

Minimum Services Analysis of Public Transportation Based On Trip Makers Preference In Banjarmasin

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Abstract - Banjarmasin trip makers are less likely to use public transportation due to low utility, services, and operating management. One of the alternatives to increase their interest in public transportation is to improve the level of service and facilities. Therefore, this study aims to analyze the factors that influence public transportation use and to determine the priority of public transportation management to fit the preferences of trip makers in Banjarmasin. This study uses logistic regression method. From the analysis results, only 17 out of 37 variables affect trip makers interest to use public transportation. The improvement of the quality of public transportation services and facilities includes safety and security of trip makers from accidents, pickpockets and thugs, punctuality of departure and arrival schedules, service information availability which includes fares, departure and arrival schedules, routes area, well-mannered, respectful, and friendly drivers with an identity card, clean and convenient environment, not crowded during getting on and off public transportation, well-maintained facilities, attractive design, quiet atmosphere, accessible service on a smartphone, and has the number of trip makers information per route.

Keywords - feeder, public transportation, transportation modes.

I. INTRODUCTION

The existing public transportations in Banjarmasin are still conventional and old-fashioned. Lower utility of public than private transportation increases the number of private vehicles users. Poor services and operating management cause minimum passengers on public transportation and increase the traffic volume due to the high density of private vehicles. This study will discuss the factors that influence the preferences of trip makers to use public transportation in Banjarmasin. The purpose of this study is to create a model of the equation, identify and analyze the factors that influence the public in using public transportation and determine the priority of public transportation management that fits the preferences of people in Banjarmasin. The limitation of this research is to survey the people who use public transportation in Banjarmasin through questionnaires.

Sampling uses a random sampling technique, the study only focused on public transport (feeder) and the users in Banjarmasin, with logistic regression analysis method.

II. LITERATURE REVIEW

Transportation is the activity of moving an object from one place to another, while another meaning of transportation is a process of moving, transporting, and displacing [1].

The first step in the transportation planning process is to analyze each relevant data and information as a basic basis for predicting what will happen in the future. In order to obtain good and accountable results, a comprehensive analysis and a systemic approach are needed. It is especially necessary to collect accurate and reliable data. The weakness of transportation planning in Indonesia is in terms of data collection as a basis for analysis [2].

Public Transportation is any vehicle that used for the transportation of goods and/or people for a fee [3]. Government regulations No. 41 of 1993 concerning Road Transportation in Chapter I General Provisions defines [4]:

1. Every motor vehicle equipped with a maximum of 8 (eight) seats excluding the driver's seat, either with or without luggage transport equipment is called a passenger car.
2. Passenger cars used as public transportation are called public passenger cars.

The purpose of providing public transportation is the availability of good, comfortable, safe, fast and cheap transportation services for the public [5].

The community has the right to mobilize and function public transportation in 2 ways, namely:

1. Providing opportunities for people who do not use private vehicles for economic satisfaction and unfulfilled social desires on their way.
2. Providing alternatives to private vehicles, because physically and economically they do not have limitations, their use is not sufficient and is not socially feasible and others [6].

The increase in the welfare of the community and the increase in buying private vehicles will lead to a high level of private vehicle ownership. However, this may not always be followed by the construction of a new road network, thus



encouraging the increasing role of the use of passenger public transport in urban areas [7].

Logistic regression is a regression model that can explain the relationship between response variables that are dichotomous (nominal or ordinal scale consisting of two categories) or polychotomous (nominal or ordinal scale with more than two categories) with one or more predictor variables that are category [8].

Simple logistic regression model as follows [9]:

$$E(y) = \frac{\exp(\beta_0 + \beta_1 x)}{1 + \exp(\beta_0 + \beta_1 x)}$$

Where the value of E (y) is the expectation value of the response variable y, the value of exp is the exponential function, the value of β_0 is a constant, and the value of β_1 is the regression coefficient.

Tests on the logistic regression model are as follows:

a. Hosmer-Lemeshow Test

The Hosmer-Lemeshow test aims to determine whether the resulting model is correct or incorrect. The basis on the value of Goodness Of Fit is if the value generated in Hosmer and Lemeshow's Goodness of Fit Test is < 0.05, then the null hypothesis is rejected, which means that there is a significant difference between the model and the observed value so that the Goodness of Fit Test resulted is not good. If the values in Hosmer and Lemeshow's Goodness of Fit Test > 0.05, then the null hypothesis can be accepted and the model can predict the observation value and match the observation data [10].

b. Overall Model Fit Test

The basis in this test is if there is a decrease in the number in -2LL block number 1 from the value in block number 0 then it shows a good regression model.

c. Coefficient of Determination Test (Nagelkarke R - Square)

In this test, it can be seen that the value of the independent variable is able to explain the variation of the dependent variable.

d. Coefficient Model Test

This test aims to check whether all independent variables or one of the independent variables affect the dependent variable. The basis in this test if the value of Sig < 0.05 means that the hypothesis can be accepted.

e. Wald test/Partial Test

Wald test aims to determine whether the predictor variables in the model affect the response variables. This hypothesis compares the probability value (sig) with a significance level of 5%, if the probability value (sig) > (α) then the hypothesis is rejected and if the probability value (sig) < (α) then the hypothesis is accepted.

