p–ISSN: 2723 - 6609 e-ISSN : 2745-5254
Vol. 6, No. 6 June 2025 http://jist.publikasiindonesia.id/

The Relationship Between Travel Patterns and Transportation Information in Palembang City

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Keywords: *Generation, Attraction, Information System, Palembang City*

ABSTRACT

This study aims to analyze the relationship between socioeconomic characteristics and travel patterns with the need for a transportation information system in Palembang City. The research is grounded in the growing importance of providing transportation information systems that are responsive to the social and economic dynamics of urban communities. Data were collected through questionnaires distributed to 656 respondents across 18 districts, using a random sampling technique. The sample size was determined using the and Slovin's formula with a 5% margin of error. The analysis employed descriptive statistics and chi-square tests, based on constructs such as Perceived Ease of Use (PEOU), Perceived Usefulness (PU), Attitude Toward Use (ATU), Behavioral Intention to Use (BIU), and Actual Use (AU). The results indicate a significant relationship between both socioeconomic and travel characteristics with the need for a transportation information system. These findings highlight the importance of developing transportation information systems that consider the varying socioeconomic backgrounds and travel behaviors of users. Such systems can play a crucial role in supporting more effective and inclusive transportation planning in Palembang City.

Introduction

Rapid population growth and urban development have led to major changes in various aspects of community activities. One of the sectors that is experiencing the fastest conversion is the transportation system (Kumaat, 2013). This is closely related to the intensity of social and economic activities (Putri and Haryanto, 2021). In the context of the city of Palembang, transportation challenges are very important, considering that this city is one of the centers of economic and cultural activity in Indonesia. With the development of population mobility, adaptive transportation system planning is becoming increasingly urgent (Jusman, Caroles, & IPU, 2024; Khairunnisa, 2024; Tamara, Indriyati, & Bahtiar, 2014a; Zulfa, 2016). For this reason, it is necessary to conduct an in-depth study of the patterns of travel and pull and its integration with the needs of transportation information systems, which can help formulate inclusive and sustainable transportation policies (Tamin, 1997).

The city of Palembang as one of the major cities in Indonesia faces complex challenges related to population movement, especially in managing an efficient and sustainable transportation system. To overcome these problems, it is necessary to in-depth about the rise and pull of travel that occurs in this region. *Travel Awakening* refers to the number of trips that start from a region, while *Travel Pull* is the number of trips that end in an area. Analysis of travel trends and pulls is an important part of transportation modeling and is the basis for planning a transportation system that is responsive to the needs of the community. This data not only helps to map movement flows, but also provides insight into high-activity zones that require special attention in the provision of infrastructure (Sarwanta et al., 2022).

People's travel behavior is closely related to their daily activities, such as working, going to school, shopping, and doing other social activities. The daily activity-based approach is considered more representative in describing the actual needs of the community for modes and transportation networks. Hanson and Giuliano (2004), this approach is able to capture the dynamics of travel in more detail because it considers the motivation and context of each movement made by individuals.

Previous studies have shown that travel characteristics are influenced by social, economic, and spatial variables. For example, research by Susilo and Kitamura (2008) found that household structure, type of work, and density of residential areas significantly affect people's travel patterns. In the urban context in Indonesia, a study by Putri B. (2021) in Yogyakarta also shows that daily commutes are most dominated by commutes to work and education, with travel times and modes of transportation strongly influenced by accessibility and availability of infrastructure. However, most previous studies have not directly linked socioeconomic and travel characteristics to the need for transportation information systems, especially in the context of medium-sized cities such as Palembang. This gap is the basis of this research, where a new approach is needed that combines socio-economic analysis, travel patterns, and behaviors towards information systems.

The novelty of this research lies in an integrative approach between socioeconomic characteristics, travel characteristics and approaches to the acceptance of technology to identify the needs of local public transportation information systems.

