An analysis of the travel time in the Unhas lecturer housing of Makassar city

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Abstract. Travel is the movement of a person from one place to another. The journey was formed because of the activities carried out not in their residence. Travel characteristics of the population depend on the purpose of the trip. The purpose of this research is to identify the variables that affect travel time and model the use of modes of travel time for workers who live in UNHAS Lecturer housing. In this research, the data analysis used inferential analysis, namely multiple regression analysis with the help of the SPSS computer program. The results showed variables that affect the travel time in the UNHAS Lecturer housing are the distance traveled and the time of departure to work. Regression modeling that corresponds to the travel time in this case study is \( Y = 3.433 + 0.259 X_4 - 0.010 X_5 \).

1. Introduction

Travel is the movement of a person from one place to another. The journey was formed because of the activities carried out not in his residence. Travel characteristics of the population depend on the purpose of the trip [1]. The previous study explains that the basis of the travel pattern is an individual journey that is made a concept as a trip, starting from the place of origin of the house and ending at a destination where certain activities occur [2]. In the case of home-based movements, the purpose of movements that are often used includes movements to the workplace, movements to schools or universities, movements to shopping places, and movements for social and recreational purposes [3]. Travel time of a road is one of the references that can be used in planning a trip. Estimated travel time information is very useful for road users to choose travel routes that can make it easier to get to the destination. For this reason, a reliable travel time estimate is needed.

The method of estimating travel time can be estimated by direct surveys in the field and can also be obtained from travel time modeling. Variations in time are caused by changes in traffic flow, mixing of vehicle types, driver groups, lighting, and weather and also traffic events. Travel time is the total time required to pass a certain length of the road, including stop-times and delays at junctions. Travel time does not include stopping for resting or repairing vehicles [4]. The movement occurs due to a satisfaction process that must be done every day, every hour and even every minute, such as the satisfaction of work, education, recreation, and others [5]. The form of these activities will greatly determine the pattern of movement in a system, especially associated with zones/regions, where the movement of individuals in a zone will be different from other zones is also strongly influenced by the characteristics of each actor [6], [7].

The purpose of this research is to identify the variables that affect travel time and model the use of modes of travel time for workers who are domiciled in the Unhas Lecturer housing at the street of...
2. Methodology

2.1. Location
This research was carried in the suburbs of Makassar City, namely in Unhas Lecturer Housing in the street of Perintis Kemerdekaan Km.10 Makassar City, Tamalanrea District, Makassar City, South Sulawesi Province, the Republic of Indonesia as shown in Figure 2. The total population of this housing is 2,317 the majority of workers who work in the areas of Makassar City. Taking the number of research samples from the population in this housing and carried out by Proportionate Stratified Random Sampling with a confidence level of 95%, so that the obtained sample size of 345 residents.

2.2. Model Analysis and Research Variables
The Regression Analysis through the SPSS program determines the travel time model. The regression model is multiple linear models [8]. Where the variables of this study are one dependent variable, namely length of travel time from home to office/place of activity (Y) and independent variables namely gender (X1), age (X2), mode used (X3), travel distance (X4) and time departure to work (X5).

3. Result and discussion

3.1. Characteristics of Respondents
From the results of research using variables of travel time, gender, age, modes used, distance traveled, time of departure from home to office can provide an overview of the characteristics of the population in this housing as follows.

3.1.1. Travel Time Characteristics
Based on Figure 3, the travel time from home to office place of activity, the number of respondents with travel time less than 30 minutes is 62.86%, the number of respondents with travel time between 30-60 minutes is 35.71%, the number of respondents with travel time is between 60 -90 minutes by 1.43%, while there are no respondents with a travel time of 90-120 minutes and greater than 120 minutes. From the results of the research, as shown in Figure 3, it can be seen that the travel time of residents in this housing is dominated by travel time less than 30 minutes.
3.1.2. **Gender Characteristics**

The male population dominates the gender characteristics of this housing as explained in Figure 4 where the percentage approaches 78.57%. On the other hand, the total population of women only has 21.43%. Here it shows that in this housing the male gender dominates the work journey.

