

## Review of Mode Selection Probability Public Transportation Route Lhokseumawe - Medan

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### Abstract

In an intercity movement, the choice of mode plays a fairly important role, someone will move from one city to another will certainly consider many things. In traveling during the day or night on the Lhokseumawe Medan route or vice versa, travelers will be faced with a choice of land transportation modes, namely using the Putra Pelangi Bus and the Hiace Minibus. This study aims to determine the characteristics of mode users, factors that influence mode selection. Modeling analysis was carried out using multiple linear regression analysis method. Multiple linear analysis serves to measure the effect of the independent variables on the dependent variable. There are two regression models in this study, the first model based on the characteristics of the mode (Y1) and the second based on the characteristics of the passengers (Y2). The best model based on the characteristics of the mode is  $Y1 = 0.656 + 0.021X1 + 0.108X2 + 0.019X3 + 0.130X4$  with  $R^2 = 0.962$  and The best model based on the characteristics of the passengers is  $Y2 = 1,775 - 0,032X1 + 0,094X2 - 0,005X3 + 0,028X4 + 0,079X5 + 0,059X6 - 0,226X8$  with  $R^2 = 0.564$ .

**Keywords:** Model; Multiple linear regression analysis; Ordinary Least Square (OLS)

### INTRODUCTION

The transportation system is an important and strategic part of development of a region. Transportation has a very important role for the growth of national development considering its nature as a driver, motivator, and glue for bridging the gap between regions. In addition can be interpreted as an effort to move, move, transport or move an object from one place to another, useful for purposes- specific purpose.

In planning the selection of transportation modes, the selection of modes is a very important model in planning due to its key role public transportation as a transportation policy. No one can deny that public transportation uses more road space efficient than private transportation. Passenger public transportation is passenger transportation carried out on a rental or payment system, such as: bus transportation, trains, sea transportation and air transportation. Users of public transportation services can be grouped into several categories that have certain characteristics. Service characteristics must meet consumer demands, namely: reliable, safe, comfortable, cheap, fast, easy to obtain, fun, high frequency and dignified. (Meylisa et al., 2017)

In intercity movement, the mode selection factor plays a role. which is quite important, someone who is going to move from one city to another city of course will consider many things, namely whether the movement is carried out in this case using public transportation buses or minibuses. In Using this transportation, there are many choices of transportation modes that can be chosen used, all of these things are closely related to various characteristics of both modes, type of trip and characteristics of the traveler. Factors that can affect mode users can be grouped in terms of road user characteristics, movement characteristics, mode facility characteristics, city or zone characteristics. (Al Muntsari et al., 2021)

Passenger characteristics such as age, gender, income and Jobs also have a significant impact on transportation choices. For example, low-income people choose cheaper modes of transportation I depending on their ability to pay. On the other hand, people with High mobility jobs tend to choose more convenient modes of transportation fast.

Putra Pelangi bus is a public transportation that serves intercity travel. city and inter-provincial, Putra Pelangi buses are also popular buses in Aceh province and Medan City. While the Hiace minibus (PT. BAHTERA) is a type of minibus transportation that serves between cities and is also one of the Public transportation that is in great demand by people who travel intercity.

When traveling during the day or at night on the Lhokseumawe route Medan or vice versa, travelers will be faced with a choice of transportation modes. land transportation, namely by using Putra Pelangi Bus and Minibus Hiace. To determine the choice of transportation mode, this is the traveler considering various factors, such as the purpose of the trip, distance traveled, and costs.

## MATERIALS & METHODS

In this study, the locations used are two locations, namely the Lhokseumawe bus terminal and the Lhokseumawe hiace terminal. Data collection consists of two data, namely primary data and secondary data. Primary data is obtained by distributing questionnaires and surveys with direct interview techniques to respondents using the stated preference method, which is an approach to respondents in choosing their best alternative by creating an alternative. While secondary data is obtained from related agencies, from a collection of journals and books related to the topic to be discussed. Data analysis using multiple linear regression analysis. The use of linear regression is intended for forecasting, selecting influential variables, modeling and knowing the relationship between variables. Data processing uses the SPSS program which is able to analyze large data and has complete statistical test tools in it.

Furthermore, data analysis and data processing are the processes of identifying data carried out based on primary data and secondary data that have been obtained. The data obtained through a primary survey with a questionnaire based on the stated preference method is still qualitative data, then the data is processed and presented in a simpler form. The analysis and data processing in this study are as follows.

### Analysis of Passenger Characteristics of Bus and Minibus Hiace.

Analysis of characteristics that influence mode selection is a descriptive analysis to identify passenger characteristics in choosing a mode of transportation. In the group of traveler characteristics, all variables in the questionnaire are related to individual travelers and contribute to influencing travelers in choosing a mode.

