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Article

Analysis of Transportation Mode Choice to Campus by Students of Pahlawan University

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A B S T R A C T

Transportation is an essential element in daily life, especially for students with high mobility. This study aims to analyze the choice of transportation modes used by Pahlawan University students on their way to campus. This study highlights student characteristics, factors influencing mode choice, and modeling of transportation mode choice. The method used is a quantitative approach through the distribution of online questionnaires to 100 active student respondents in the 2024–2025 academic year. Data were analyzed using descriptive analysis and binary logistic regression with the help of SPSS software. The results show that the most commonly used mode of transportation is private vehicles, especially motorcycles. The study found that 'pocket money' (allowance) is a significant factor influencing transportation mode choice. The binary logistic regression model provides a robust statistical picture of student mode preferences in the local context of Bangkinang. This research is expected to serve as a reference in making transportation policies on campus and provide input for the development of an efficient transportation system that meets student needs.

1. Introduction

Transportation is the lifeblood of daily life and one of the basic needs of society. Transportation is used to meet needs such as work, school, recreation, or social interaction. This is because every movement made by society cannot be met in one place, so society needs to go to a different place to meet their living needs using transportation tools (Wijaya, 2020). Social activities of society have increased compared to before, this condition requires every segment of society to have transportation tools to support the activities carried out (Adeswastoto et al., 2023).

The selection of transportation modes is essential to ensure the mobility of both people and goods. As part of the economic system, transportation plays a crucial role in regional development. On the other hand, traffic density appears to be increasing due to the rising number of students, particularly those using private vehicles or public transportation (Budiman et al., 2022).

There are various modes of transportation that can be used, including private vehicles, public transportation, and online-based transportation services. In the context of student mobility, this diversity of choices, along with various considerations such as cost, comfort, and time efficiency, often leads to confusion in determining the most appropriate mode of transportation. (Kristyanto et al., 2022).

The needs and mobility patterns of students cannot be separated from the dynamics of the areas where they live or are active. One region experiencing significant change is Bangkinang Kota District, which shows increasing transportation activity alongside population growth and rising daily mobility needs. This condition reflects the reciprocal relationship between individual transportation choices, such as those of students, and the development of infrastructure and transportation services at the local level.

Bangkinang Kota District continues to develop as a result of the rapid socio-economic growth of the community. This growth and development have significantly impacted many aspects of life, including the transportation sector (Wardana, 2024). Good transportation access is key to the economic progress of a region or country. Advances in transportation will enhance the mobility of people, production components, and processed products being marketed (Nur et al., 2021).

Higher education institutions are areas that can generate in and out traffic movements. In Riau Province, one of the higher education institutions that experienced significant growth is Universitas Pahlawan Tuanku Tambusai, located in Bangkinang, Kampar Regency. Every year, this university records a significant increase in the number of students. Universitas Pahlawan becomes a magnet for movement for students and all academic communities in Bangkinang City to come and carry out various activities on campus. The activities taking place at Universitas Pahlawan are very diverse, even on the same day students can carry out two or more activities at once. Therefore, they need suitable transportation facilities. Satisfaction with each type of transportation becomes one of the main factors in determining the students' choice.

2. Literature Riview

2.1 Definition of transportation.

The development of Bangkinang Kota District, accompanied by population growth, requires the availability of adequate transportation systems and road infrastructure to support community mobility (Adeswastoto, 2021). Transportation is an inseparable part of human life and has been used since the early stages of civilization, although in very simple forms (Decy Arwini & Juniastra, 2023). In general, transportation is defined as the process of moving people or goods from one place to another in order to support various human activities within society (Nur et al., 2021).

Users of public transportation can be classified into routine and sporadic groups based on their travel patterns. In addition, people have various transportation mode choices, such as motorcycles, private cars, and public transport. Mode choice is influenced by several factors, including travel purpose, travel distance, cost, and comfort level (Wardana, 2024). However, in practice, transportation mode choice mechanisms are difficult to define precisely because they are affected by diverse social and economic conditions.

2.2 Transportation Mode Selection Model

transportation mode choice models are analytical approaches used to understand and predict individual or group decisions in selecting certain modes of transportation. These models consider various factors such as cost, travel time, comfort, safety, and users' socio-economic

characteristics. Their primary purpose is to assist transportation planners in designing efficient transportation systems that meet community needs. A model represents real-world conditions in a simplified and measurable form. Models can be classified into verbal models, which describe conditions using words; physical models, which represent real conditions in reduced scale forms such as building or bridge models; and mathematical models, which use mathematical equations and are commonly applied in transportation planning. Mathematical transportation models can be descriptive, predictive, or planning-oriented, depending on their purpose.