This study aims to study travel patterns in Palembang City based on people's daily activities. Urban planners and policymakers can create more targeted, efficient, and inclusive transportation strategies by understanding how daily activities relate to travel. According to Pratama S. (2018), technology has a significant role in transportation planning to improve the efficiency and reliability of transportation systems. It is hoped that this research will provide significant benefits in the process of forming an urban transportation system that is able to adapt to the dynamics of community mobility in Palembang City

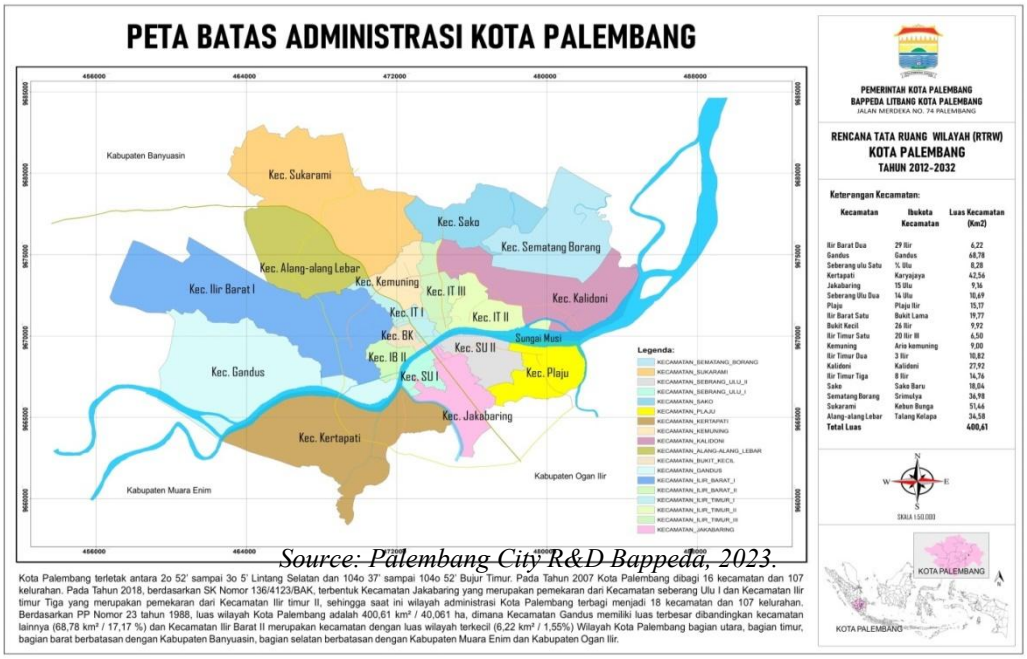
Research Methods

The research methodology is a crucial stage in the overall research process because it describes the steps of the descriptive approach method and a simple inferential analysis

(chi-square test) to identify the relationship between socioeconomic characteristics and travel with the need for a transport information system to be taken to achieve the pre-established research objectives (Scott, 2017). The stages of the research are described in the following steps:

A. Data Collection

In the study, it is located in the city of Palembang which is divided into 18 sub-districts. The sample was taken using a random sampling technique, assuming that each individual in the population had an equal chance of being selected as a sample. However, the population is not homogeneous because it consists of several sub-districts with a variable population of 15–59 years old. The determination of the number of respondents was carried out using the Slovin formula Nurdin T. (2017), with an error tolerance rate of 5% For the Palembang administrative boundary map, it can be seen in Figure 1.



Source: Palembang City R&D Bappeda, 2023.

Kota Palembang terletak antara 2o 52' sampai 3o 5' Lintang Selatan dan 104o 37' sampai 104o 52' Bujur Timur. Pada Tahun 2007 Kota Palembang dibagi 16 kecamatan dan 107 kelurahan. Pada Tahun 2018, berdasarkan SK Nomor 136/4123/BAK, terbentuk Kecamatan Jakabaring yang merupakan pemekaran dari Kecamatan seberang Ulu I dan Kecamatan Ilir timur Tiga yang merupakan pemekaran dari Kecamatan Ilir timur II, sehingga saat ini wilayah administrasi Kota Palembang terbagi menjadi 18 kecamatan dan 107 kelurahan. Berdasarkan PP Nomor 23 tahun 1988, luas wilayah Kota Palembang adalah 400,61 km² / 40,061 ha, dimana Kecamatan Gandus memiliki luas terbesar dibandingkan kecamatan lainnya (68,78 km² / 17,17 %) dan Kecamatan Ilir Barat II merupakan kecamatan dengan luas wilayah terkecil (6,22 km² / 1,55%) Wilayah Kota Palembang bagian utara, bagian timur, bagian barat berbatasan dengan Kabupaten Banyuasin, bagian selatan berbatasan dengan Kabupaten Muara Enim dan Kabupaten Ogan Ilir.

