



Analysis of Bus Performance and Road Perception Based on Transit User Perspective on Ferry Usage -A Case Study at Ferry Port from North Buton Regency to Kendari Municipal-

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# Analysis of Bus Performance and Road Perception Based on Transit User Perspective on Ferry Usage - A Case Study at Ferry Port from North Buton Regency to Kendari Municipal -

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## Abstract

Public transport system is a part of transportation system in a region and improving the efficiency of public transport system means not only to improve the quality of but also economic and environment life in the region. The purpose of this study are to 1) show important indicators performance for ferry bus and road perception based on user transit opinion and 2) analyze the relationship and effect with ferry usage in undeveloped area.

Location of this study is in the North Buton Regency and 206 questionnaire respondents obtained. Analysis of data acquired using SEM PLS with SmartPLS 3.0 software. Based on the analysis, the main indicators for bus performance are personal security on board, fare and service provided, goods security on board and cleanness of seat. It also reveals that bus performance has influence on ferry usage and road perception to bus performance. This mean that improving service on bus performance will increase number of ferry users and road improvement will attract users' transit to preferred bus.

**Keywords:** Bus performance, SEM PLS, indicator performance

## 1. INTRODUCTION

Public transport system is a part of transportation system in a region and improving the efficiency of public transport system means not only to improve the quality of but also economic and environment life in the region. Thus, why the public transport system needs to tackle environmental problems and social needs by become more productive and attractive. Being referred comparatively rarely <sup>1)</sup>, the problem of regional public transport systems presents in every region, especially in rural area with low density population connected to urban area with high density population. One of the problems in regional public transport system is the lack of intermodal interchanges <sup>2)</sup>.

Public transport system is not only the best to moving massive amount of people <sup>3)</sup> but also goods and other things efficiently in which affect many factors in development of a country. Measurement process or set of parameters specified for public transport service started from the investment cost to obtain planned objectives <sup>4)</sup>.

Improving the quality of service for public transport system by analyzing the performance public transport system quality and improving the performance itself needed to upgrade transportation system according to its own characteristics in services <sup>5)</sup>. The characteristics of transportation systems are varying in many factors

such as urban transport system and rural transport system or in the developed country and developing countries. For example, reducing the urban transport system problems by improving the quality of public transport service <sup>6)</sup>. With the several of urban transport mode, the performance of public transport system arranged to upgrade the quality of service while for the rural transport system can be improving the transport mode. The quality of transit system can drive away people to use private vehicle and reducing the congestion.

Caused by the impact of Indonesia region separated by sea, the transport system in regional level area are mostly consist of sea transport mode such as Ferry ship and sea ship. Along with ferry port, the development of road infrastructure also carried out to connect the port with high density area. Ferry port can be utilized for freight and passengers, truck for goods transport and bus for passenger movement, mostly in remote area provided by central government.

The focus of this study is to show important indicators performance for Ferry Bus and road perception based on user transit opinion then analyze the relationship and effect with ferry usage in undeveloped area. These important as to show the performance of bus operated and road built by government in undeveloped regency.

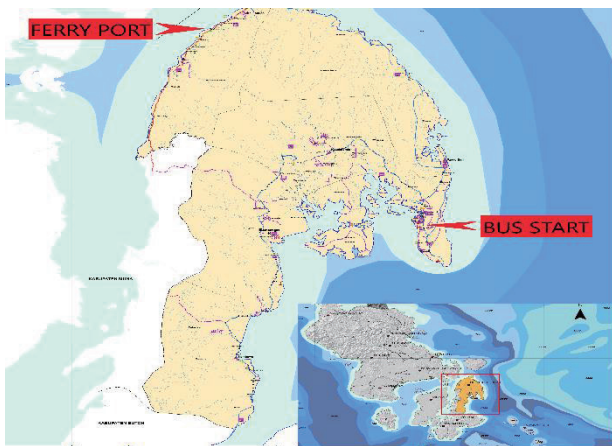
## 2. STUDY AREA

Ferry port from North Buton Regency to Kendari Municipal located in Labuan Bajo, North Wakorumba. It connects Buton island and Sulawesi island through South Konawe Regency and most dense transit users number compared with other ferry port or even sea ship.