Transportation mode choice plays an important role in transportation planning, as its analysis provides valuable input for service providers and policymakers in making future decisions (Firdausi & Putra, 2021). Transportation service users can be divided into captive users, who rely on public transport due to the lack of private vehicles and are generally from lower economic groups, and choice users, who have access to private vehicles and can freely choose between private and public transport. In terms of transportation modes, Elvaria (2023) classifies them into private transportation and public transportation. Private transportation includes walking, bicycles, motorcycles, private cars, and privately owned ships, trains, or aircraft. Public transportation refers to shared modes operated under fixed routes and schedules, such as pedicabs, buses, trains, ferries, and shared aircraft, where users must comply with predetermined operational regulations.

2.3 Characteristics of transportation mode

According to (Adiman et al., 2024), the forms of transportation equipment (modes) or types of transportation services generally fall into 2 (two) major groups of transportation modes, namely:

a. Private Transportation
   Private vehicles are motor vehicles used for individual or household purposes, not for public or commercial transportation. In the context of Indonesian law, private vehicles are defined as motor vehicles used for personal interests and not for rental or use as public transportation. (Ruhaidani et al., 2022).

b. Public Transportation
   Public transportation, commonly referred to as mass transit, is intended for shared use by many people, serving common interests, providing shared services, having the same direction and destination points, and being bound by established regulations and schedules. Passengers are required to comply with these provisions once they choose this mode of transportation. According to (Kusuma et al., 2023).

2.4 Factors influencing mode of transportation choice

According to (Budiarnaya & Ardianto, 2023) the factors influencing the choice of this mode can be grouped into three as follows:

a. characteristic of travel participants
   In this factor group, all variables are related to the individual traveler. These variables collectively contribute to influencing the travel maker's behavior in choosing a mode of transportation.
b. Characteristics of the journey.
   Important factors influencing the choice of transportation mode. The main variables include the purpose of the trip, travel time, and distance. The purpose of the trip determines the need for punctuality and comfort, where in developed countries public transportation is more preferred, while in developing countries private vehicles still dominate. The time of travel also has an impact, as travel at certain times, such as midnight, tends to require private vehicles due to the limitations of public transportation operations. In addition, the distance of the trip affects the choice of mode, where long-distance travel generally prefers public transportation over private vehicles.
c. Characteristics of transportation system facilities
   Travel mode choice behavior by travelers is grouped into quantitative and qualitative factors. Quantitative factors include total travel time and transportation costs, while qualitative factors encompass comfort and safety, which, although difficult to measure directly, significantly determine user preferences in choosing a mode of transportation.

2.5 Mode of transportation selection

According to (Kristyanto et al., 2022), the selection of transport mode is an important stage in transportation planning. Transportation is also defined as the activity of moving and transporting cargo, whether it be people or goods, from one place to another. This is because the role of public transportation in efforts to increase efficiency and effectiveness of the movement system in the transportation system. The results of the analysis on mode selection are very beneficial as input and for consideration by transportation service providers and policymakers in taking into account and making decisions in the future.

2.7 Fashion Selection Modeling

According to (Wijaya, 2020), Mode Choice Modeling is a model that illustrates how public perception forms the basis for selecting the type of transportation mode used. This can be influenced by factors of public transport services such as route, fare, comfort, safety, and others. The mode choice model aims to determine the proportion of people using each transportation mode. This process is carried out with the intention of calibrating the mode choice model for the base year by identifying the independent variables that influence mode choice, and after the calibration process, the model can be used to predict mode choice based on the values of independent variables for the future.

2.8 Binary Logistic Analysis Method

Testing in binary logistic regression analysis consists of three types of hypothesis tests as follows:

a. Hypothesis testing of the model
   This test is used to determine the effect of the independent variable on the dependent variable simultaneously in the model.
b. Partial test
   The purpose of statistical analysis is to find a suitable model and a strong relationship between the model and the existing data.
c. Hosmer and Lemeshow

2.9 Determination of sample size.

The method used to determine the sample size is the random method (probability sampling). Probability sampling, or random sampling, is a method of selecting n units from N members of a population, so that each individual in that population has an equal chance or probability of being selected as a sample member. This method can be applied using Slovin's formula (1960) as follows:

$$n = \frac{N}{1 + N \,.\, e^2}$$

Where:
n = Sample Size
N = Population Size
e = Margin of error

3. Research Methodology

3.1 Research Design

This research employs a quantitative method, utilizing a questionnaire that will be distributed to students of Pahlawan University. The data obtained from the questionnaire will be processed using SPSS 25.

