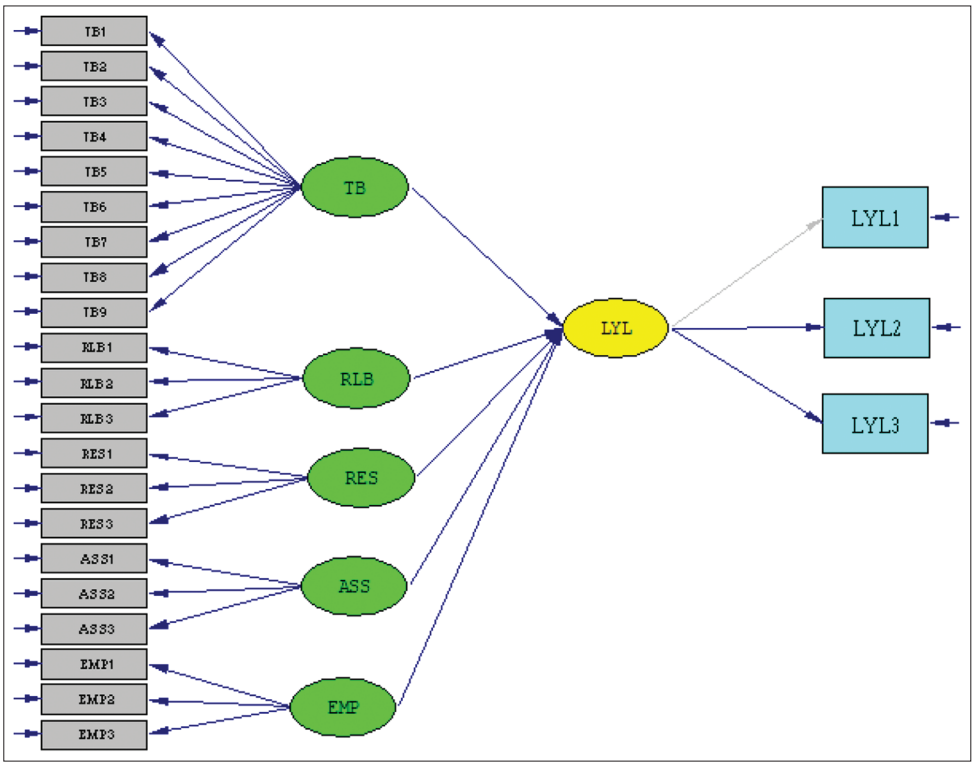


Table 1: Goodness of fit test

GOF size	Good fit	Marginal fit	GOF measurement model	Conclution
Chi-square				
Chi-square	Small		296.73	Bad fit
Degree of freedom			230	
P-value	≥0.05		0.00	
Absolute fit indices				
Goodness of fit index (GFI)	≥0.9	0.8 ≤GFI <0.90	0.92	Good fit
Root mean square error approximation (RMSEA)	≤0.08		0.077	Good fit
Root mean square residual (RMR)	≤0.05		0.045	Good fit
Standardized root mean residual (SRMR)	≤0.1		0.091	Good fit
Incremental fit indices				
Normed fit index (NFI)	≥0.9	0.8 ≤NFI <0.90	0.77	Bad fit
Tucker lewis index or non normed fit index (TLI or NNFI)	≥0.9	0.8 ≤TLI <0.90	0.82	Marginal fit
Comparative fit index (CFI)	≥0.90	0.8 ≤CFI <0.90	0.92	Good fit
Relative fit index (RFI)	≥0.90	0.8 ≤RFI <0.90	0.89	Marginal fit
Adjusted goodness of fit index (AGFI)	≥0.91	0.8 ≤AGFI <0.91	0.83	Marginal fit
Incremental fit index (IFI)	≥0.92	0.8 ≤IFI <0.92	0.85	Marginal fit

that show good compatibility, and four GOF criteria that show marginal match. Thus, it can be concluded that the results of the model can be used as a basis for this research.