Figure 1. Palembang City Administrative Boundary Map

The purpose of this study is to find out the characteristics of the travel of the people of Palembang City, with special emphasis on the use of transportation information systems in daily life. using a descriptive quantitative approach (Junaedi, 2009). Primary data was collected through a questionnaire directly through a field survey, using a questionnaire that was distributed to 656 respondents. and secondary data were obtained from related agencies Nasution (2019) such as PT Transport Global Mandiri, PT Trans Musi Palembang Jaya, and the South Sumatra Light Railway Management Center.

In total, there were 656 people involved in the survey, and they were spread across 18 sub-districts, according to the recapitulation table of the number of respondents by sub-district of domicile. This data shows that there are differences in the level of community participation in each sub-district, which may be influenced by social, geographical, and accessibility factors to survey activities. The fairly evenly distributed

of respondents is an important indicator of the success of the survey. For the distribution of the respondent sample, it can be seen in Table 1.

Table 1. Sample Distribution by Sub-district

No.	District	Total
1.	Alang – Alang Lebar	77
2.	Bukit Kecil	30
3.	Gandus	60
4.	Ilir Barat I	57
5.	Ilir Barat II	22
6.	Ilir Timur I	27
7.	Ilir Timur II	31
8.	Ilir Timur III	24
9.	Jakabaring	26
10.	Kalidoni	33
11.	Kemuning	30
12.	Kertapati	37
13.	Plaju	58
14.	Sako	27
15.	Seberang Ulu I	24
16.	Seberang Ulu II	27
17.	Sematang Borang	21
18.	Sukarami	45
	Total of Respondent	656

The table above shows the number of each respondent from each sub-district in Palembang City. The respondents were evenly distributed in 18 sub-districts, with a total of 656 people. The sub-district with the highest number of respondents is Alang-Alang Lebar with 77 people, followed by Gandus with 60 people, Plaju with 58 people, and Ilir Barat I with 57 people. The number of respondents in other sub-districts varied between 21 and 45 people, such as Sukarami as many as 45 people, Kalidoni as many as 33 people, and Ilir Timur II as many as 31 people. Meanwhile, the sub-district with the least number of respondents is Sematang Borang with 21 people and Ilir Barat with 22 people.

B. Research Variables and Data Processing Methods

1. Research Variables

Research variables are an important element in a study that is used to measure and explain the phenomenon being studied. In this study, the perception data was described into several variables, namely ease of use (PEOU), perceived benefits (PU), behavior in using (ATU), interest in using (BIU), and actual use of the system (AU) (Venkatesh, 2003). The use of these five variables aims to map the main factors that affect users' decisions in utilizing transportation information systems.

2. Validity and Reliability Tests

The validity test is an important step to ensure that the instrument used in the study actually measures the variables in question. Validity indicates the extent to

which the measurement results reflect the concept or construct to be studied (Sugiyono, 2017). The validity test aims to assess whether a questionnaire is really capable of measuring what it intends. A questionnaire is considered valid if the questions in it can accurately reflect the aspect or variable to be studied. (Ghozali, 2009).

Meanwhile, the reliability test aims to measure the consistency of the measurement results of an instrument if used repeatedly under the same conditions. Reliable instruments will produce stable and consistent data, which means that the measurement results can be trusted (Kadir, 2015). One of the most frequently used methods is Cronbach's Alpha, which assesses the extent to which each item in an instrument has a good internal correlation. Thus, reliability tests are important to ensure that the data collected does not fluctuate significantly as a result of measurement errors.

3. Testing using *Chi Square*

Variable relationship analysis using *the Chi Square* test aims to find out whether there is a relationship between two categorical variables in a study. This test works by comparing the expected frequency and the observed frequency, so that it can be concluded whether the relationship that occurs is significant or just a coincidence (Ghozali, 2009).

