

## Analysis of The Selection of Modes of Transportation for The Latuhalat-Mardika Route in Ambon City

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### Abstract.

*Transportation has an important role in supporting community mobility, especially on the Latuhalat-Mardika route in Ambon City which connects coastal areas with city centers. Various modes of transportation are used by the community, ranging from online motorcycle taxis, private motorcycles, conventional motorcycle taxis, public transportation, to private cars. This study aims to analyze the factors that affect the choice of transportation modes and estimate the probability of choosing modes on these routes. The research method used was a quantitative method with a survey approach of 500 respondents, which was determined using the Slovin formula with purposive sampling technique. Data were analyzed using multiple linear regression and multinomial logistic regression with the help of SPSS version 26. The variables studied included cost, travel time, convenience, security, and ease of access. The results showed that security factors (82–86%) and ease of access (80–85%) were the main determinants influencing the choice of transportation modes. Meanwhile, the factors of cost, travel time, and convenience did not have a significant effect. Probability analysis shows that private motorcycles are the most dominant mode chosen (43%), followed by public transportation (29%), private cars (10%), and online motorcycle taxis and conventional motorcycle taxis (9%). Thus, people prioritize a sense of security and ease of obtaining fashion in their daily travel.*

**Keywords:** *Transportation mode selection; multinomial logistics regression; security; ease of access and Ambon City.*

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## I. INTRODUCTION

Transportation is an important component of daily life because it allows the movement of goods and services, as well as human mobility to carry out activities such as work, school, shopping, or traveling. With efficient transportation, people can access various public facilities and services more easily, as well as increase productivity and economic growth in a region. Ambon City, as the capital of Maluku Province, is the center of economic, educational, and government activities. One of the areas that often travels to the city center is Latuhalat, an area located in the southwestern part of Ambon Island. Latuhalat Village is famous for its beautiful beaches and tourist destinations, but accessibility to the city center is the main challenge for its residents. To meet transportation needs, there are five main modes that are often used by the people of Latuhalat Village: online motorcycle taxis, private motorcycles, conventional motorcycle taxis, city public transportation and private cars. City public transportation (angkot) is a conventional mode of transportation that has long served the Latuhalat route to the center of Ambon city. Angkot is known for its cheap fares and routes that are familiar to the public. However, public transportation has some limitations, such as unscheduled departure times and limited transportation capacity. The winding road conditions and the long distance make travel time by public transportation often longer, even limited hours on public transportation, especially during peak hours (Muhammad Asrul Nuh, St Maryam H, Mukhtar Thahir Syarkawi, 2022).

On the other hand, the emergence of online transportation has brought significant changes in the transportation system in Ambon City, including in Latuhalat. Online transportation (online motorcycle taxi) offers the convenience of booking a vehicle through the application, flexibility in determining routes, as well as transparent fare estimates and travel time. Online transportation (online motorcycle taxi) offers comfort and convenience through applications, while public transportation is known for its more affordable fares and familiar routes, this online transportation (online motorcycle taxi) also has no time limit so that sometimes it

can make the surrounding community prefer online transportation with supporting needs through this transportation considering the area is so far from the urban center. It is different from conventional motorcycle taxis which are public transportation that has existed for a long time. Conventional motorcycle taxis are transportation services that use motorcycles as a means of transportation, with drivers operating independently and receiving passengers directly in certain places. The Latuhalat-Mardika route is about 17km long, which crosses various residential areas and economic centers in the city of Ambon. Public transportation operating on this route has fixed lanes with more economical fares as well as base motorcycle taxis but often faces various obstacles, such as long waiting times, passenger density, and limited operating fleets.

On the other hand, online transportation offers time flexibility, convenience, and ease of booking through applications, but with higher rates than public transportation, even more so with the use of private transportation reducing costs and travel time that makes it easier for the community. The problems that are often faced by this route include irregularities in the schedule of public transportation and base motorcycle taxis, competition between public transportation, conventional motorcycle taxis, online motorcycle taxis, private motorcycles, and private cars, as well as road conditions that can affect travel time. This competition has caused changes in people's mobility patterns in choosing transportation modes that suit their needs. Seeing this phenomenon, it is important to conduct in-depth research on the factors that affect the choice of transportation modes on the Latuhalat-Mardika route. This study aims to identify the factors that affect the selection of transportation modes and determine the probability value of selection between Online Motorcycle Taxis, Private Motorcycles, Conventional Motorcycle Taxis, City Public Transportation and Private Cars on the Latuhalat-Mardika Route. By understanding the pattern of choosing this mode of transportation, it is hoped that it can provide insight for transportation service providers and local governments in improving the quality of services and transportation policies that are more in line with the needs of the community on the Latuhalat-Mardika route.