After the overall model suitability test, the model validity test is carried out to analyse the effect of significant indicators that can reflect the construct variables and latent variables. In this study, this model is considered valid as a validity test result in the t-value ≥ 1.96 and the Standardize Loading Factor value ≥0.70 or ≥0.50. Standardize Loading Factor values can be seen in Figure 3 and t values can be seen in Figure 4.

3.5. Measurement Model Fit

Once the validity test is completed, the next step is testing the model reliability, which aims at identifying the consistency of measurement. It can be concluded that the construct has a high consistency in measuring its latent construct by analysing the value of composite reliability ≥0.5 and variance extracted ≥0.7 The CR and VE values can be selected in Table 2.

3.6. Structural Model Fit

Then, the next stage is to evaluate the structural model by testing the hypothesis of latent variables related by looking at the t-value

Figure 2: Parameter estimation

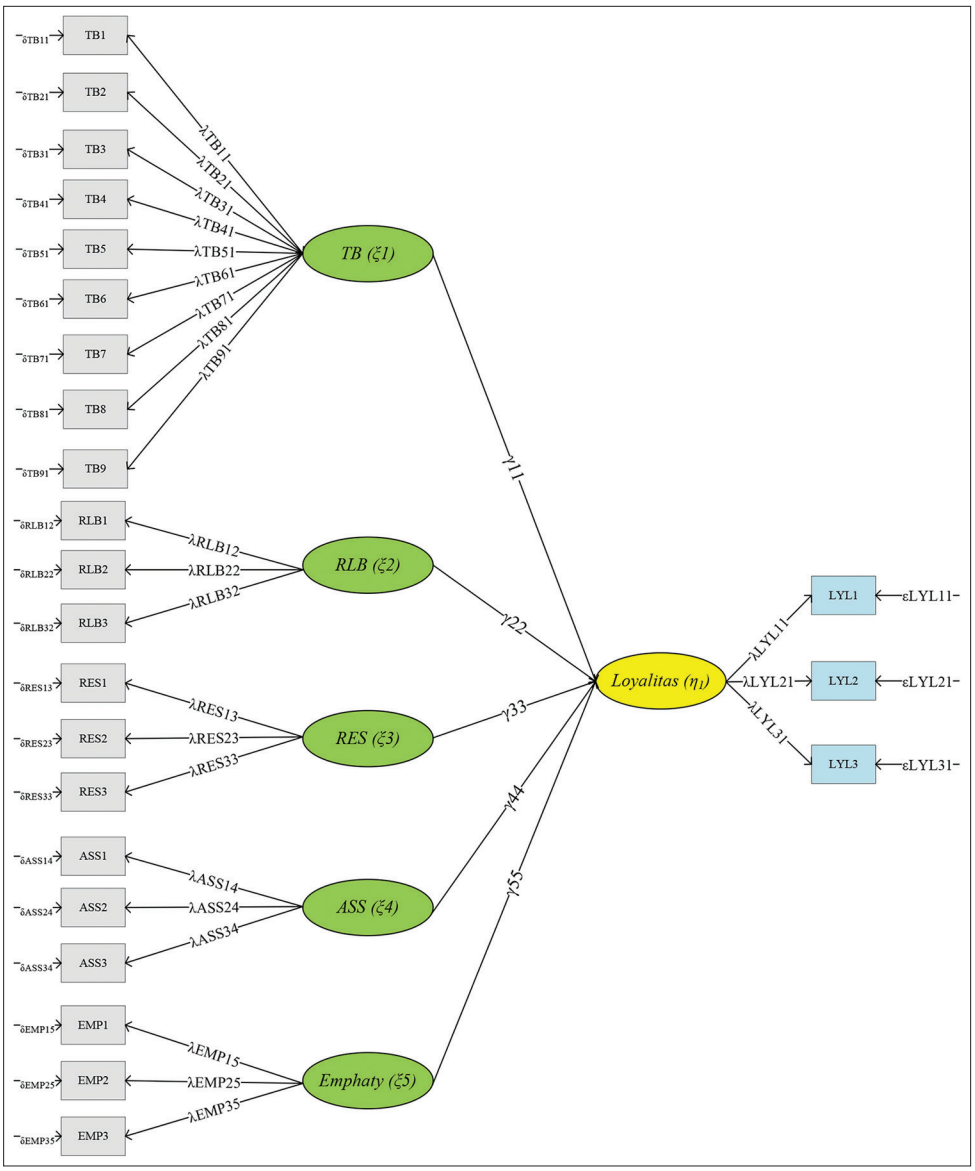
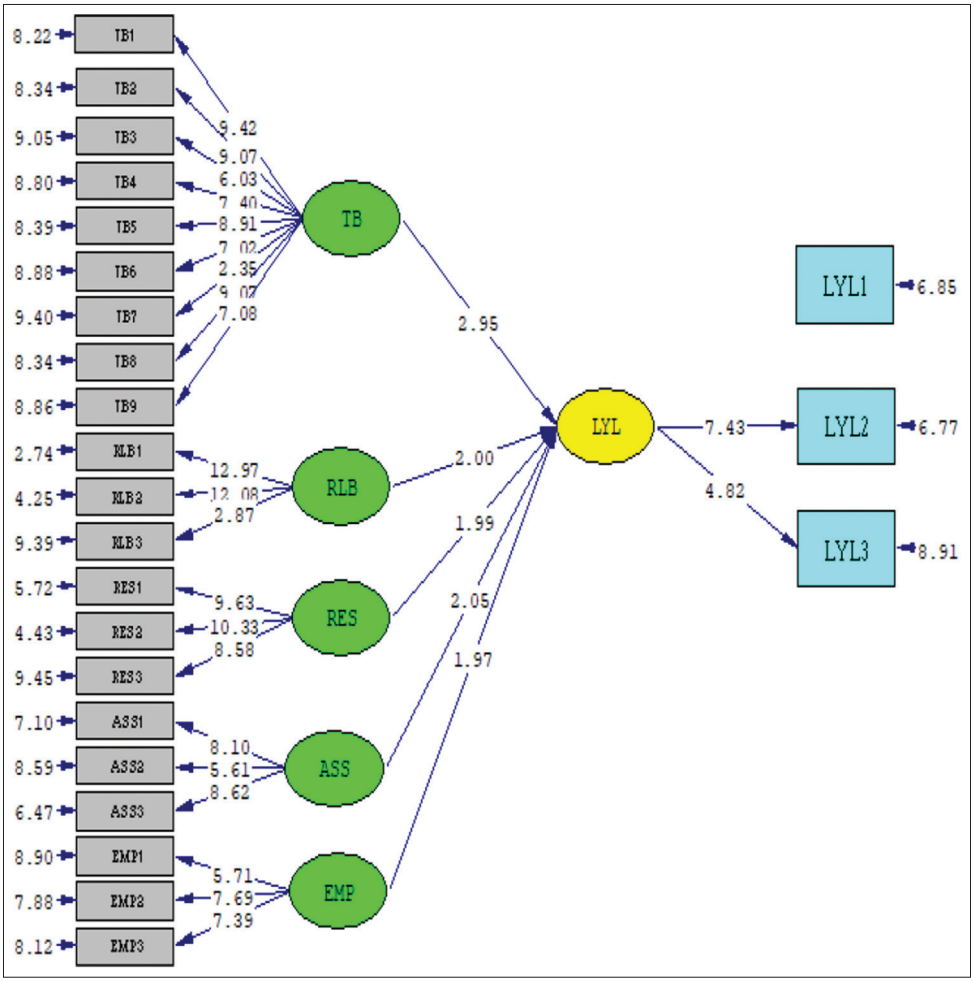


Table 2: Composite reliability and variance extracted values

Dimension	VE value	VE criteria	CR value	CR criteria	Summary
Tangible	0.5197	≥0.5	0.8638	≥0.7	Reliable
Reliability	0.6539		0.8496		Reliable
Responsiveness	0.6298		0.7252		Reliable
Assurance	0.5531		0.7703		Reliable
Empathy	0.5909		0.7076		Reliable
Loyalties	0.5685		0.7233		Reliable

Figure 3: Standardize value loading factor



≥1.96. Testing this hypothesis aims to see the significance of the relationship between one variable with another variable. With the null hypothesis the independent variable significantly does not have a positive effect on the dependent variable and the rival hypothesis which is the independent variable has a significant positive effect on the dependent variable. In this study the independent variable is the authority on the service quality dimension and the dependent variable in this study is passenger loyalty. The results of hypothesis testing can be seen in Table 3.