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**Figure 1. Location Of Study**

Ferry port supported by bus to carried out passenger from North Buton Regency and Bau bau Municipal. From North Buton Regency, the bus start from Kulisusu Subdistrict through South Kulisusu Subdistrict, Bonegunu Subdistrict and Maligano Subdistrict (Muna Regency) to North Wakorumba. Road in Kulisusu Subdistrict provided by North Buton Regency while in Bonegunu Subdistrict and Maligano Subdistrict built by South East Sulawesi Province and North Wakorumba road carried out by Central Government.

### 3. RESEARCH METHODS

#### 3.1 Primary data collection

Questionnaire conducted to collect data of demographic attributes and transit users' opinions. The first section is for demographic attributes such as gender, occupation, monthly income and vehicle ownership. The second part is users' perception on bus performance. Next part is for road performance based on the transit users' opinion. Last part is for users' perception to use ferry in the most of their journey next time. Second part until fifth part use 5-point Likert scale.

Secondary data was obtained in December 2019 and primary data were collected in March until April 2020 in ferry port from 206 bus passengers.

#### 3.2 Data analysis

Structural Equation Modeling (SEM) was used to analyze primary data. SEM Partial Least Square (PLS) method with SmartPLS 3.0 software was used.

First part is analyzing users' characteristics and distribution by using descriptive statistical method. Second part is to collect users' opinion on bus performance in which start from Q1 to Q11. Q1 and Q2 are asking users' opinion for cleanness of seat and vehicle, Q3 and Q4 for security of personal and goods on board, Q5 is for comfort opinion, Q6 to Q8 are for service as comparison of fare and service, frequency of

run and easiness boarding to ferry, Q9 is for travel time and Q10 and Q11 are for information about ferry schedule and inspection of personnel on board. The third part is Q12 to Q17 asking users' perception on the road. Q12 to Q14 are asking users' satisfaction on 3 tracks in term they think the road is convenient for them, while Q15 to Q17 are asking for the safety of 3 tracks in term of road safety facilities. Q12 and Q15 refer to Ereke - Laeya (track 1), Q13 and Q16 refer to Laeya - Maligano (track 2) and Q14 and Q17 refer to Maligano - Labuan Bajo (track 3). The last part is Q18 for asking the likelihood will users use ferry in the most of their journey in the future.

Next step is drawing and analyzing the model in SmartPLS 3.0. Analyzing steps are divided into two section which are measurement model assessment and structural model assessment. Measurement model assessment will assess indicator reliability, convergent reliability, internal consistency and discriminant validity. Meanwhile, structural model will analyze collinearity issues, significance and relevance of the structural model relationship, level of  $R^2$ , effect size  $f^2$  and predictive relevance  $q^2$ .

### 4. DATA ANALYSIS AND RESULTS

#### 4.1 Respondent attributes

Part one collects profile of survey respondent as shown in table 1. Majority of respondents were male in which mostly were 17 to 45 years old. Most of them are farmer/laborer with no private vehicle ownership or 1 motorcycle ownership as shown in table 1. Following with distribution of users' transit opinion table 2.

**Table 1. Profile of Respondents**

Demographic Characteristics		%
Gender	Male	61,65
	Female	38,35
Age	< 17	5,34
	17-24	37,38
	25-45	44,17
	> 45	13,11
Occupation	Student	29,61
	Civil Servant/TNI/POLRI	5,83
	Trader/Businessman	9,71
	Farmer/Laborer	37,86
	A retired person	3,40
	Housewife	4,37
	Other	9,22
Income	<1 million	35,92
	1-3 million	32,52
	3-5 million	27,18
	>5 million	4,37
Vehicle	Don't have	30,58

Ownership	1 Motorcycle	29,13
	2 Motorcycles	15,05
	>2 Motorcycles	16,02
	1 Car	8,25
	2 Cars	0,49
	> 2 Cars	0,49