To determine the relationship between variables in travel patterns, such as the relationship between the type of work and the destination of the trip or between the level of education and the frequency of travel, the statistical method of the Chi-Square test (χ^2) is used. This test aims to find out if there is a significant relationship between two categorical variables. The basic formula of the Chi-Square test is:

$$\chi^2 = \sum \frac{(O_{ij} - E_{ij})^2}{E_{ij}}$$

Where O_{ij} is the frequency of observations in the i and jth cells, while E_{ij} is the expected *value* which is calculated based on the assumption that there is no relationship between variables (null hypothesis). If the Chi-Square value obtained is greater than the critical value at a certain degree of freedom and the level of significance (e.g. 0.05), then it can be concluded that there is a significant relationship between these variables (Sugioyo, 2017)

Results and Discussion

Based on the distribution of 656 questionnaires that were considered valid, sufficiently representative data was obtained to be analyzed. This data is then used as the basis for conducting the next stage of analysis, namely processing statistical data and testing hypotheses in accordance with the research objectives. Using this data, predictions can be made about the number of human movements in the future so that appropriate policies can be made to meet the transportation needs of the community (Milawaty Waris & Masruq , 2023).

A. Data Presentation

1. Socio-Economic Characteristics

Socioeconomic characteristics are attributes that describe the social and economic conditions of individuals or groups of people. In a survey or research, understanding these characteristics is important to thoroughly identify the respondent's profile. The socio-economic characteristics in the study consisted of gender, age of the respondents, respondents' occupation, last education, and the amount of monthly income.