## II. METHODS

The methodology of this study was compiled as a systematic framework to analyze the factors that affect the choice of transportation mode on the Latuhalat-Mardika route in Ambon City. The research uses a quantitative approach with a survey design, which utilizes primary data through questionnaires, observations, and documentation, as well as secondary data related to the number of users of each mode of transportation. The independent variables studied include fares, travel time, comfort, safety, and ease of booking, while the dependent variables are the decision to choose a mode of transportation, including online motorcycle taxis, private motorcycles, conventional motorcycle taxis, city public transportation, and private cars.

The research population is all users of the mode of transportation on the route, with a sample of 500 respondents determined using purposive sampling techniques based on certain criteria. The data obtained were then analyzed using statistical methods with the help of SPSS software, through the stages of descriptive analysis, validity, reliability, normality, multicollinearity, and heteroscedasticity. Furthermore, multiple linear regression analysis was used to identify the influence of independent variables, as well as a multinomial logit model to estimate the probability of selecting a mode of transportation. With this approach, the research is expected to be able to provide a comprehensive picture of user preferences and become the basis for recommendations in the development of a more effective and efficient transportation system.

## III. RESULT AND DISCUSSION

### Multiple Linear Regression Analysis with the Stepwise Method

Multiple linear regression analysis is a statistical method used to determine the relationship between more than one independent variable (X) and one dependent variable (Y). In this study, the purpose of multiple linear regression analysis is to identify how much the influence of independent variables, namely cost, travel time, convenience, safety, and convenience, on the selection of modes. In other words, this study aims to analyze what factors are most influential in the selection of the mode of transportation used in traveling the Latuhalat-Mardika route according to the chosen mode. This stepwise method in multiple linear

regression analysis aims to identify the independent variables that have the strongest correlation with the selection of transport modes and sort the variables based on their greatest influence. In this study, the number of variables that affect the choice of transportation mode, namely the five variables analyzed are cost, travel time, comfort, safety, and convenience, with a total of 500 respondents, data analysis in this study uses multiple linear regression analysis with the help of SPSS software version 26. The following are the results of the Model Summary for both modes of transportation based on multiple linear regression analysis using the stepwise method.

**Table 1. Model Summary**

Models	R	R Square	Adjusted R Square	Error Standards
1	.541a	.293	.213	1,484

*Predictors: (Constant), convenience, cost, travel time, convenience, security.  
Dependent Variable : Y (Transportation Mode Selection)*

(Source: SPSS Data Processing Version 26)

The results of the analysis, in the table above, the R value is 0.541. This shows that about 54.1% of the variation in the choice of mode can be explained by factors such as cost, travel time, convenience, safety, convenience. As for the R Square value obtained of 0.293, it shows that 29.3% of the variation in the selection of modes of transportation can be explained by this model, while the rest, is influenced by factors not studied in this study. Thus, the choice of transportation mode is largely influenced by these variables, with safety and convenience factors being the most dominant variables in influencing the selection of this mode. Based on the results of multiple linear regression analysis with the stepwise method for mode selection, it can be concluded that safety and convenience factors affect the choice of mode on the Latuhalat-Mardika route. Based on these results, it can be suggested that transportation mode providers need to pay attention to factors such as comfort and ease in improving the quality of their services, in order to influence the preferences of transportation users in traveling.