![Figure 3. Gender Characteristics.](image)

3.1.3. **Age Characteristics**

In figure 5 explains that the age characteristics of people who travel from housing is dominated by people aged between 40 to 50 years with a percentage of 38.57%, then residents aged between 30 to 40 years with a percentage of 42.45%, after that the residents who aged bigger than 50 years with a percentage of 17.14% and a population aged between 20 to 30 years with a percentage of 10.00% and then the population aged less than 20 years with a percentage of 2.86%.
3.1.4. Travel Distance
The distance from the residence to the destination of this residential population varies between less than 1 km into bigger than 15 km. Percentage of each distance traveled is dominated by distance bigger than 15 km with a percentage of 38%. Based on the above experience, it can be seen the number of respondents who distance the office/place of activity from home less than 1 km of 22.86%, and between 1-2 km of 62.86%, and also between 2-5 km of 5.71%, and then between 5-10 km is 2.86%, after that between 10-15 km is 2.86%, then bigger than 15 km is 2.86%. From the result of the travel distance above, it can be seen that the more dominant travel distance to the office from home is between 1-2 km (62.86%).

3.1.5. Mode Used
The mode used in traveling as shown in figure 6 shows that the population in this housing estate tends to use motorbike in traveling where the percentage using motorbikes is 52.86% while those using private cars are 32.86% and those using public transportation 14.29%.
3.1.6. Departure Time

From the result we obtain that departure time to the place of work, those who work at 6.30-07.00 is 10%, from 07.00-07.30 is 24.29%, and the time between 07.30-08.00 is 32.86%, and also the time between 08.00-08.30 is 20%, then the time bigger than 08.30 is 12.86%. From the result above, it can be seen that the departure time to work is dominated by the time between 07.30 -08.00 with a percentage of 32.86%.

3.2. Data Analysis

The results of the correlation analysis showed a significant correlation coefficient between the independent variables. So, for multiple linear regression analysis, the independent variables used are (X1) gender, (X2) age, (X3) mode used, (X4) travel distance, and (X5) departure time.

3.2.1 Multiple Linear Regression Analysis

This analysis shows the magnitude of the quantitative influence between two or more variables, in the case of the independent variable and the dependent variable. This analysis is needed to obtain multiple regression equations, namely:

\[ Y = a + b_1X_1 + b_2X_2 + b_3X_3 + \ldots + b_nX_n \]

where each component \((a, b_1, b_2, b_3 \ldots b_n)\) is obtained using the SPSS program, and the results are as follows:
### Table 1. Multiple Linear Regression.

| Model | Unstandardized Coefficients | Standardized Coefficients | t | Sig. |
|-------|-----------------------------|---------------------------|---|-----|
|       | B                             | Std. Error               | Beta |     |     |
| (Constant) | 3.433                      | .317                      |     |     |     |
| 1     | X4                            | .259                      | .048 | .578 | 5.375 | .000 |
|       | X5                            | -.010                     | .047 | -.023 | -.218 | .828 |

**Coefficients**

a. Dependent Variable: Y

#### 3.2.2 Travel time from home to office

Based on the data in the table above, the following equation is found:

\[
Y = 3.433 + 0.259 \text{X}_4 - 0.010 \text{X}_5
\]  

Regression results of the evaluation of the relationship of travel time, which is influenced by the length of travel time from home, is the distance from home to work, departure time to work from home.

### Table 2. Time Travel Regression.

| Model | Sum of Squares | df | Mean Square | F   | Sig.  |
|-------|----------------|----|-------------|-----|-------|
| Regression | 6.234          | 2  | 3.117       | 17.643 | .000a |
| 1     |                |    |             |     |       |
| Residual | 11.837        | 67 | .177        |     |       |
| Total  | 18.071         | 69 |             |     |       |

**ANOVA**

a. Predictors: (Constant), X5, X4

b. Dependent Variable: Y

#### 3.3. Model Testing

#### 3.3.1 Multiple correlations of coefficient (Multiple R)

The multiple correlation of coefficient (Multiple R) is good if it approaches ±1. Based on the value of multiple linear regression analysis in the correlation summary model table R = 0.587a, this shows a strong correlation (correlation) between two independent variables namely X4 (Travel Distance), X5 (Departure time to work) with variable Y (length of time taken).