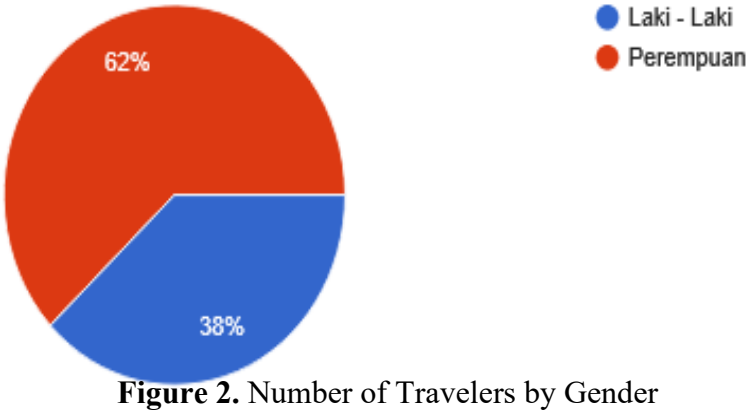


Figure 2. Number of Travelers by Gender

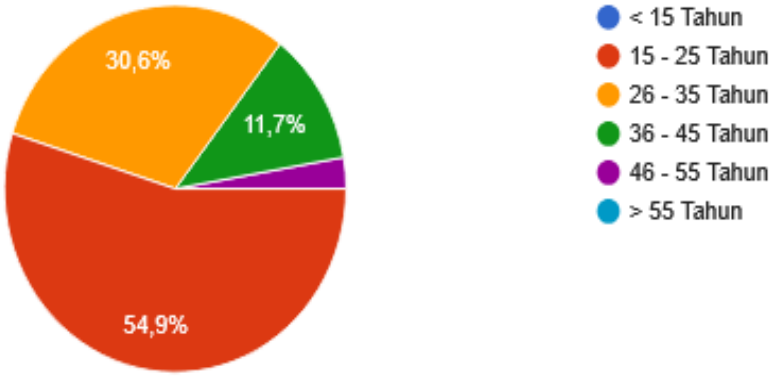


Figure 3. Number of Travelers Based on Respondents' Age

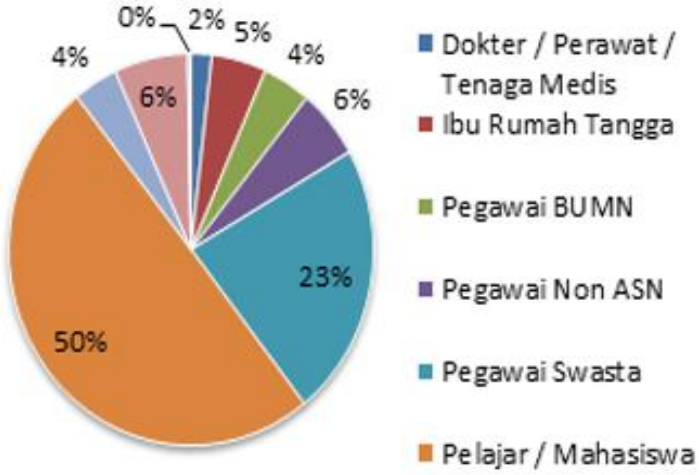


Figure 4. Number of Travelers Based on Respondents' Occupations

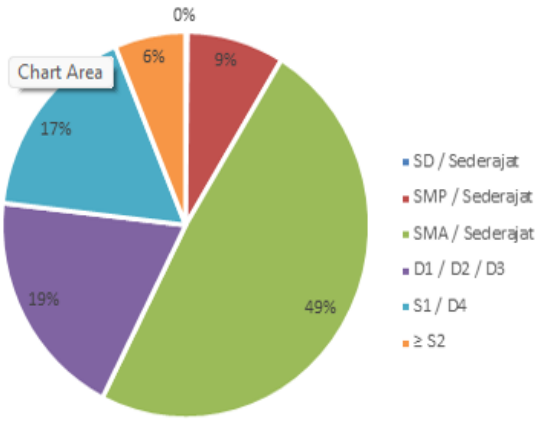


Figure 5. Number of Travelers by Last Education

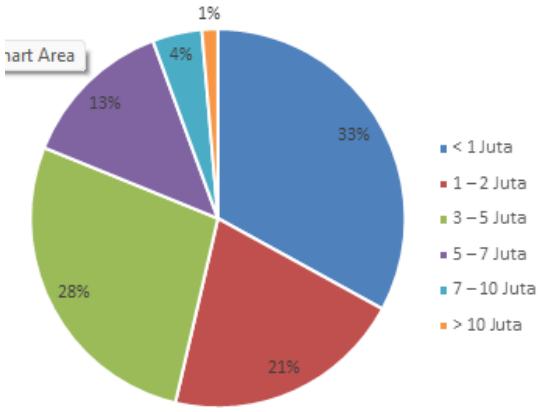


Figure 6. Number of Travelers by Income

From the diagram above, it can be seen that the socio-economic characteristics in Palembang City are dominated by 62% female respondents, 54% of respondents aged 15-25 years, 50% of job respondents from students/students, 49% of respondents from high school/equivalent, 28% of respondents with income in the range of 3-5 million. It can be concluded that the profile of respondents in Palembang City shows the dominance of young groups, especially female students and students, with upper secondary education levels and lower middle middle incomes. This can be an important consideration in transportation planning and public policy, especially to accommodate the mobility needs of productive age groups who are very active in daily life.

2. Characteristics of Travel Movement

The characteristics of travel movements describe the patterns and mobility behaviors of respondents in daily life. This characteristic is used to understand transportation needs, travel habits, and mode preferences used by the public.

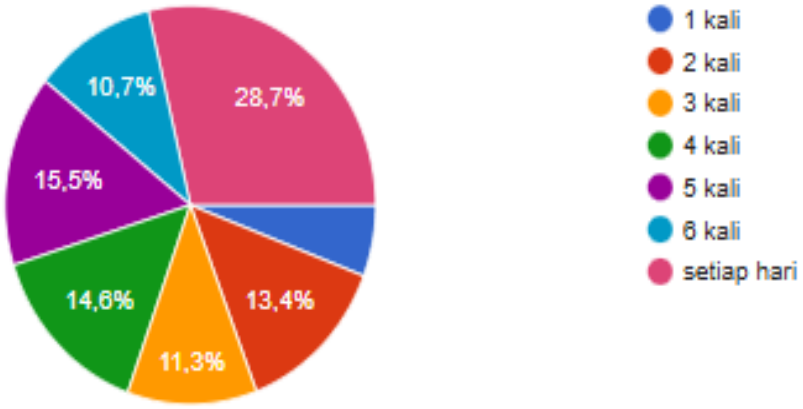


Figure 6. Number of Travelers by Frequency

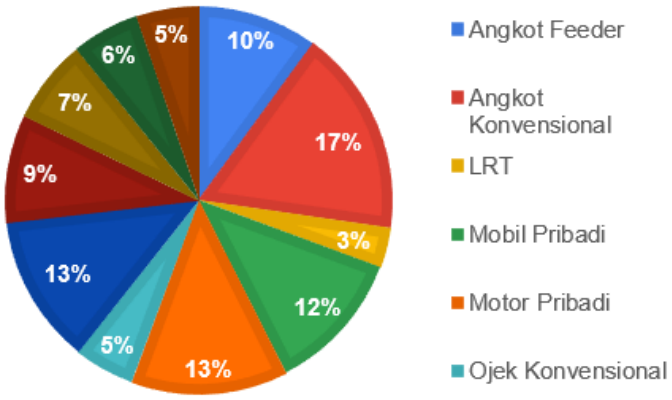


Figure 7. Number of travelers by vehicle used

From Figure 6 above, most of the respondents 29% have a very high intensity of travel, which every day shows an active level of mobility. The rest is spread quite evenly on the frequency of trips 1-6 times a week. It can be used to design an efficient

transportation system that meets the needs of the majority of the community, especially on weekdays and peak hours.