3.7. Respesification

The next step is to calculate the parameter coefficient values in the equation that has been formed by using the Lisrel 8.80 Software, the structural model can be seen in Figure 6 with the results of the formulation as follows:

$$LYL = 1.51\ TB + 0.40\ RLB + 0.19\ RES + 0.42\ ASS + 0.17\ EMP$$

Symbol description: LYL = Loyalty, TB = Tangible, RLB = Reliability,

RES = Responsiveness, ASS = Assurance, EMP = Empathy.

The coefficient obtained from the equation above has a positive correlation. The equation can be interpreted if the tangible variable goes up by 1 it will affect the loyalty variable will go up by 1.51, as well as other variables. If satisfaction with service quality rises, it is directly proportional to the value of passenger loyalty.

Table 3: Hypothesis testing results

Hypothesis	t-value	Summary
H_1: Tangible→Loyalties	2.96	Accepted H_1
H_2: Reliability→Loyalties	2.00	Accepted H_2
H_3: Responsiveness→Loyalties	1.99	Accepted H_3
H_4: Assurance→Loyalties	2.05	Accepted H_4
H_5: Empathy→Loyalties	1.97	Accepted H_5

Finally, the value of the coefficient of determination was also analysed to determine the contribution of influence given by the independent variable (X) to the dependent variable (Y). R2 in Structural Equation Modelling does not have a clear interpretation and to interpret R2 as in the regression equation R2 data must be taken from the reduced form equation. The coefficient of determination can be seen in Table 4. The R2 results obtained from the Lisrel reduced form equation output show a coefficient of determination of 0.88 which means that 88% of the independent variables (satisfaction variable from service quality) affect the loyalty variable and 12% are influenced by other factors.

