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Mode Selection Model Based on Travel Time and Price of Goods with Regression Analysis Model

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Abstract- Padang City Market is one of the shopping centres in Padang City, which is located in the West Padang District. The shopping centre presents a place for people to buy kitchen supplies or basic daily needs. This makes the area quite attractive for community travel. This research was conducted on 400 respondents who visited Padang City Market. In this study, the choice of mode is represented by the Y variable and is categorized into private vehicles, public transportation, rental vehicles, walking, and others. The travel time variable represents X_1. The variable price of goods represents X_2. This study aims to assess the level of correlation between the choice of mode (Y) on the variable travel time (X_1) and the variable price of goods (X_2).
Furthermore, the mode selection (Y) was modeled based on the variables X_1 and X_2 using linear regression analysis with SPSS tools. The results of the analysis show a strong relationship between the Y variable and the X_1 and X_2 variables. The best linear regression model produced is $Y = 0{,}010 + 0{,}76X_1 + 0{,}029X_2$ with a value of $R = 0{,}437$. This means that the closer the travel time is and the lower the price of goods, the more the intensity of motorcycle mode selection to Pasar Raya Padang increases.

1. Introduction

In everyday life, the people of Padang City cannot be separated from transportation. Transportation is needed to help people carry out the process of moving from one place to another safely, comfortably, quickly and cheaply (Akustia, 2016; Khisty, C. Jotin, 2005). Padang City consists of several areas, namely educational areas, trade areas, industrial areas and residential areas.

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One thing that influences people's travel levels is the trade/shopping area, especially Pasar Raya Padang, which is precisely in the West Padang District. Where The shopping centre provides a place for people to buy kitchen needs or basic daily necessities (Pratiwi, A, 2022).

This makes Pasar Raya Padang quite a big travel attraction for the people of Padang City. According to (Rita, 2010), the market is a place to sell or market goods/as a form of accommodation for trading activities. The increase in travel in the Pasar Raya Padang area could be due to an increase in the number of private vehicles and public transportation in Padang City, which causes frequent traffic jams on roads. Where private vehicles and public transportation stop or park on the road (Yusnita, Y, 2020). As a result, when traffic volume is high, traffic jams will occur (Yusnita, 2020). Traffic jams occurring at Pasar Raya Padang can be prevented if, before determining the location of the place, first estimating the generation and attraction of traffic movements on land use (Sugiyanto, 2013). By knowing the magnitude of the generation and attraction of traffic flow, the geometry of the road sections in the Pasar Raya Padang area can be prepared and planned. This issue decreases the likelihood of using public transportation and raises the likelihood of driving private automobiles directly to their destinations (Lu, Ying et al., 2023). The benefits of expanding roadways to mitigate traffic are counteracted by induced vehicle travel sooner than is typically anticipated (Yang, Wookjae, 2023).

Market activities are traditional economic activities which are characterized by bargaining between sellers and buyers (Munajir, 2018). Because of its nature to serve the daily needs of the Population, its location tends to be close to or in residential areas (Anggraini, 2021). The majority of visitors to Pasar Raya Padang are native residents of Padang City. So, most of the people of Padang City shop for their daily needs at Pasar Raya Padang. According to (Anugrah, 2023), The market has a travel attraction caused by the distance from residence to the market, the type of goods purchased and total spending. Apart from that, the prices of goods offered by Pasar Raya Padang sellers are also very affordable for the public. Therefore, this research aims to analyze the relationship between mode choice and Pasar Raya Padang based on the variables of travel time and price of goods.

2. Methods

This research uses a descriptive-analytical method, namely collecting and compiling initial data, then explaining and analyzing it so that it can produce conclusions about existing problems. The problem studied is analyzing the relationship between mode choice and travel time variables and goods prices. Modelling mode selection is based on travel time and the price of goods, assisted by SPSS 21 software.

This research was conducted in the Pasar Raya area of Padang City, West Padang District, Padang City, West Sumatra. The survey carried out in this research was carried out twice. The first survey was preliminary in the Pasar Raya area of Padang City and was carried out on January 1 2023; the second survey was interview with visitors to the Padang City Market, namely charging questionnaires conducted on time day Work January 9 – January 15 2023 at 07.30 WIB – 12.00 WIB and carried out at peak pull namely on Thursday and Sunday, January 12 and January 15 2023 at 07.30 – 12.00 WIB. Based on the research objectives, data collection techniques were carried out through observation, interviews using questionnaires, and documentation.

Travel characteristics are described through the percentage of questionnaire results from 400 respondents with several criteria, namely first, criteria regarding respondent data (gender, age, occupation, total income, number of vehicles, and means of transportation used) and second, respondent criteria regarding the Padang City Grand Market (destination to Pasar Raya Padang City, travel time to Pasar Raya Padang City, parking space capacity, price of goods and completeness of goods at Pasar Raya Padang City).