**Table 2. Distribution of Users' Transit Opinion**

Question	SA	A	N	D	SD	
Q1	Cleanness of seat	10,68 %	26,2 1%	35,44 %	16,99 %	10,6 8%
Q2	Cleanliness of Vehicle	9,71%	24,7 6%	42,23 %	18,93 %	4,37 %
Q3	Personal security on board	21,84 %	38,3 5%	22,82 %	14,56 %	2,43 %
Q4	Goods security on board	13,11 %	37,8 6%	32,52 %	8,25% %	8,25 %
Q5	Comfort on board	12,62 %	27,6 7%	6,80% %	44,17 %	8,74 %
Q6	Fare and service provided	19,90 %	29,1 3%	20,39 %	25,24 %	5,34 %
Q7	Frequency of runs	4,37%	32,5 2%	37,86 %	25,24 %	0,00 %
Q8	Easiness boarding to ferry	16,50 %	11,1 7%	47,09 %	23,30 %	1,94 %
Q9	Travel time	0,00%	18,4 5%	23,30 %	42,72 %	15,5 3%
Q10	Information about linier schedule with ferry	13,59 %	24,7 6%	47,09 %	12,62 %	1,94 %
Q11	Inspection of personnel on board	18,93 %	15,0 5%	37,86 %	28,16 %	0,00 %
Q12	Satisfied on track Ereke - Laeya (track 1)	4,37%	29,6 1%	48,06 %	17,96 %	0,00 %
Q13	Satisfied on track Laeya – Maligano (track 2)	0,49%	8,74 %	25,73 %	43,20 %	21,8 4%
Q14	Satisfied on track Maligano - Labuan Bajo (track 3)	6,80%	54,3 7%	31,55 %	5,34% %	1,94 %
Q15	Safety on track Ereke - Laeya (track 1)	21,36 %	11,6 5%	36,41 %	27,18 %	3,40 %
Q16	Safety on track Laeya – Maligano (track 2)	0,49%	6,31 %	33,98 %	32,04 %	27,1 8%
Q17	Safety on track Maligano - Labuan Bajo (track 3)	13,11 %	36,8 9%	47,09 %	1,46% %	1,46 %

Q18	Take ferry in the most your journeys in the future	18,93 %	33,5 0%	17,48 %	13,59 %	16,5 0%
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SA=Strongly Agree, A=Agree, N=Neither Agree or Disagree

D=Disagree, SD=Strongly Disagree

#### 4.2. Bus Performance and Road Perception

Users transit were interviewed to express their opinion on performance of bus, a scale ranges from 1 for strongly agree to 5 for strongly disagree.

From the table 3 shows that most of the respondents rated below good for bus performance in which mean of satisfaction rate is 2,83. More specifically, only Q3 (Personal Security on Board) was judged almost good ( $\geq 2$ ), other items were considered as near to neutral. Among the attributes, Q9 (travel time) can be said almost dissatisfied.

**Table 3. Bus Performance and Road Satisfaction Rate**

Indicator	Mean	Variance
Q1	2,91	1,28
Q2	2,83	0,98
Q3	2,37	1,11
Q4	2,61	1,17
Q5	3,09	1,57
Q6	2,67	1,45
Q7	2,84	0,73
Q8	2,83	1,06
Q9	3,55	0,93
Q10	2,65	0,87
Q11	2,75	1,13
Q12	2,80	0,61
Q13	3,77	0,82
Q14	2,41	0,60
Q15	2,80	1,34
Q16	3,79	0,87
Q17	2,41	0,62
<b>Overall Bus Performance</b>	<b>2,83</b>	<b>1,12</b>
<b>Overall Road Perception</b>	<b>3,00</b>	<b>0,81</b>

The satisfaction rate for bus performance rated as less satisfied in which the mean shows higher than 2. Road perception of users scored as normal as the mean of all indicators nearly 3. In details, track 3 (Maligano – Labuan Bajo) rated almost satisfied while track 1 (Ereke – Laeya) almost neutral and only track 2 (Laeya – Maligano) rated almost dissatisfied.