### Table 3. Model Summary.

| Model | R  | R Square | Adjusted Square | Std. error of the Estimate |
|-------|----|----------|-----------------|---------------------------|
| 1     | .587a | .345     | .325            | .420                      |

a. Predictors: (Constant), X5, X4

Evaluation of the results for the correlation evaluation is related within the travel time that is influenced by the length of travel time from home, distance traveled, and time of departure to work with the coefficient of determination (R Square) has an interval value between 0-1. The greater R2 (close to 1) is better with the results for the regression model. From the results of the multiple linear analysis in the table above, the value of R2 = 0.345 is obtained where this explains that 34.5%, the overall influence of the three variables
X1 (Gender), X2 (Age), X3 (Mode Used), X4 (Travel Distance), X5 (Departure Time to Work) while 65.5% were influenced by other variables not discussed in this study.

3.3.2 Significant test of coefficient regression (t-test)

The hypothesis is stated below:

H0:  $t$ arithmetic $\leq$ t table the regression coefficient on the independent variable is not significant
H1:  $t$ arithmetic $>$ t table (regression coefficient on the significant independent variable)

Decision-making is that if $t$ arithmetic bigger than (> ) t table then H1 is accepted (significant regression coefficient). If $t$ arithmetic less than (<) t table then H0 is accepted (regression coefficient is not significant). Based on the results of multiple linear regression analysis in the coefficient table, t values (count) were obtained for each regression coefficient (5.978), and (-0.128) while for t tables the values of $t$ (64), 0.05 = (see the statistical table t the numerator degree df 1 = (k-1) = 6-1 = 5 and the denominator df2 = (nk) = 70-6 = 64), so $t$ (0.05) = 1.295. From these results produce $t$ arithmetic > from t table, where $t$ arithmetic for the distance of 5.978 bigger than (>) 1.295 this means that Travel Distance has a significant positive effect on travel time while $t$ arithmetic for departure hours of -0.128 less than (<) 1.295 which means the departure time has an influence negative travel time means that if the departure time starts earlier the travel time will also be reduced.

3.3.3. Model validation test/Significant linear relationship test (F-test)

This F-statistic test is carried out to find out whether the distance, hours of departure from home to the office that is used can jointly and significantly affect the travel time.

Based on the model summary table above shows Fsig(0.000) < F statistic ($\alpha$=0.05). Meanwhile, the calculated F value is obtained Fcount(17.643) > from Ftable_0.05(64)=2.36 (see the table of statistical values of F0.05 with numerator degrees, k = 6, and degrees of freedom). For the degree of freedom in the F test is the numerator df1 = (k-1) = 6-1 = 5 and in the denominator df2 = (n-k) = (70-6) = 64. Obtained F-table; at $\alpha$ = 0.05 of 2.36. From these results we can reject H0; it means that these variables are jointly and significantly influenced by travel time.

3.3.4. Model validation test/Significant linear relationship test (F-test)

From the model testing conducted on the travel time, the model and the effect of each variable partially are as follows:

$$Y = 3.433 + 0.259 X_4 - 0.010 X_5$$  \hspace{1cm} (2)

$$R^2 = 0.345$$  \hspace{1cm} (3)

The interpretation of the equation is $a = 3.433$ which is the length of time the worker takes residence in the Unhas Lecturer Housing on the street of Perintis Kemerdekaan Km.10 Makassar City. $X_4 = 0.259$ where this is the distance from the office of residence, here indicates that every 1 km distance from home to office will also increase travel time by 0.259 hours, $X_5 = -0.010$ where this is the hour of departure to work, here indicates that each - 0.010 hours affect travel time to the time of departure to work, which means the faster going to work, the travel time also decreases by -0.010 hours.

4. Conclusion

Based on research on residents in Unhas Lecturer Housing street of Perintis Kemerdekaan Km.10 Makassar City, regarding travel time and after going through data processing and data analysis conclusions can be drawn with the variables that affect the travel time of residents in Unhas Lecturer Housing street of Perintis Kemerdekaan Km.10 Makassar City are travel distance and departure time to work in Unhas Lecturer Housing street of Perintis Kemerdekaan Km.10 Makassar City. The majority of respondents use private modes (motorbikes and private cars) as much as 100%. After analyzing, it is known that the use of mode does not have a big influence on travel time. Regression models that are appropriate to the length of travel time in this case study are:

$$Y = 3.433 + 0.259 X_4 - 0.010 X_5$$  \hspace{1cm} (4)
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