III. RESEARCH METHODOLOGY

A. Type of Research

This type of research according to the formulation of the problem is quantitative research. The quantitative research includes tabulated data, numerical data as a comparison or

reference in descriptive analysis.

B. Research Location

Research locations are Banjarmasin areas with public transportation (fareder).

C. Research Variables

In this study, secondary and primary data are necessary, primary data includes dependent and independent variables. Secondary data is data that affects the characteristics of public transportation users respondents in Banjarmasin.

Primary data includes:

a) Response variable/dependent (y):

0 = Not willing to use public transportation

1 = Willing to use transportation

b) Independent variables in the study are written into Table I.

Table I. Independent Variables

Indicator Variables		Statement
Characteristics of Transportation System (X₁)		
Safety	X1.1	Public transportation guarantees the safety of passengers and goods from accidents
Security	X1.2	Public transportation can guarantee security from outside disturbances such as buskers/beggars
Fare	X1.3	Affordable fares
Schedulling	X1.4	Public transportation has departure and arrival schedules
On Time	X1.5	Punctuality of departure and arrival schedules
Service Information	X1.6	Clear and available service information
Travel time	X1.7	Accurate Travel Time
Trip Characteristics (X₂)		
Route	X2.1	Comprehensive routes
Discipline	X2.2	Discipline and orderly passengers
Driver Socio-Demography (X₃)		
Polite	X3.1	Courteous driver in serving passengers
Driver ID	X3.2	Driver ID available
Vehicle Performances (X₄)		
Hygiene	X4.1	Clean public transport
Convenience	X4.2	Convenient public transportation
Capacity	X4.3	Passengers do not exceed the capacity
Discipline	X4.4	No cramming when getting on/off the vehicle
Smell	X4.5	Have a good smell
Maintenance	X4.6	The vehicle condition is well

		maintained
Attractive colour	X4.7	The vehicle has an attractive color
Quiet	X4.8	Noisy atmosphere (from passenger or driver)
Not noisy	X4.9	The vehicle machine does not make noise
Air conditioner	X4.10	Public transportation provides air conditioner
Smartphone application	X4.11	Accessible on smartphone
Phone battery charging	X4.12	Public transportation provides phone battery charging facility
Wi-fi	X4.13	Public transportation provides Wi-fi
Seat	X4.14	Public transportation provides priority seats, such as special seats for pregnant women, nursing mothers, the elderly, and people with disabilities
Wheelchair Room	X4.15	Public transportation provides room for wheelchair
Safety Equipment	X4.16	Public transportation provides safety equipment such as glass breaker, light fire extinguisher, and lighting tools
First Aid Kit	X4.17	Public transportation provides first aid kit
Seatbelt	X4.18	Public transportation provides seatbelt in every seat
Trash can	X4.19	Public transportation provides trash can
"No Smoking" sign	X4.20	Public transportation provides "No Smoking" sign
Passenger Ticket	X4.21	Available passenger ticket
Passenger List Book	X4.22	Available passenger list
	X4.23	Public transportation provides passenger guidebooks and prayer books
Air Circulation	X4.24	Available air circulation on public transportation
Luggage	X4.25	Public transportation provides top and bottom luggage racks
Indicator Variables		Statement
Passenger Convenience	X4.26	Public transportation provides convenience for passengers with disabilities, the elderly, children, and pregnant women in purchasing tickets, choosing seats, and giving priority during getting on/off the vehicle.

From the 37 variables, 18 variables are previous research, 15 from the Minimum Service Standards for Transportation with Public Motorized Vehicles on The Route, and 4 variables from the survey pilot.

IV. RESULT AND DISCUSSION

In logistic regression analysis for public transportation, the initial analysis uses 37 independent variables, and the results are shown in Table II.

Table II. Initial Logistics Regression Analysis

Test	Test Description	Indicator / Model	Value
Goodnes Of Fit	Sig > 0.05	Model	0.581
Overall Model Fit	-2log likelihood block 0 > - 2log likelihood block 1	Model	970.406 > 517.728
omnibus test of Model coefficients	Sig < 0.05	Model	0.000
Cox & Snell R Square and Nagelkerke R Square Test	The influence of factors as independent variables	Model	Cox & Snell R-Square value 0.476 Nagelkerke R Square value 0.635
variable in the equation	Sig < 0.05		x1.1 fare 0.000 x1.3 Security 0.006 x1.4 Schedulling 0.000 x1.5 On Time 0.005 x1.6 Service Information 0.045 x1.7 Travel Time 0.012 X2.1 Route 0.031 X2.2 Discipline 0.027 x3.1 Polite 0.018 x3.2 Driver ID 0.020 x4.1 Hygiene 0.019 x4.3 Capacity 0.001 x4.4 Discipline 0.009 x4.5 Smell 0.002

The results of initial logistic regression analysis still do not meet the requirements because 23 variables have no effect, therefore trial and error logistic regression analysis is carried out by eliminating the 23 variables as shown in Table III.