From figure 7 above, conventional modes of public transportation, private motorcycles and online motorcycle taxis dominate the respondents' choice in traveling. This shows that despite the progress in public transportation such as LRT and Teman Bus, most of the people still rely on traditional modes and private vehicles. This can be a consideration in the planning and development of an integrated transportation system in the city of Palembang.

3. Characteristics of the Use of Transportation Information Systems

Overall, the characteristics of the use of transportation information systems show that today's people are greatly helped by digital technology in planning and running their trips. With the high use of smartphones and the increasing need for travel efficiency, transportation information systems are becoming an integral part of urban mobility, especially in big cities like Palembang. The characteristics of information system use consist of the intensity of transportation information system use, the type of information system application, access media, and application use factors.

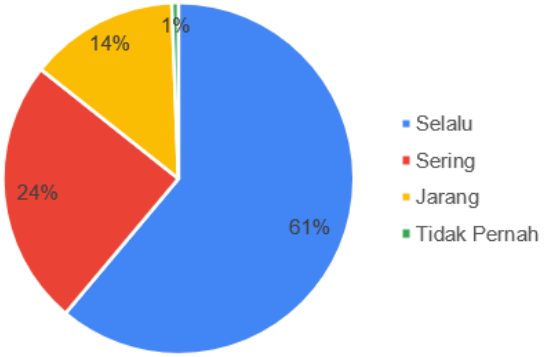


Figure 8. Intensity of Use of Transportation Information Systems

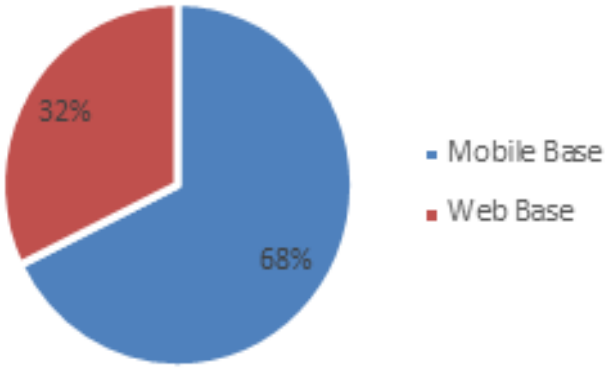


Figure 9. Transportation Information System Access Media

From figure 8 above, the majority of respondents use transportation information systems with a frequency of 58%. As many as 22% of respondents stated that they always use transportation information systems. Meanwhile, 19% of respondents stated that they rarely attend, possibly only in certain situations or when it is urgently needed. Only 1%

of respondents stated that they had never used a transportation information system. This shows that almost all respondents know and use information technology in their transportation activities, albeit with varying intensities.

From Figure 9 above, 68% of respondents chose to use a mobile-based transportation information system application. Web-based apps are used by 32%. This shows that, compared to desktop or laptop devices, mobile devices such as smartphones are more widely used to access transportation information. The high usage of mobile apps may be due to the ease of access, flexibility, and mobility of mobile devices, especially in the case of trips that require immediate information.