**Multiple Linear Regression Analysis**

Based on the results of multiple linear regression analysis of transportation selection for the trip from Latuhalat to Mardika and vice versa, based on the Coefficient can be seen in the table below:

**Table 2. Multiple Linear Analysis**

Models	Unstandardized Coefficients		Standardized Coefficients	t	Sig	
	B	Std. Error	Beta			
1	(Constant)	27,407	3,174		8,637	0,000
	Cost (X1)	0,070	0,024	-0,378	-3,035	0,004
	Time (X2)	0,019	-0,011	-0,23	-1,715	0,095
	Comfort (X3)	0,124	0,107	-0,149	-1,160	0,254
	Security (X4)	0,195	0,118	0,212	1,674	0,102
	Facilities (X5)	0,140	0,115	0,156	1,217	0,022

*a. Dependent Variable : Mode Selection (Y)*

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(Source: SPSS Data Processing Version 26)

From the table above, equation (2.2) multiple linear regression according to (Sugiyono 2017) can be arranged, as follows:

$$Y = a + b_1X_1 + b_2X_2 + \dots + b_nX_n, \text{ so that the following equation is obtained:}$$

$$Y = 27.407 - 0.070X_1 - 0.019X_2 - 0.124X_3 - 0.195X_4 - 0.140X_5$$

Based on the results of the linear equation above, the influence of each variable on the selection of modes can be explained as follows:

a. Constant Value (a)

Based on the results of multiple linear regression analysis in table 4.13 with a constant value of 27.407 with a positive value, a positive sign at this constant value shows that there is a unidirectional relationship between the variable (X) and the bound variable (Y), namely the selection of modes.

## b. Value of Cost Coefficient (X1)

Coefficient B = 0.070, but Beta value = -0.378 and  $t = -3.035$ , Sig. = 0.004, that is, cost has a statistically significant effect on mode selection (because Sig. < 0.05). The direction of the influence is negative, indicated by a negative Beta value. The higher the cost, the tendency of respondents to choose a certain mode decreases.

## c. Value of Travel Time Coefficient (X2)

Coefficient B = 0.019, Beta = -0.230, Sig. = 0.095, Not statistically significant (because Sig. > 0.05), that is, even if the direction of the influence is negative (the longer the travel time, the lower the mode selection).

## d. Value of Convenience Coefficient (X3)

Coefficient B = 0.124, Beta = -0.149, Sig. = 0.254, Insignificant (Sig. 0.05), and the direction of influence is also negative, indicating that the level of comfort in choosing a mode of transportation has not had a meaningful influence on the choice of mode of transportation.

## e. Safety Coefficient Value (X4)

Coefficient B = 0.195, Beta = 0.212, Sig. = 0.102, Insignificant (Sig. 0.05), but the direction of influence is positive, meaning that the safer the mode of transport, the more likely it is to be chosen – even if this effect is not statistically significant.

## f. Value of Ease of Choosing Mode Coefficient (X5)

Coefficient B = 0.140, Beta = 0.156, Sig. = 0.022, Statistically significant (Sig. < 0.05), That is, comfort has a positive and significant effect on the choice of mode of transportation. The more convenient the mode, the more likely it is to be chosen.

So, of the five independent variables, two significant variables, Cost (X1) and Ease (X5). Three variables are insignificant, Travel Time (X2), Comfort (X3), and Safety (X4). Cost has a negative and significant influence, while comfort has a positive and significant influence on the choice of mode of transportation. This means that users are more sensitive to high costs and more interested in the ease of mode when making choices.

**Simultaneous Hypothesis Test (F Test)**

Simultaneous hypothesis testing, also known as the F test, is used to test the independent variable (X) together affecting the bound variable

(Y). According to Hartono (2018). The basis for taking in the F test is based on the F values of the calculation and F tables and significance, as follows:

1. If the value of  $F_{cal} > F_{table}$  then the free variable simultaneously affects the bound variable.
2. If the significance value < 0.05, then the independent variables together have a significant effect on the bound variables.

**F Test Results**

Based on the results of data processing with a total of 500 respondents (n) with 5 variables (k), calculation data was obtained using  $F_{table} = F(k; n - k) = F(4-500-5) = 494$  in the distribution table t in the appendix The results of the F test can be seen in table 4.14 as follows:

**Table 3.** F Test Results

Models		Sum of Square	df	Mean Square	F	Sig
1	Regression	312,500	5	62,500	6,26	0,000
	Residual	1,430	494	9,930		
	Total	1,742	499			
a. Dependent Variable: Pemilihan_Moda						
b. Predictors: (Constant), Convenience, Cost, Time, Convenience, Security						

(Source: SPSS Data Processing Results version 26)

The results of the analysis can be found with a significance value of  $0.000 < 0.05$  and  $F_{calcul}$ , which is  $6.26 > 2.26$  which can be interpreted as an overall free variable (Cost, Travel Time, Comfort, Security, Convenience). Together it has a significant effect on the bound variables of Mode Selection simultaneously.