Figure 4: T-value values

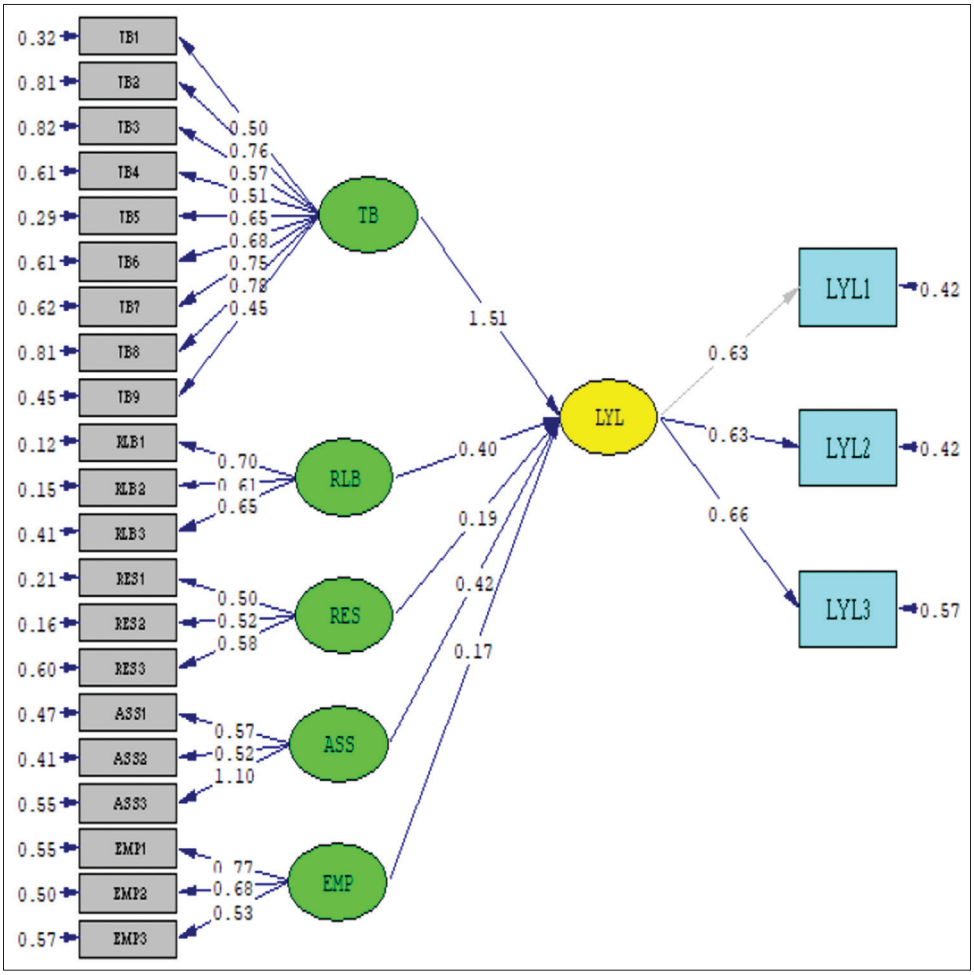
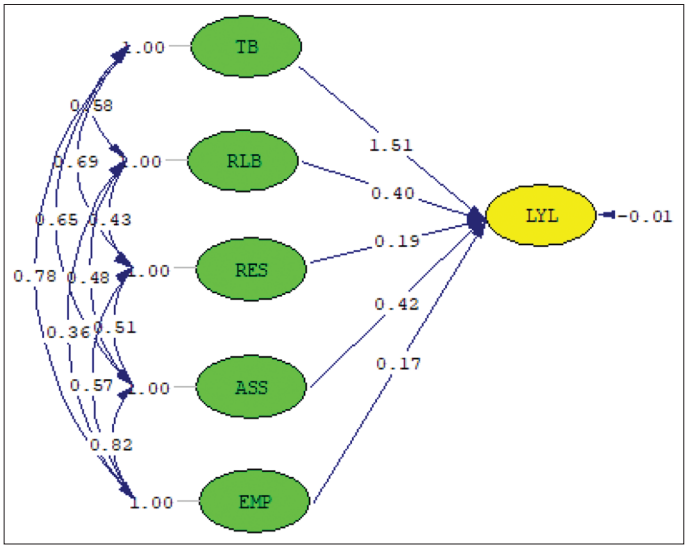


Figure 5: Structural model



3.8. Proposed Service Quality Variables

Preferences are choices of trends, interests, or preferences are choices made by passengers. Preference theory can be used to analyze the level of satisfaction. The percentage of satisfaction level with the quality of services provided can be seen in Table 5. This preference is used as a benchmark for the priority of improving service quality to increase passenger loyalty. The priority of the improvements made is the real aspect because it has the biggest correlation with passenger loyalty. The attribute that has the highest percentage of dissatisfaction must be corrected first. The proposed service quality variable that affects passenger loyalty. This proposal is based on indicators of questionnaire question attributes that can describe real latent variables. The priority of improvement is based on the highest percentage of dissatisfaction that can be seen in Table 5.

Table 4: Coefficient of determination

Variable dependent	Variable independent	Error variance	R^2
Loyalties	Tangible Reliability Responsiveness Assurance Empathy	0.0087	0.88

4. DISCUSSION

Measurement model analysis (external mode) is performed to analyze the results of the validity and reliability test of each manifest variable (indicator) against its latent variable. The results from the external model show that the indicators used are reliable

Figure 6: Comparison of existing load factors, break-even load factors, vehicle operating revenues and costs on the route