Based on the variance of the bus performance and road perception can be showed that users' opinion on bus performance are more heterogeneous than road perception. The average variance calculated for the variance of all the bus performance rates is about 1,12, while the corresponding average variance relating to road perception is about 0,81. Q1 (clean of seats) is the attribute rated in the most heterogeneous of bus performance, while the less heterogeneous is Q10 (for information about ferry schedule). In the road perception rates, Q15(safety on track 2) valued as the most heterogeneous way, and Q12 (satisfaction on tracks 1 is the less heterogeneous way).

### 4.3. Measurement Model Assessment

Measurement model assessment mainly to assess relationship between latent variable and indicators. Reflective indicator loading indicates Item Reliability in which show that indicator is a good measurement of the latent variable as the value  $> 0.5$ <sup>7)</sup>. Average Variance Extracted (AVE) present convergent reliability in value  $> 0.5$  by comparing proportion of variance explained in factor analysis<sup>8)</sup>. To assess Internal Consistency, Composite Reliability (CR) was used by measuring latent variable reliability in which the value  $> 0.7$ <sup>9)</sup>. Cronbach's alpha<sup>10)</sup> and Rho\_A in value  $> 0.7$  measure latent variable reliability in term of all variables are positively related to each other.

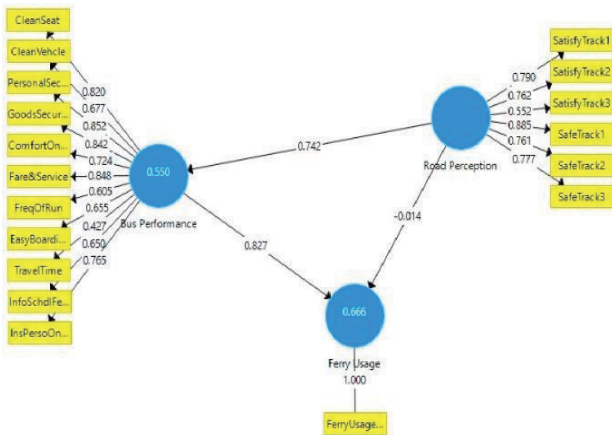


Figure 2. Measurement Model Analysis using SmartPLS 3.0

As shown in table 4, AVE, CR, Cronbach's Alpha and Rho\_A value indicates that latent variables are reliable. The indicators in relation with each their latent variable present value more than 0.5 which is described as good measurement of latent variable except for TravelTime item in which is below 0.5.

Next step in measurement model analysis is Discriminant Validity that show subjective independence of latent variable. Discriminant Validity use Heterotrait-Monotrait (HTMT) to present ratio of correlation as it will show below 0.9<sup>11)</sup>. The result of Discriminant Validity by using HTMT shown in table 5.

Table 4. Measurement Model

Indicator	Item	Loading	AVE	CR	Rho_A	Cronbach's Alpha
Bus Performance	Q1	0.82	0.527	0.922	0.923	0.906
	Q2	0.677				
	Q3	0.852				
	Q4	0.842				
	Q5	0.724				
	Q6	0.848				
	Q7	0.605				
	Q8	0.655				
	Q9	0.427				
	Q10	0.65				
	Q11	0.765				
Road Perception	Q12	0.79	0.579	0.89	0.877	0.851
	Q13	0.762				
	Q14	0.552				
	Q15	0.885				
	Q16	0.761				
	Q17	0.777				
Ferry Usage	Q18	1	1	1	1	1

Table 5. Discriminant Validity (HTMT)

	Bus Performance	Ferry Usage	Road Perception
Bus Performance			
Ferry Usage	0.837		
Road Perception	0.82	0.626	

### 4.4. Structural Model Assessment

Structural model analysis is performed to ensure that the structural model is robust and accurate<sup>12)</sup>. Collinearity assessment carried out by evaluating tolerance and VIF values in which specifically the inner VIF values. Significance and relevance of the structural model relationship measure the relationship between latent variable and also can be utilized to assess hypothesis by statistical testing.