The factors that influence travel attraction are produced in the form of variable modelling. Travel attraction modelling is obtained using multiple linear regression analysis. The variables used for modelling that will be regressed are travel time, parking area, price of goods and cleanliness. Meanwhile, to obtain the best travel attraction modelling results, model tests such as correlation test, partial t-test, F / ANOVA test, determination test (R^2), multicollinearity test and autocorrelation test are carried out. (Roza A, Yusnita Y & Mandasari, 2019) .

To systematically calculate the sample size of the Population in one area, the Slovin formula can use Equation 2.1 as follows:

$$n = \frac{N}{1+Ne^2} \quad (2.1)$$

Where:
n = estimated sample size
N = Estimated Population = 939112 people (Central Statistics Agency of Padang City, 2018) The desired level of accuracy is 95%, so the error tolerance limit (e) = 5% (Harlan J, 2018). Based on Equation 2.1, the sample size estimation is obtained as follows.

$$n = \frac{N}{1+Ne^2}$$
$$= \frac{939112}{1+939112 \times 0{,}05^2}$$
$$n = 399.79 \approx 400 \; people$$

Characteristics journey depicted through percentages results charging questionnaire of 400 respondents with a number of criteria is First criteria regarding respondent data (type gender, age, occupation, number income, amount vehicles and tools transportation used) and second criteria respondents regarding Padang City Market (destination to Padang City Market, time journey to Padang City Market, capacity room parking, price goods and equipment goods at the Padang City Market).
For influencing factors, a pull journey is generated from the form modelling variable. Modelling pull journey is obtained with the analysis of multiple linear regression. The variables used for modelling will be regressed, that is, time travel, wide land parking, price goods, and cleanliness. Meanwhile, to obtain results, the modelling pull journey is best done through model testing such as correlation test, partial t-test, F / ANOVA test, determination test (R^2), multicollinearity test and autocorrelation test. In this research, only 2 variables were analyzed best that is time itinerary and price goods.
Variables such as time itinerary and price of goods were analyzed best.
In transportation modelling, the technique that is often used is the regression technique (Saputra R, Anggraini R, 2017 ; (Roza, Angelalia, 2020). Regression analysis is used to measure the magnitude of the influence of the independent variable (X) on the dependent variable (Y). According to (Harlan J, 2018), Regression analysis is also used to predict the dependent variable using the independent variable. According to (Ofyar Z & Tamrin, 2014), in transportation analysis, linear regression analysis is often used, both simple linear and double linear. According to (Harlan J, 2018), the formula for multiple linear regression analysis is as follows:

$$Y = B_0 + B_1X_1 + B_2X_2 + \cdots + B_nX_n \quad (2.2)$$

Where:
Y = Dependent variable (Y)
$X_1, X_2, \cdots, X_n$ = Independent variables (X)
B_0 = Constant
$B_1, B_2, \cdots B_n$ = Estimated Coefficient

3. Results and Discussion

From the data obtained through the questionnaire, the mode choice model uses a multiple linear regression formulation assisted by SPPS 21 software. The steps for creating a mode choice model are as follows.

1. Mode Choice Data

Most visitors to Pasar Raya Padang use motorbikes (49%), and 31% of visitors use public transportation. This can be seen in Table 1.

Table 1. Mode Choice Data

No	Choice	Amount	Per cent
1	Motorcycle	196	49
2	Car	44	11
3	Public transportation	124	31
4	Taxibike	32	8
5	Bicycle	4	1

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Total	400	100

2. Travel Time Data

visitors to Pasar Raya Padang live near the Pasar Raya Padang area, so as many as 49% of respondents only need a travel time of 0-15 minutes to Pasar Raya Padang. This can be seen in Table 2.

Table 2. Travel Time Data

No	Choice	Amount	Per cent
1	0 - 15 minutes	176	44
2	15 - 30 minutes	134	33.5
3	30 - 45 minutes	90	22.5
4	45 - 60 minutes	0	0
Total		400	100

3. Goods Price Data

Visitors assess that the prices of goods offered by sellers to visitors to Pasar Raya Padang are very cheap, as much as 66% and visitors who consider the prices of goods in the Pasar Raya Padang area to be cheap, as much as 44%. This can be seen in Table 3.

Table 3. Goods Price Data

No	Choice	Amount	Per cent
1	Very Not Cheap	0	0
2	Not cheap	0	0
3	Cheap	176	44
4	Very cheap	224	56
Total		400	100

4. Mode Selection with Travel Time Variables

Recapitulation process results analysis multiple linear regression between election mode with variable time journey using SPSS 21 software can be seen in Table 4.