3.2 Location and time of research

The research location is situated at Jl. Tuanku Tambusai No.23, Bangkinang Kota, Kampar Regency, Riau Province, Indonesia, 28412.

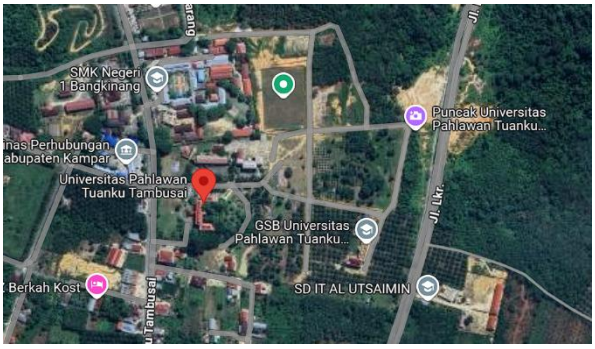

Figure 1. Research Location

4. Results and Discussion

4.1 Descriptive analysis of respondent characteristics.

The statistical analysis used in this study to describe the characteristics of the respondents. In this study, a tool was used with the SPSS Statistics 23 program. From the results of filling out the questionnaire via Google Form with the number of respondents being students. In the data collection stage, the research must use online data collection techniques, here is the profile of student characteristics at Pahlawan University:

a. Gender
   Respondent characteristics based on gender are estimated to influence the choice of transportation mode to be used, where

generally female students/respondents tend to prefer safe or low-risk transportation, while male respondents prefer to move quickly to campus and pay less attention to safety or risk aspects. Based on the survey results, it is known that the highest proportion of respondents are female, amounting to 77%, and male, amounting to 23%. These figures are relatively based on the use of public and private transportation.

b. Monthly allowance
The monthly allowance of the respondents certainly shows the economic value that can describe the economic characteristics of students that may influence the characteristics of student travel. From the data obtained from the dissemination of the questionnaire to the respondents have been categorized into 4 groups, each with a range of Rp. 500,000. The first group consists of students with a monthly allowance of less than Rp. 500,000, followed by group 2, which is Rp. 500,000 - Rp. 1,000,000, then the group of students with a monthly allowance of Rp. 1,000,000 - Rp. 1,500,000, and the 4th group consists of students with a monthly allowance of over Rp. 1,500,000. From the data collected, the survey showed that students with a monthly allowance of Rp. 500,000 - Rp. 1,000,000 have the most respondents with a percentage of 38%. The following is the distribution of respondent allowance per month.

c. Monthly transportation expenses.

d. In the data on transportation expenses, it is certainly influenced by the monthly allowance and the type of vehicle mode used. The obtained data shows the amount of each student's monthly expenses for using transportation modes to reach campus. There are 4 groups: the first group consists of students with transportation expenses less than Rp. 100,000 per month, the second group includes students with expenses of Rp. 100,000 – Rp. 200,000, followed by students with expenses of Rp. 200,000 – Rp. 300,000, and finally students with expenses more than Rp. 300,000 per month for transportation. Below is the table and pie chart of the distribution of respondents' monthly transportation expenses.

e. Private vehicle ownership
Based on the data on private vehicle ownership, the majority of respondents own motorcycles, accounting for 90 respondents or 90%. This indicates that motorcycles are the most dominant mode of private transportation used by the community. A total of 7 respondents (7%) do not own any private vehicle, while bicycle ownership is limited to 2 respondents (2%). Car ownership is very low, with only 1 respondent (1%). These findings suggest that motorcycles are the preferred choice due to their affordability, flexibility, and suitability for local travel characteristics.

f. SIM ownership
Based on the data on driver's license ownership, most respondents do not possess a driver's license, accounting for 65 respondents or 65%. Respondents who hold a motorcycle license (SIM C) total 32 respondents (32%), while only 2 respondents (2%) have a car license (SIM A). A small proportion of respondents, 1%, possess both SIM C and SIM A. These results indicate that despite the high ownership of motorcycles, a large number of respondents do not have a valid driver's license, which may have implications for traffic safety and transportation policy.