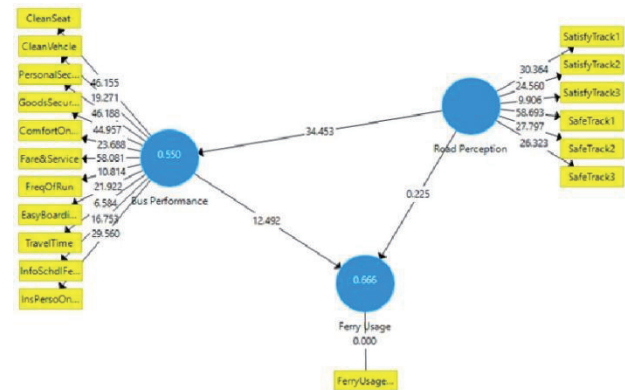


Figure 2. Structural Model Analyzing using Bootstrapping SmartPLS 3.0

Bootstrapping is done for hypothesis testing by estimating the spread, shape and bias of the sampling distribution of the population drawn from<sup>13)</sup>. Bootstrapping procedure with a resample of 5,000 suggested to assess  $\beta$  and the corresponding t-values<sup>14)</sup>. In bootstrapping also produce R-Square (Coefficient Determination) to measure the proportion of variance in a latent endogenous variable in which explained by other exogenous and denoted as a percentage<sup>14)</sup>. Then present the Effect size ( $f^2$ ) to evaluate if the omitted

indicator has a significance impact on the endogenous indicator on the model. Predictive Relevance ( $q^2$ ) of exogenous indicators obtained through Blindfolding procedure by omitting every n-th data point of endogenous indicators for estimating the parameters with the remaining data points<sup>13</sup>).

Inner VIF values and R-square obtained through PLS Algorithm. Table 6 shows that the values of indicators value are not more than five that indicate no strong indication of multicollinearity. While R-Square presented in table 7 in which represent the amount of variance in the endogenous variable explained by all of the exogenous variable linked to it. R-Square measures model predictive accuracy that range 0 to 1 to indicate the level of predictive accuracy.

**Table 6. Inner VIF Values**

	Bus Performance	Ferry Usage	Road Perception
Bus Performance		2,225	
Ferry Usage			
Road Perception	1	2,225	

**Table 7. R-Square**

	R Square	R Square Adjusted
Bus Performance	0,55	0,548
Ferry Usage	0,666	0,663

The next step is significance and relevance of the structural model relationship predictive by performing bootstrapping direct effect result. Significance and relevance of the structural model relationship obtained from Path Coefficients for Sample Mean (Std Beta), Standard Deviation (Std Error), T-Statistics ( $|t\text{-value}|^{\wedge}$ ) and Confidence Intervals (95%CI LL and 95%CU LL). Effect size  $f^2$  evaluate the power of exogenous variable contributes to explaining a certain endogenous variable in terms of  $R^2$  in which is obtained from equation as:

$$f^2 = (R^2_{\text{included}} - R^2_{\text{excluded}}) / (1 - R^2_{\text{included}})$$

$f^2$  obtained by estimating the PLS path model twice to calculate the change in the  $R^2$ . Second running of PLS path model will 1 exclude exogenous variable which are *Bus Performance* and *Road Perception*. Predictive Relevance ( $q^2$ ) treated as same as  $f^2$  through Blindfolding with equation as:

$$q^2 = (Q^2_{\text{included}} - Q^2_{\text{excluded}}) / (1 - Q^2_{\text{included}})$$

The result of direct relationship of structural model presented in table 8, while the calculation of direct relationship  $f^2$  and  $q^2$  showed in Table 9 and indirect relationship illustrated in table 10.

**Table 8. Direct Relationships**

Relationship	Std Beta	Std Error	$ t\text{-value} ^{\wedge}$	Decision
Bus Performance -> Ferry Usage	0.829	0.066	12.492**	Accepted
Road Perception -> Bus Performance	0.745	0.022	34.453**	Accepted
Road Perception -> Ferry Usage	-0.016	0.063	0.225*	Rejected

**Table 9.  $f^2$  and  $q^2$**

Relationship	$f^2$	$q^2$	95%CI LL	95%CU LL
Bus Performance -> Ferry Usage	0.85	0.832853	0.716	0.935
Road Perception -> Bus Performance			0.709	0.78
Road Perception -> Ferry Usage	-0.35294	-0.13833	-0.121	0.09