### Multiple linear regression analysis

The formula for a multiple linear regression is:

$$y = \beta_0 + \beta_1 X_1 + \dots + \beta_n X_n + \epsilon \quad (1)$$

y = the predicted value of the dependent variable

$\beta_0$  = the y-intercept (value of y when all other parameters are set to 0)

$\beta_1 X_1$  = the regression coefficient ( $\beta_1$ ) of the first independent variable ( $X_1$ ) (a.k.a. the effect that increasing the value of the independent variable has on the predicted y value)

... = do the same for however many independent variables you are testing

$\beta_n X_n$  = the regression coefficient of the last independent variable

$\epsilon$  = model error (a.k.a. how much variation there is in our estimate of y)

Linear regression analysis is to determine the attributes of the independent variable X and the attributes of the dependent variable Y, this analysis is carried out to test whether there are factors that influence passenger decisions in choosing a mode.

The first model with dependent variable (Y) used in this study is the type of transportation mode chosen, namely the Putra Pelangi bus and the Hiace minibus and the independent variables (X) used are the factors that influence the choice of mode, namely:

X1 = travel time

X2 = waiting time

X3 = travel costs/fares

X4 = terminal costs

The second model analysis of mode selection factors based on passenger characteristics aims to produce a regression equation model between the dependent variable (y) and the independent variable (x). The dependent variable used is the mode chosen and then analyzed with independent variables based on passenger characteristics, namely:

X1= age

X2= gender

X3= occupation

X4= income

X5= last education

X6= trip purpose

X7= mode chosen

X8= reason for choosing mode

X9= convenience

X10= safety

## RESULTS AND DISCUSSION

The study of night transportation mode selection on the Lhokseumawe-Medan route was conducted at the Lhokseumawe Bus Terminal and the Lhokseumawe Hiace Terminal. The survey lasted for 4 days, starting from Friday, Saturday, Sunday and Monday. In this study, there were two modes studied, namely the Putra Pelangi Bus and the Hiace Minibus. The research method used a questionnaire with a direct interview technique with respondents who were traveling. Respondents were selected randomly as many as 100 samples.

Analysis of Bus and Hiace Minibus Passenger Characteristics. From this data, more detailed information will be obtained about the respondents from each mode selection as follows:

It is known that respondents who choose the Putra Pelangi Bus mode are dominated by female respondents 29 people and male respondents 15 people. While respondents who choose the Hiace minibus mode are dominated by male respondents 31 people and female respondents 25 people.

The data obtained shows that the age of respondents who choose the Putra Pelangi Bus is mostly aged 20-30 years, namely 24 people, in second place are respondents aged 30-40 years, namely 11 people, then respondents aged 40-50 years, namely 7 people, and respondents aged 50-60 years, as many as 2 people. While the respondents who choose the Hiace minibus are mostly aged 20-30 years, namely 41 people and aged 30-40 years, as many as 15 people.

The number of respondents who chose the Putra Pelangi Bus was dominated by self-employed/entrepreneurs as many as 18 people, respondents with other jobs as many as 12 people, student respondents as many as 10 people, then respondents with civil servant jobs as many as 2 people, and housewife respondents as many as 2 people. Meanwhile, respondents who chose the Hiace minibus were also dominated by self-employed as many as 30 people, civil servants as many as 10 people, other jobs as many as 10 people and students as many as 6 people.

Respondents who chose the Putra Pelangi Bus were dominated by respondents who had a monthly income of 1-2 million, namely 14 people, with an income of 2-3 million 12 people, with an income of <500 thousand as many as 11 people, income > 3 million as many as 6 people and respondents who had an income of 500 thousand-1 million as many as 1 person. Meanwhile, those who chose the Hiace minibus were dominated by respondents with an income of 2-3 million as many as 35 people, >3 million as many as 10 people, 1-2 million as many as 4 people and <500 thousand as many as 7 people.

Data from field research respondents who chose the Putra Pelangi Bus were dominated by respondents with a high school education of 28 people, 12 people with a bachelor's degree (S1), 4 people with a diploma (D3). Meanwhile, those who chose the Hiace minibus were also dominated by respondents with a high school education of 24 people, then 21 people with a bachelor's degree (S1), 10 people with a diploma, and 1 person with an elementary school education.

Respondents who chose the Putra Pelangi Bus for family travel purposes were 32 people, travel for work was 3 people, travel for education was 6 people and travel for tourism was 3 people. Meanwhile, respondents who chose the Hiace minibus were also dominated by family travel purposes of 31 people, then work matters of 21 people, for education of 2 people and for tourism of 2 people.