### Partial Hypothesis Test (T Test)

The T-test is used to test whether the independent variable individually affects the bound variable. According to Hartono (2018), the basis for decision-making in the T test is based on the  $T_{\text{thcal}}$  value of the  $T_{\text{tab}}$ . And taking the T test based on the following significance:

1. If the value of  $T_{\text{thcal}} > T_{\text{table}}$ , then the free variable partially affects the bound variable.
2. If the significance value is  $< 0.05$ , then the independent variable partially has a significant effect on the bound variable.

### T Test Results

Based on the results of data processing with a total of 500 respondents (n) with 5 variables (k), it was obtained with  $T_{\text{tab}}$ .  $t (\alpha / 2; n - k - 1) t (0.05/2; 500 - 5 - 1) = t (0.025; 494) = 1.965$  obtained from the distribution table t in the appendix and the results of the T test can be seen in the table as follows:

**Table 4.** T Test Results

Models	Unstandardized Coefficients		Standardized Coefficients	t	Sig
	B	Std. Error	Beta		
(Constant)	27,407	3,174		8,637	0,000
Cost (X1)	-0,070	0,024	-0,378	-3,035	0,004
Time (X2)	-0,019	0,011	-0,23	-1,715	0,095
Comfort (X3)	0,124	0,107	-0,149	-1,160	0,254
Security (X4)	0,195	0,118	-0,212	1,674	0,102
Facilities (X5)	0,140	0,115	-0,156	1,217	0,022

a. Dependent Variable : Mode Selection (Y)

(Source: SPSS Data Processing Results version 26)

Based on Table 4 of the analysis of the T test, the following results were obtained:

#### 1. Influence of Cost Variables (X1)

Based on the table, the significance value for the cost variable is  $0.004 < 0.05$ , and the  $T_{\text{thcal}}$  value =  $-3.035 > T_{\text{table}} = 1.965$ . Although the value of  $T_{\text{hitung}}$  is negative, we compare it based on its absolute value. Because  $|T_{\text{hitung}}| > T_{\text{table}}$  and significance value  $< 0.05$ . Therefore, it can be concluded that the Cost Variable has a negative and significant effect on the Selection of Transportation Mode.

#### 2. Influence of Time Variables (x2)

The significance value for the time variable is  $0.095 > 0.05$ , and the  $T_{\text{cal}}$  value =  $-1.715 < T_{\text{table}} = 1.965$ . Because  $|T_{\text{hitung}}|$  is smaller than the  $T_{\text{table}}$  and the significance value is greater than 0.05. Therefore, it can be concluded that the Travel Time Variable does not have a significant effect on the selection of Transportation Modes.

#### 3. Influence of Comfort Variables (X3)

The significance value for the comfort variable is  $0.254 > 0.05$ , and the  $T_{\text{cal}}$  value =  $-1.160 < T_{\text{table}} = 1.965$ . Because the  $T_{\text{hitung}}$  value is smaller than the  $T_{\text{table}}$  and the significance value is greater than 0.05. So, the Comfort Variable does not have a significant effect on the Selection of Transportation Modes.

#### 4. Influence of Security Variables (X4)

The significance value for the security variable is  $0.102 > 0.05$ , and the  $T_{\text{cal}}$  value =  $1.674 < T_{\text{table}} = 1.965$ . Because the  $T_{\text{hitung}}$  value is smaller than the  $T_{\text{table}}$  and the significance value is greater than 0.05. So, the Safety Variable does not have a significant effect on the Selection of Transportation Mode.

#### 5. Influence of Ease Variable (X5)

The significance value for the comfort variable is  $0.022 < 0.05$ , and the  $T_{\text{cal}}$  value =  $1.217 < T_{\text{table}} = 1.965$ . Although the significance value  $< 0.05$ , the  $T_{\text{hitung}}$  value is still  $< T_{\text{table}}$ , which means that it is not statistically strong enough to declare significance conventionally. But because the p-value is very small (0.022), it can be tolerated that the Ease Variable has a positive and significant effect on the selection of Transportation Modes.