**Table 10. Indirect Relationship**

Relationship	Std Beta	Std Error	$ t\text{-value} ^{\wedge}$	Decision	95%CI LL	95%CU LL
Road Perception -> Bus Performance -> Ferry Usage	0,618	0,055	11,215	Accepted	0,515	0,696

## 5. DISCUSSIONS

### 5.1. Bus Performance and Road Perception

Perspective of users' transit on bus performance is not satisfied in which indicating that public transport performance provides a convenient service<sup>5</sup>) and need improvement. Only in personal security on board rated almost good. Since the passenger do not need to leave the bus along their journey. The other indicators judged as below their expectation. Based on practical finding in this study, the specification and facilities in bus can be differ each trip. For example, comfort on board

understood as air-conditioning in bus can be equipped with or not. Only travel time rated as almost dissatisfied as it took more than 8 hours to travel from North Buton Regency to Kendari Municipal.

In term of road perception, bus users pose neutral feeling along their journey in term of their comfort and safety of driving and road safety facilities. Track 3 from Maligano to ferry port is rated almost satisfied by bus users. This road constructed by central government with high specification. Refer to the field survey, the road use hot mix asphalt more than 75% in this track. The track 2 that range from Laeya to Maligano is the responsibility of provincial government in which rated almost bad. The road condition in Maligano in which cover about 50% in this track is extremely bad.

### 5.2. Effects of Bus Performance on Ferry Usage

Personal Security on board (Q3), Fare and Service Provided (Q4), Goods Security on Board and Cleanness of Seat (Q1) are observed variable with the highest explanation<sup>15)</sup> on bus performance. These four indicators represent 42,75% weight of the sum of all the weight while Inspection Personnel on Board (Q11), Comfort on Board (Q5), Cleanness of Vehicle (Q2), Easy Boarding to Ferry (Q8), Linier Schedule with Ferry Ship (Q10) and Frequency of Run (Q7) have considerable measurement on bus performance at total 51,82% weight of the sum of all the weight. Only Travel Time (Q9) has the lowest weight to measure bus performance at 5,43% of all weight.

Bus performance show positive effect on ferry usage as not only carrying passengers but also transporting goods. Specifically, in user transit side, bus provide more convenient in seat and more spacious for baggage. The price of bus ferry from North Buton Regency to Kendari Municipal is cheaper than other mode such as MPV car or private car.

### 5.2. Effects of Road Perception on Bus Performance

All the indicators of road perception can be used to explain their latent exogenous variable that each has weighted at range around 17,66% of sum all weights. On the other hand, satisfying on the track Maligano to Labuan Bajo (Q17) in which just little higher than value suggested as 0.5<sup>7)</sup>.

The relationship between road perception and bus performance is positive which mean that road perception has impact on bus performance. The better condition in traveling, more comfort for the users. The condition of road also can be a factor distract bus potential users. Based on interview, passengers will choose another transit mode such as MPV public car when the rainy season caused by road condition in Maligano become even worst and unsafe.

### 5.3. Effect of Road Perception on Ferry Usage

Road perception has no effect on ferry usage as there are some alternative road rather than the 3 tracks

of bus route. From North Buton Regency to ferry port, an alternative line available. This road is more preferred for motorcyclist, private car and MPV public car.

## 6. CONCLUSIONS

This study aims to analyzing the bus performance indicators, road perception and ferry usage in the context of undeveloped area. Bus performance and road perception in the route of bus based on this study are not providing good service. The main indicators for bus performance are Personal Security on board, Fare and Service Provided, Goods Security on Board and Cleanness of Seat. For road perception along bus track, the all indicators are good measurement except satisfying on track Maligano – Labuan Bajo.

Positive relationship between bus performance to ferry usage and road perception to bus performance showed on the analysis. This mean that bus operated by state-owned enterprise and subsidized by central government need to get treatment to be improved in service provided. Thus, the number of ferry users will increase and improve the economy in the region. Road perception also has a positive association with bus performance in which road improvement needed and part of local government responsibility.

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