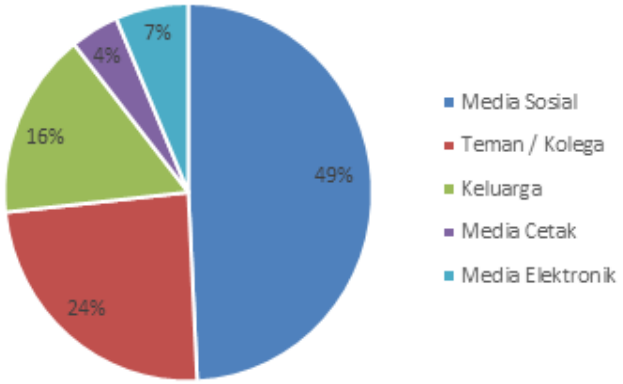


Figure 10. Transportation Information System Information Media

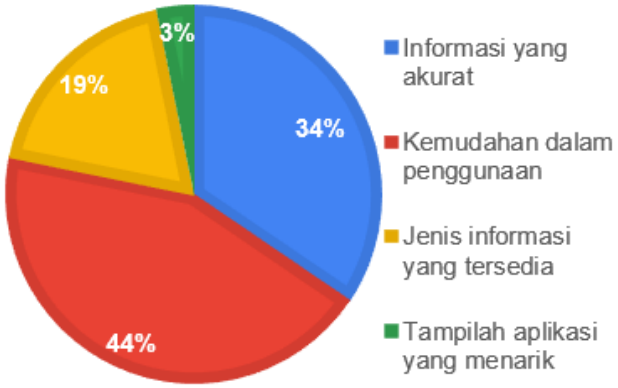


Figure 11. Transportation Information System Application Usage Factors

From the 10 figures above, it shows that social media is the most dominant source of information used by respondents as many as 49%. Meanwhile, followed by information from friends/colleagues as much as 24%, followed by information from family as much as 16%. Furthermore, the use of electronic media as a source of information is only 7% and print media is the least used at 4%.

From figure 11 above, it shows that ease of use is the most dominant factor in the transportation information system as much as 44%. Furthermore, followed by the accurate information factor of 34%. Furthermore, as many as 19% factor in the type of information available, followed by an attractive display of the application.

B. Validity Test and Reliability Test

Furthermore, after the data collection through the survey is completed, the data obtained is then tested for accuracy using statistical analysis. The statistical analysis used in this study includes validity test and reliability test which are basic analysis methods used in this study to test the accuracy of questionnaire results obtained from respondents. The following is a summary of the Validity and Reliability tests that have been carried out

Table 4. Validity and Reliability Test Results

Dimension	Variable	r-count	Alpha Cronbach	Validity Test Results	Reliability Test Results
Ease of Use (PEOU)	PEOU1	0,884	0,921	Valid	Reliable
	PEOU2	0,885	0,929	Valid	Reliable
	PEOU3	0,861	0,929	Valid	Reliable
	PEOU4	0,888	0,925	Valid	Reliable
	PEOU5	0,892	0,920	Valid	Reliable
Perceived benefits (PU)	PU1	0,874	0,955	Valid	Reliable
	PU2	0,880	0,954	Valid	Reliable
	PU3	0,864	0,956	Valid	Reliable
	PU4	0,896	0,952	Valid	Reliable
	PU5	0,871	0,955	Valid	Reliable
	PU6	0,880	0,954	Valid	Reliable
	PU7	0,865	0,955	Valid	Reliable
	PU8	0,877	0,954	Valid	Reliable
Behavior toward technology use (ATU)	ATU1	0,856	0,889	Valid	Reliable
	ATU2	0,883	0,911	Valid	Reliable
	ATU3	0,875	0,889	Valid	Reliable
	ATU4	0,880	0,882	Valid	Reliable
Interest in using technology (BIUS)	BIU1	0,876	0,913	Valid	Reliable
	BIU2	0,855	0,922	Valid	Reliable
	BIU3	0,873	0,922	Valid	Reliable
	BIU4	0,877	0,927	Valid	Reliable
	BIU5	0,883	0,913	Valid	Reliable
Actual System (AU) Usage	AU1	0,865	0,912	Valid	Reliable
	AU2	0,862	0,923	Valid	Reliable
	AU3	0,893	0,922	Valid	Reliable
	AU4	0,865	0,915	Valid	Reliable
	AU5	1	0,917	Valid	Reliable

C. Analysis of Variable Relationships with Chi *Square Test*

To test the hypothesis about the relationship between variables, the *chi square* test technique can be used, where this method helps to find out if there is a statistically significant relationship between the variables. From the tests conducted, it can be seen that the correlation between socioeconomic and travel characteristics with the needs of transportation information systems is described as follows.