The percentage of night transportation modes used by the Community from Lhokseumawe to Medan using the Putra Pelangi Bus was 44% and those using the Hiace were 56%. The reasons for choosing a mode by respondents who chose the Bus were for reasons of comfort, while respondents who chose the Hiace were for reasons of travel time and comfort. The comfort of the transportation mode chosen by respondents who chose the Bus was comfortable and those who chose the Hiace were quite comfortable and comfortable. The percentage of safety in the transportation mode chosen by respondents who chose the Bus was comfortable 44% and those who chose the Hiace were comfortable 44% and quite comfortable 12%.

**Analysis of Influencing Factors of Mode Selection based on mode characteristics**

The correlation test is a test used to measure the extent of the relationship between two or more variables.

**Table 1.** Correlation Test

	Selected mode	Travel time	Waiting time	Travel cost/fare	Terminal cost
Selected mode	1	0,577	0,955	0,608	0,959
Travel time		1	0,552	0,351	0,519
Waiting time			1	0,598	.913
Travel cost/fare				1	0,549
Terminal cost					1

The basis for decision making in the T test is if sig > 0.05 or T count < T table then there is no influence of variable X on variable Y and if sig < 0.05 or T count > T table then there is an influence of variable X on variable Y. The T table value for the T test is obtained in the following way:

$$T \text{ table} = T (\alpha / 2 ; n-k-1) = T (0.025; 95) = 2.277$$

**Table 2.** T Test model Y1

Variable (X)	t	Sig
Travel time (X1)	2,478	0,015
Waiting time (X2)	8,028	0,000
Travel cost/fare (X3)	2,349	0,034
Terminal coxt (X4)	10,650	0,000

The F test is conducted to determine whether all independent variables have a simultaneous influence on the dependent variable.



**Table 3.** Test F model Y1

Model	F	Sig.
Regression	608,611	0,000

The F table value for the F test is obtained in the following way:

F table = F (0.05; n-k-1) = F (0.05; 95) = 1.985. The results of the F hypothesis test show the results of the SPSS calculation with a calculated F value of 608.611. Based on the F test, it is concluded that the calculated  $F > F$  table, namely  $608.611 > 1.985$  and the sig value of  $0.00 < 0.05$  meets the requirements, so the conclusion is that all the attributes considered have a joint effect on passenger decisions in choosing a mode.

Based on the test results using SPSS, the determination coefficient or R Square value is 0.962 or equal to 96.2%. This means that the independent variables of travel time (X1), waiting time (X2), travel costs/fares (X3) and terminal costs (X4) jointly affect the dependent variable of the selected mode (Y) by 96.2%.

The multicollinearity test is to see whether there are two or more independent variables that are linearly correlated.

**Table 4.** Multicollinearity Test model Y1

Variable (X)	Tolerance	VIF
Travel time (X1)	0,694	1,442
Waiting time (X2)	0,147	6,806
Travel cost/fare (X3)	0,642	1,557
Terminal coxt (X4)	0,166	6,013

Based on table 4, the results of the multicollinearity test using SPSS show that each variable has a VIF value  $< 10$  and a tolerance value  $> 0.1$  so that there is no multicollinearity. This means that there is no relationship or correlation between independent variables.

The heteroscedasticity test aims to test whether in the regression model there is inequality of variance from the residuals of one observation to another.

**Table 5.** Heteroscedasticity Test model Y1

Variable (X)	Sig
Travel time (X1)	0,067
Waiting time (X2)	0,476
Travel cost/fare (X3)	0,314
Terminal coxt (X4)	0,368

Based on table 5, the results of the heteroscedasticity test using SPSS can be concluded that:

- 1) The travel time variable (X1) has a sig value of  $0.067 > 0.005$ , so there is no symptom of heteroscedasticity.
- 2) The waiting time variable (X2) has a sig value of  $0.476 > 0.005$ , so there is no symptom of heteroscedasticity.
- 3) The travel cost/fare variable (X3) has a sig value of  $0.314 > 0.005$ , so there is no symptom of heteroscedasticity.
- 4) The terminal cost variable (X4) has a sig value of  $0.368 > 0.005$ , so there is no symptom of heteroscedasticity.