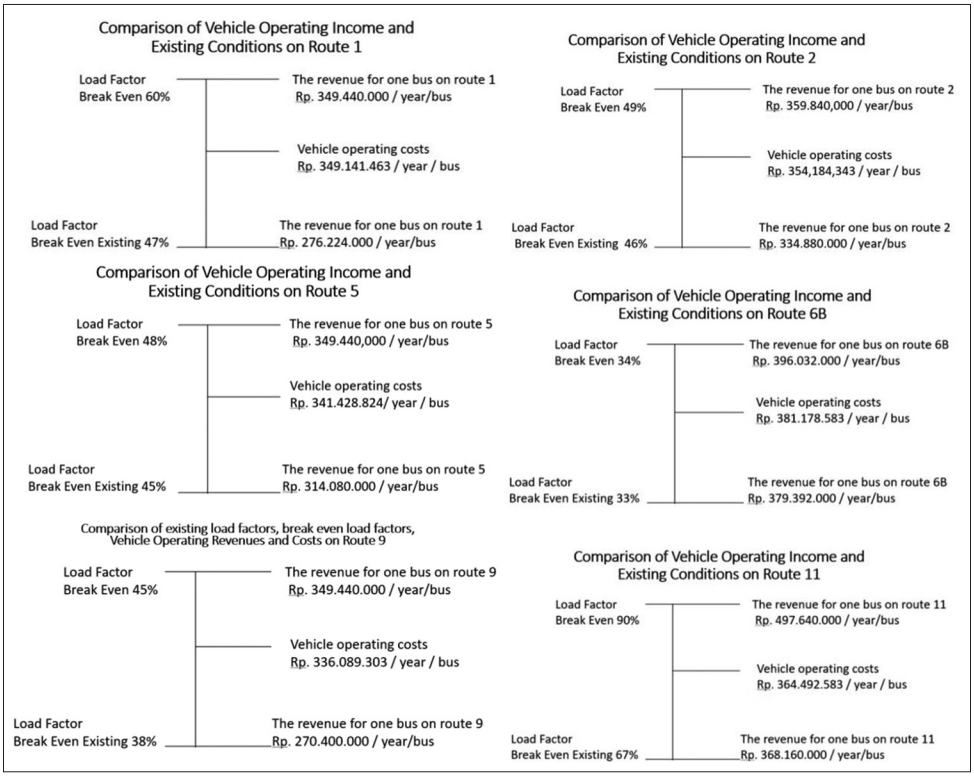


Table 5: Repair priorities

Tangible (TB)	Statement	(%) Dissatisfaction
TB1	Appropriate tariff	70,56
TB6	Electronic display on the bus for information about stops and route Tariff	63,33
TB7	There is a socket for mobile phone chargers on the bus	57,22
TB4	There are departure and arrival time information for each route in the terminal	60,56
TB3	There are decent waiting chairs inside the terminal and there are comfortable seats on the bus	48,89
TB5	There is audio information about the location of the stop in a clear voice on the bus	46,67
TB2	There is audio information about the location of the stop in a clear voice on the bus	28,89
TB9	Bus drivers use uniforms and identification	23,33

and valid. The latent variables are: Tangible (X1), reliability (X2), responsiveness (X3), guarantee (X4) and Empathy (X5).

The structural model (internal model) analyses the results of five hypothesis tests. Hypothesis testing results see variables that have a significant influence on service quality and customer satisfaction. Hypothesis testing concluded that H1, H2, H3, H4, H5 were accepted, where tangible variables had the highest correlation with passenger loyalty, and the Appropriate rate needed to be prioritized first. Service quality and vehicle load factors should be considered to improve the quality of city bus service (Carrese et al., 2013). The calculation results using Load Factor method (Handschin and Dornemann, 1988) can be seen in Figure 5.