1. Socio-Economic Characteristics with the Need for Transportation Information Systems

Socioeconomic characteristics, such as age, education level, occupation, and income, often affect preferences, needs, and abilities in using transportation information systems. This correlation analysis can help policymakers in designing transportation information systems that are inclusive, user-friendly, and in accordance with the needs of the community. It can be seen in the following table(Farida, 2013; Hikmah, Sumaryana, Kusmira, Alawiyah, & Apriyani, 2019; Tamara, Indriyati, & Bahtiar, 2014b)

Table 5. Socio-Economic Characteristics with the Need for Transportation Information Systems

Socioeconomic Characteristics	Independent Variables	Chi Square Count (χ^2)	Chi Square Table (χ_{tab})	Information
Age	PEOU	100,89	21,026	H_0rejected
	PU	101,47	21,026	H_0rejected
	ATU	99,83	21,026	H_0rejected
	BIU	103,79	21,026	H_0rejected
	AU	100,26	21,026	H_0rejected
Work	PEOU	93,11	46,194	H_0rejected
	PU	83,79	46,194	H_0rejected
	ATU	86,09	46,194	H_0rejected
	BIU	89,20	46,194	H_0rejected
	AU	84,49	46,194	H_0rejected
Education	PEOU	88,72	31,410	H_0rejected
	PU	87,84	31,410	H_0rejected
	ATU	85,68	31,410	H_0rejected
	BIU	90,89	31,410	H_0rejected
	AU	86,79	31,410	H_0rejected
Income	PEOU	89,02	31,410	H_0rejected
	PU	87,70	31,410	H_0rejected
	ATU	87,11	31,410	H_0rejected
	BIU	90,96	31,410	H_0rejected
	AU	87,28	31,410	H_0rejected

From the table above which examines the correlation between socioeconomic characteristics such as age, occupation, education, and income with the needs of transportation information systems, it can be seen that all values $\chi^2 > \chi_{tab}$. H_0 is

therefore rejected, which means that socioeconomic characteristics have a significant relationship with the needs of transportation information systems

2. Characteristics of Travel with the Need for Transportation Information Systems

The importance of developing an adaptive transportation information system and being able to provide information tailored to the specific travel characteristics of each user, so as to increase the efficiency and comfort of travel in the city of Palembang. Travel characteristics, such as travel destinations, duration, and modes of transportation used, greatly affect the needs of transportation information systems (Hidayati, Prasetyo, Mulyono, & Magfirona, 2023; M. and Masruq Waris, 2023). This can be seen in the table below.

Table 6. Characteristics of Travel with the Need for Transportation Information Systems

Travel Characteristics	Independent Variables	Chi Square Count (χ^2)	Chi Square Table (χ_{tab})	Information
Modes of Transportation	PEOU	59,00	55,758	H_0rejected
	PU	59,15	55,578	H_0rejected
	ATU	58,30	55,578	H_0rejected
	BIU	60,82	55,578	H_0rejected
	AU	58,62	55,578	H_0rejected
Travel Destinations	PEOU	74,61	26,296	H_0rejected
	PU	93,65	26,296	H_0rejected
	ATU	92,60	26,296	H_0rejected
	BIU	96,01	26,296	H_0rejected
	AU	93,05	26,296	H_0rejected
Travel Time	PEOU	93,58	26,296	H_0rejected
	PU	93,96	26,296	H_0rejected
	ATU	92,60	26,296	H_0rejected
	BIU	96,12	26,296	H_0rejected
	AU	92,97	26,296	H_0rejected

The test results shown in the table above regarding the relationship between the variables of travel characteristics in the form of the mode of transportation used, the purpose of travel, and the travel time with the needs of the transportation information system showed that all test statistical values exceeded the critical values. This condition indicates a rejection of the zero hypothesis, so it can be stated that travel characteristics are significantly correlated with the need for transportation information systems.

Conclusion

The results of the data analysis identified that there was a significant correlation between the socioeconomic characteristics and travel characteristics of the people of Palembang City and the need for a transportation information system. Socioeconomic characteristics such as education level, type of occupation, income, and age have a strong

influence on transportation information preferences and needs. People aged 46–55 years show higher needs than other age groups. Private employees and state civil servants (ASN) tend to have greater transportation information needs than informal or non-working workers. In addition, people with lower middle level education have a high need for information because transportation information systems provide direct benefits in their daily activities. Lower-middle-income groups also show a higher level of need for this system. On the other hand, the travel pattern of the people of Palembang, which is dominated by work and education purposes, emphasizes the need for an information system that is able to provide accurate travel time estimates and recommendations for efficient modes of transportation. Travel characteristics such as the type of mode used, travel destination, and travel time have been shown to be positively correlated with the intensity of information needs. Based on these findings, it is recommended that local governments and transportation service providers develop transportation information systems that are user-based, responsive to local socio-economic conditions, and integrated with available modes of transportation to improve the efficiency and comfort of community mobility.

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