g. Mileage
Based on the survey results, it was found that respondents with a distance of more than 10km numbered, those with a distance of 2km to 5km numbered, and those with a distance of 6km to 10km numbered. For students who have a travel distance <1 kilometer, they prefer to walk and use a motorbike to get to campus. Then, for students who have to travel a distance of 1-5 kilometers to campus, they use a motorbike, car, and public transportation, depending on the location of their residence.

h. Travel time
Based on the travel time data, the largest proportion of respondents requires more than 20 minutes to reach their destination, accounting for 44 respondents (44%). Respondents with travel times between 10–20 minutes represent 26% of the total, while those with travel times of 5–10 minutes account for 20%. The smallest proportion

of respondents, 10%, have travel times of less than 5 minutes. These results indicate that most respondents experience relatively long travel times, which may influence their transportation mode choice.

i. Main vehicle to campus
Based on the data on transportation modes, motorcycles are the dominant mode used by respondents, with 90 respondents or 90%. A small proportion of respondents travel by walking, accounting for 3%, while 7% rely on sharing rides with friends. Only 1% of respondents use online motorcycle transportation services. No respondents reported using bicycles, private cars, or public transportation such as city minibuses (angkot). These findings indicate a strong dependence on motorcycles and very limited use of public transportation among respondents.

j. Consideration of the reason for the use of mode.
In the questionnaire, the question regarding the reasons for using the main mode of transportation is presented in the form of options that allow for more than one answer. These options include low cost, safety, comfort, speed, and availability. From the questionnaire data, it can be seen that speed, availability, and low cost are the primary considerations.

4.2 Binary logistic regression analysis

From the data that can affect the choice of transportation mode for students, the data will be processed using IBM SPSS software with binary logistic regression analysis because there is a dependent variable in the form of qualitative data with two variables. However, previously a cross-tabulation recap is needed to find out which variables may be affected and which are not affected by the choice of mode. Since this initial step cannot confirm whether a variable affects the mode choice.

The cross-tabulation was conducted solely to identify variables that "may influence" mode choice, specifically by determining that if a cross-tabulation is fully populated (all rows and columns), then the variable falls into the "may influence" category. Conversely, variables are considered "not influential" if their cross-tabulation has empty sections. Based on the obtained data, there were no incomplete entries, meaning all the above data categories are considered variables that may influence the mode choice of students at Pahlawan University.

4.3 Factors Influencing Characteristics of Student Travel to Campus

After using data analysis with binomial logistic regression method, it was found that among the 12 independent variables tested for their significance against the dependent variable, the variable with a significant value of less than 0.05, indicating that the pocket money had a significant effect on the choice of students of Universitas Pahlawan to the campus. Based on the characteristics of the respondents in choosing the mode/vehicle to the campus, it was found that the majority of the respondents were female, 77%, with an average pocket money of Rp. 500,000 to Rp. 1,000,000 and transportation expenses per month of Rp. 100,000, 43%. The majority of the respondents have a personal vehicle, a motorcycle, which is 90% and the majority do not have a SIM, 65%. And for the distance traveled by the respondents from their residence to the campus, less than 1 km, 25% and more than 15 km, 40%.

Based on the regression test results, it was found that the p-values for the variables are: Allowance (0.001), Driver's License Ownership (0.456), Transportation Expenditure (0.082), Safety Considerations (0.215), Travel Distance (0.401), and Travel Time (0.548). The data that meets the criteria (sig. < α, with α = 0.05) is the Allowance data. From the results obtained, the factors influencing respondents in their choice of mode/vehicle to campus include all categories of variables that may affect the transportation mode selection of students at Pahlawan University. After testing the data using binary logistic regression analysis, it was found that out of 12 independent variables, their significance will be tested against the dependent variable (primary mode to campus).

5. Conclusion

Based on the research results above, Pahlawan University is one of the Private Higher Education Institutions located in Riau Province. In the data collection stage, the research used an online data collection technique via Google Forms, leading to the following conclusions:

1. The mode choice characteristics of respondents traveling to campus predominantly favor private vehicles, specifically motorcycles, with availability and safety being the primary considerations.

2. The factors influencing transportation mode choice based on a significance value of less than 0.05 indicate that allowance (pocket money) has a significance value of 0.001, making it the main influencing factor in transportation mode choice to campus.
3. The factors influencing transportation mode choice based on a significance value of less than 0.05 indicate that allowance (pocket money) has a significance value of 0.001, making it the main influencing factor in transportation mode choice to campus.

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