### Model Determination Based mode characteristics

Based on the requirements and also the significance of the survey data model with a questionnaire based on the stated preference method, it is then processed with the SPSS program and its requirements and significance are tested, then for the construction of the mode selection utility model, the requirements and significance of the model are first seen, the results of the data processing output using SPSS obtained the best mode selection model is:

$$Y1 = 0.656 + 0.021X1 + 0.108X2 + 0.019X3 + 0.130X4 \quad (2)$$

Description:

- X1 = travel time
- X2 = waiting time
- X3 = travel cost/fare
- X4 = terminal cost

### Analysis of Influencing Factors of Mode Selection based on Passenger Characteristics

After conducting a correlation test between the independent variables, a multiple linear regression test was carried out

between the independent variables and the dependent variable, the best model was obtained using the variables of age (X1), gender (X2), occupation (X3), income (X4), latest education (X5), travel purpose (X6), and reasons for choosing the mode (X8).

$$Y2 = 1,775 - 0,032X1 + 0,094X2 - 0,005X3 + 0,028X4 + 0,079X5 + 0,059X6 - 0,226X8 \quad (3)$$

Description:

- X1 = Age
- X2 = Gender
- X3 = Occupation
- X4 = Income
- X5 = Last education
- X6 = Trip purpose
- X8 = Reason for choosing mode

Based on the test results using SPSS, the determination coefficient or R Square value is 0.564 or equal to 56,4%.

**Table 6.** T Test model Y2

Variable (X)	t	Sig
Age (X1)	-0,643	0,522
Gender (X2)	1,322	0,189
Occupation (X3)	-0,154	0,878
Income (X4)	1,105	0,272
Last education (X5)	2,022	0,046
Trip purpose (X6)	1,436	0,155
reason for choosing mode (X8)	-9,279	0,000

based on the table, then there is no effect of variable X on variable Y

**Tabel 7.** Test F model Y2

Model	F	Sig.
Regression	17,02	0,000

Y2 is an equation that has a sig value <0.005 meets the required, so the conclusion is that all X variables jointly affect the Y variable.

**Table 8.** Multicollinearity Test model Y2

Variable (X)	Tolerance	VIF
Age (X1)	0,898	1,114
Gender (X2)	0,930	1,076
Occupation (X3)	0,679	1,473
Income (X4)	0,681	1,469
Last education (X5)	0,865	1,156
Trip purpose (X6)	0,825	1,212
reason for choosing mode (X8)	0,922	1,084

The results of the multicollinearity test using SPSS show that model Y2 has a VIF value <10 and a tolerance value > 0.1 so that there is no multicollinearity. This means that there is no correlation between the independent variables.

**Table 9.** Heteroscedasticity Test model Y2

Variable (X)	Sig
Age (X1)	0,283
Gender (X2)	0,128
Occupation (X3)	0,887
Income (X4)	0,153
Last education (X5)	0,035
Trip purpose (X6)	0,000
reason for choosing mode (X8)	0,000

The variable X1  $0.283 > 0.05$  and X2  $0.128 > 0.05$  and X3  $0.887 > 0.05$  and X4  $0.153 > 0.05$  and X5  $0.035 < 0.05$  and X6  $0.000 < 0.05$  and X8  $0.000 < 0.05$ , so there are symptoms of heteroscedasticity.

Based on the determination coefficient or R Square ( $Y1=96,2$ ,  $Y2=56,4\%$ ) and Ordinary Least Square (OLS), it can be concluded that the Y1 model is better than the Y2 model. This means that what influences passengers in choosing the hiace and bus transportation modes are the characteristics of the mode not the characteristics of the passengers.

## CONCLUSIONS

Respondents who choose the mode of transportation can be said to be not too different, namely those who choose the Putra Pelangi Bus as many as 44 respondents and those who choose the Hiace Minibus as many as 56 respondents. The characteristics of passengers in choosing the mode are on average 20-30 years old and female respondents prefer the Putra Pelangi Bus while male respondents prefer the Hiace minibus. Furthermore, passengers with an income of 2 million-3 million prefer the Hiace minibus and passengers with an income of 1-2 million choose the Putra Pelangi Bus and the average job is self-employed, the characteristics of road users with an average travel purpose for family matters.

The influencing factors for choosing the mode based on the attributes offered are travel time, waiting time, travel costs and terminal costs obtained from the regression analysis have an  $R^2$  of 0.962 or 96.2% influence. So that the best mode selection model obtained from the results of the linear regression analysis is  $Y1 = 0.656 + 0.021X1 + 0.108X2 + 0.019X3 + 0.130X4$ .

The influencing factors for choosing the mode based on the characteristics of the passengers are age, gender, occupation, income, last education, trip purpose and reason for choosing mode from the regression analysis have an  $R^2$  of 0.564 or 56.4% influence. The best model form the results of the linear regression analysis is  $Y2 = Y = 1,775 - 0,032X1 + 0,094X2 - 0,005X3 + 0,028X4 + 0,079X5 + 0,059X6 - 0,226X8$ .

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