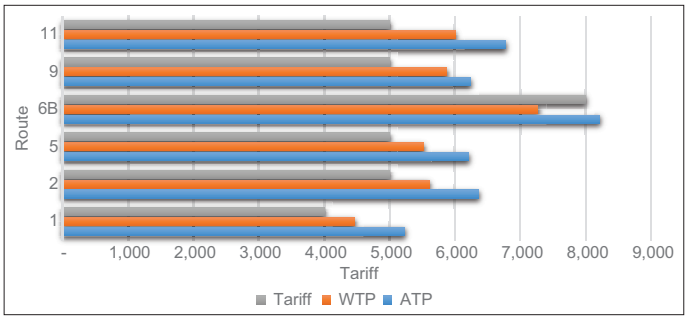
Service quality has an influence on customer satisfaction. Service quality has a very significant effect on customer satisfaction. This is evident from the calculation of the structural model obtained and the customer satisfaction R2 = 0.528, which means the customer satisfaction variable can be represented through the service quality variable of 52.8%. The results of the calculation of service quality on satisfaction is 6,731, which shows that service quality has a significant positive effect on customer satisfaction.

The ability to pay and the willingness to pay for all routes observed have a high level of ability, because the ability to pay for all routes has no value below the bus tariff. The results of a willingness to pay for all routes show that there is one route that has a willingness to pay below the bus tariff , that is on route 6B where passengers have a willingness to pay under the existing tariff because passengers feel there is too much difference in the tariff of IDR 733,- Vehicle operating costs have been obtained from the calculation, that there are some routes that have operational costs higher than the current tariff, namely on route 1 which has a difference of IDR 991,- long distance with a difference of IDR 615,- route is measured by a difference of IDR 796,- and route 2, with a difference of IDR 913,- can be seen in Figure 6.

Ability to pay and willingness to pay calculation results every route in IDR, (shown in Figure 7)

- Route 1 are 5,227, - and 4,470, - and the existing tariff is 4,000, -

Figure 7: Comparison of ATP and WTP results against VOC and existing



- Route 2 are 6,362, - and 5,607, - and the existing tariff is 5,000, -
- Route 5 are 6,204, - and 5,517, - and the existing tariff is 5,000, -,
- Route 6B are 8,207, - and 7,267, - and the existing tariff is 8,000, -.
- Route 9 are 6,232, - and 5,877, - and the existing tariff is 5,000, - and
- Route 11 are 6,777, - and 6,012, - and the existing tariff is 5,000, -

Overall results from the calculation of ability to pay as shown in Figure 7 are all bus route tariff in the city of Bandung are still in accordance with the level of ability, and Willingness to Pay shows that there is one route that has a level of willingness to pay below the applicable tariff, namely on route 6B.

5. CONCLUSIONS AND SUGGESTIONS

5.1. The Conclusion of this Study

1. Service quality has a very significant effect on customer satisfaction. This is evident from the calculation of the structural model obtained and the value of customer satisfaction R2 = 0.685, this means the customer satisfaction variable can be presented through the service quality variable of 68.5% and the rest is influenced by variables that are not measured. The results of the calculation of t distribution is the quality of service to satisfaction of 6,731, these results indicate that service quality has a significant positive effect on customer satisfaction
2. The results of the calculation of the ability to pay from the average bus passenger shows that all bus route tariff in the city of Bandung are still in accordance with the level of passenger capability
3. The results of the calculation of Willingness to Pay shows that there is one route that has a level of willingness to pay below the applicable tariff, namely on 6B, and for other routes it can still be said to be appropriate

5.2. Suggestions for Companies and for Further Research from this Research

1. The suggestion for bus companies is to improve service quality, because it will positively affect passenger satisfaction. If satisfied with the quality of service, the impact on the community will be an increase in the frequency of public bus users as their mode of daily transportation
2. Suggestions for bus physical facilities to improve quality, and tariffs are maintained or increased with improved facilities and better services, so that more passengers can use public bus transportation
3. Based on the results of research on the needs of different fleet numbers as follows:
   Route 1 requires 12 buses, with the current number of buses 15, Route 9 requires 17 buses, with the current number of buses 21, Route 11 requires 17 buses, with the current number of buses 12
4. Suggestions for Route 11, which requires less than 5 buses, should transfer the allocation of one bus for route 1, and four buses for Route 9. The remaining buses are used for backup buses
5. Suggestions for further research to find out how much the tariff is in accordance with the additional facilities needed at this time, because the results of the study the amount of the tariff in the range obtained from the level of willingness to pay passengers.

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