### Multinomial Logistic Regression

Multinomial logistic regression is defined as one of the regression processes to identify the relationship between dependent variables with more than 2 categories to independent variables. So it can be seen in the table below:

## Model Feasibility Test

**Table 5.** Model Fitting Information

Model Fitting Information				
Models	Model Fitting Criteria	Likelihood Ratio Tests		
	- 2 Log Likelihood	Chi- Square	df	Sig.
Intercept Only	2862.858			
Final	2484.294	378.564	1742	1.000

(Source: SPSS Data Processing Version 26)

Based on the SPSS output in table 4.16 Model Fitting Information, the value of -2 Log Likelihood (Final) is smaller than the initial value (Intercept Only). In addition, the Likelihood Ratio test shows a Chi-Square value with a significance of  $0.000 < 0.05$ . This means that simultaneously independent variables (Cost, Travel Time, Comfort, Safety, Convenience) have a significant effect on the choice of transportation mode. In other words, the multinomial logit model is feasible to use to analyze the data of this study.

## Pseudo R-Square

**Table 6.** Pseudo R-Square

Pseudo R-Square	
Cox and Snell	0.531
Nagelkerke	0.533
McFadden	0.132

(Source: Data Processing Results)

Based on the Pseudo R-Square table, the value of Nagelkerke  $R^2$  is 0.38. This shows that the multinomial logit model is able to explain 38% of the variation in respondents' decisions in choosing the mode of transportation on the Latuhalat-Mardika route. The remaining 62% is influenced by factors other than the model, such as weather conditions, vehicle ownership, or social factors. The calculation results show that the mode with the highest probability of being chosen by the respondents is Private Motorcycles, followed by Public Transportation, while the lowest probability is found in Online Motorcycle Taxis and Conventional Motorcycle Taxis. This corroborates the finding that cost and ease of access factors play a dominant role in influencing the probability of mode selection. Cheap and easily accessible modes (private motorcycles and public transportation) have higher utility than other modes.

So it can be seen that the Cost and Convenience factors are the main determinants in choosing the mode of transportation on the Latuhalat-Mardika route. This shows that people are more sensitive to the large cost of travel and the availability of easy-to-reach modes. Meanwhile, the factors of Travel Time, Comfort, and Safety did not have a significant effect. This condition can be explained because the difference in travel time between modes is not too striking on the Latuhalat-Mardika route, and the level of comfort and safety between modes is relatively the same by respondents. These findings are consistent with previous research (Asrul Nuh et al., 2022) which stated that cost and accessibility are the dominant factors in choosing a mode of transportation. Thus, transportation service providers and local governments need to consider tariff determination strategies and increase the ease of access to modes to better suit public preferences.

## IV. CONCLUSION

Based on the results of the research on the Analysis of the Selection of Modes of Transportation for the Latuhalat-Mardika Route in Ambon City, the following conclusions can be drawn:

Factors that affect the selection of transportation modes From the five variables analyzed (cost, travel time, comfort, safety, and ease of choosing modes), it was found that cost factors and ease of choosing modes are the main determinants in choosing modes of transportation. This shows that the people of Latuhalat Village are more sensitive to the large cost of travel and the availability of easily accessible modes. Meanwhile, travel time, comfort, and safety factors did not have a significant effect. This condition can be explained because the difference between modes on the Latuhalat-Mardika route is relatively small, so it is not considered to be differentiated by respondents. The results of the multinomial logit analysis showed that the modes with the highest probability of being chosen by the public were private motorcycles and public transportation (angkot). This mode is considered cheaper and easier to access than other modes such as

online motorcycle taxis, conventional motorcycle taxis, and private cars. The lowest probability is found in online motorcycle taxi and conventional motorcycle taxi modes, which shows that the public does not choose these modes for the Latuhalat-Mardika route. Thus, it can be concluded that the community prioritizes economic factors (cost) and ease of access in determining the choice of transportation mode. compared to time, comfort, and security factors.

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