Table 4. Mode Selection with Travel Time Variables

Variable Dependents: Mode Selection			
Regression Model	Coef. Regression	t	p
Constant	-0.131	-9,609	0,000
Travel Time (X_1)	0.76	18,012	0,000
Suitability of the regression model formed (Anova Regression)		F = 324.442	0,000
Coefficient Correlation (R) = 0.252			
The model formed is: $\mathbf{Y = -0.131 + 0.76\ X_1}$			

Based on Table 4, the selection model mode with variable time journey, namely: $Y = -0.131 + 0.76\ X_1$.. This shows that time trip (X_1) affects in a way that is directly related to election mode (Y). How strong is the connection between time trip (X_1) against election mode (Y) is visible from the mark coefficient, the determinant (R) is 0.252, which means it is a variable time trip (X_1) gives enough influence of 25.2% against election mode (Y), while the remaining 74.8% is influenced by other variables that are not included in this research model. From the results, the Fcount is 324,442 compared with Ftable, which is 3.00. It said that Fcount (324,442) > Ftable (3.00). This means it is a variable time trip (X_1) by simultaneous influence to election mode (Y). In the model, there are time journeys that will increase by 0.76. This means a short time journey to Padang Market and then the increased election mode motorbike to Padang Raya Market.

5. Mode Selection with Goods Price Variables

Recapitulation Process results analysis Multiple linear regression between election mode with variable

price goods using SPSS 21 software can be seen in Table 5.

Table 5. Mode Selection with Goods Price Variables

Variable Dependents: Mode Selection			
Regression Model	Coef. Regression	t	p
Constant	0.010	0.686	0.493
Item Price (X_2)	0.029	26,463	0,000
Suitability of the regression model formed (Anova Regression)		F = 700.284	0,000
Coefficient Correlation (R) = 0.357			
The model formed is: **$Y = 0.010 + 0.029\ X_2$**			

Based on Table 5, the selection model mode with variable price goods, namely: $Y = 0.010 + 0.029\ X_2$. This shows that the price of goods (X_2) affect in a way that is directly related to election mode (Y). How strong is the connection between price goods (X_2) against election mode (Y) is visible from the mark coefficient, the determinant (R) is 0.357, which means it is a variable price item (X_2) delivers enough influence, amounting to 35.7% against election mode (Y), while the remaining 64.3% is influenced by other variables that are not included in this research model. From the results, the Fcount is 700,284 compared with Ftable, which is 3.00. It said that Fcount (700,284) > Ftable (3.00). This means it is variable price goods (X_2) by simultaneous influence to election mode (Y). In the model, there are price items (X_2) will increase by 0.029. This means more cheap price goods at the Padang Grand Market than the increase in election mode motorbikes to Padang Raya Market.

6. Mode Selection with Travel Time and Goods Price Variables

Recapitulation Process results analysis multiple linear regression between election mode with variable time travel and variables price goods using SPSS 21 software, as you can see in Table 6.

Table 6. Recapitulation of Analysis Results Regression Linear Multiple between Mode Selection with Travel Time and Goods Price Variables

Variable Dependents: Mode Selection			
Regression Model	Coef. Regression	t	p
Constant	0.010	0.713	0.476
Travel Time (X_1)	0.76	19,376	0,000
Item Price (X_2)	0.029	27,476	0,000
Suitability of the regression model formed (Anova Regression)		F = 565.178	0,000
Coefficient Correlation (R) = 0.437			
The model formed is: **$Y = 0.010 + 0.76\ X_1 + 0.029\ X_2$**			

Based on Table 6, the selection model mode with variable price goods, namely: $Y = 0.010 + 0.76\ X_1 + 0.029\ X_2$. This shows that time trip (X_1) and price goods (X_2) affect in a way that is directly related to election mode (Y). How strong is the connection between time trip (X_1) and price goods (X_2) against election mode (Y) is visible from the mark coefficient, the determinant (R) is 0.437, which means it is a variable time trip (X_1) and variables price item (X_2) delivers enough influence, amounting to 43.7% against election mode (Y), while the remaining 56.3% is influenced by other variables that are not included in this research model. From the results, the Fcount is 565,178 compared with the Ftable, which is 3.00. It said that Fcount (565,178) > Ftable (3.00). This means it is a variable time trip (X_1) and variables

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price goods (X_2) by simultaneous influence to election mode (Y). This shows that variable time trip (X_1) and variables price goods (X_2) by simultaneous influence to election mode (Y). In the model, the time journey increased by 0.76; meanwhile, the price of goods will increase by 0.029. This means more time journeys and cheaply priced goods, so the intensity of the election mode motorbike to Padang Raya Market is increased.

4. Conclusion

This section contains the essence of research findings and recommendations for further research. In this section, the authors should avoid using the numbering format.
Pasar Raya Padang is a traditional market in Padang City which provides daily necessities. So it's natural that a lot of visitors come to Pasar Raya Padang to shop, and the mode most visitors use to get to Pasar Raya Padang is private motorbikes. People prefer to use motorbikes, most likely to avoid traffic jams on the way to Pasar Raya Padang. Through the recapitulation results of multiple linear regression analysis, it was found that the best model that could be formed was $Y = 0.010 + 0.76\,X_1 + 0.029\,X_2$ with a value of R = 0.437.

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