Table III. Trial and Error Results of Logistics Regression Analysis of Public Transportation

Model	Variabel Ditinjau	Goodness of Fit Model	Overall Model	
			Step 0	Step 1
2	36	0.491	970.406	517.729
3	35	0.361	970.406	517.738
4	34	0.410	970.406	517.826
5	33	0.259	970.406	517.951
6	32	0.371	970.406	518.113
7	31	0.607	970.406	518.283
8	30	0.197	970.406	518.804
9	29	0.346	970.406	519.243
10	28	0.227	970.406	519.741
11	27	0.310	970.406	520.230
12	26	0.414	970.406	521.041
13	25	0.334	970.406	521.869
14	24	0.601	970.406	522.707
15	23	0.736	970.406	523.451
16	22	0.742	970.406	524.590
17	21	0.745	970.406	525.294
18	20	0.729	970.406	526.640
19	19	0.095	970.406	527.911
20	18	0.101	970.406	529.302
21	17	0.081	970.406	530.963

Model	Omnibus Test of Model	Determinant Coefficient		Σ No Influential Variable
		Cox & Snell R-Square	Nagelkerke R-Square	
2	0.000	0.476	0.635	22
3	0.000	0.476	0.635	21
4	0.000	0.476	0.635	20
5	0.000	0.476	0.635	19
6	0.000	0.476	0.635	18
7	0.000	0.476	0.634	17
8	0.000	0.475	0.634	16
9	0.000	0.475	0.633	15
10	0.000	0.475	0.633	15
11	0.000	0.474	0.632	14
12	0.000	0.474	0.632	13
13	0.000	0.473	0.631	12

14	0.000	0.472	0.630	10
15	0.000	0.472	0.629	8
16	0.000	0.471	0.628	7
17	0.000	0.471	0.627	6
18	0.000	0.470	0.626	5
19	0.000	0.469	0.625	2
20	0.000	0.467	0.623	1
21	0.000	0.466	0.622	0

From the trial and error results of logistic regression analysis, obtained the analysis that meets the requirements in the 21st test and is used as a selected logistic regression analysis to determine the factors that influence public transportation use in Banjarmasin.

Table IV. Selected Logistics Regression Analysis Results

Test	Test Description	Indicator / Model	Value
Goodnes Of Fit	Sig > 0.05	Model	0.081
Overall Model Fit	-2log likelihood block 0 > -2log likelihood block 1	Model	970.406 > 530.963
omnibus test of Model coefficients	Sig < 0.05	Model	0.000
Cox & Snell R Square and Nagelkerke R Square Test	The influence of factors as independent variables	Model	Cox & Snell R-Square value 0.466 Nagelkerke RSquare value 0.622
variable in the equation	Sig < 0.05	x1.1 fare x1.2 Safety x1.3 Security x1.5 On Time x1.6 Service Information x2.1 Route x2.2 Discipline x3.1 Polite x3.2 Driver ID x4.1 Hygiene x4.2 Convenience	0.000 0.016 0.019 0.000 0.003 0.021 0.004 0.012 0.040 0.015 0.014

x4.4 Discipline	0.022
x4.6 Well maintained	0.031
x4.7 Attractive colour	0.000
x4.8 Quiet	0.004
x4.11 Smartphone	0.000
x4.22 Passenger List	0.029

Based on the Wald test results in Table 4, the equation can be arranged as follows.

$$\begin{aligned}
 \ln \frac{p}{1-p} = & -5.928 + 0.504_{Fare} + 0.356_{Safety} \\
 & - 0.409_{Security} - 0.804_{On Time} \\
 & + 0.704_{Service Information} + 0.3888_{Route} \\
 & + 0.394_{Discipline} + 0.345_{Polite} \\
 & - 0.215_{Driver ID} + 0.451_{Hygiene} \\
 & + 0.505_{Convenience} + 0.451_{Discipline} \\
 & - 0.495_{Well Maintained} \\
 & - 0.509_{Attractive Colour} - 0.579_{quiet} \\
 & + 0.597_{Smartphone} - 0.266_{Passenger List}
 \end{aligned}$$

Based on Table IV, the alternative management of factors that influence people in using public transportation in Banjarmasin is as shown in Table V.

Table V. Alternative Management of Influencing Factors

No	Influencing factors	Required facilities
1.	Fares	Affordable fares is IDR 5.200 per passenger
2.	Safety	Guaranteed safety of passengers and goods from accidents
3.	Security	Public transportation passengers feel safe from outside disturbances such as thugs or pickpockets
4.	On Time	Punctual and accurate departure and arrival schedules of public transportation
5.	Service Information	Available information includes: 1. departure; 2. arrival; 3. fares; 4. route.
6.	Route	Public transportation serves a comprehensive route
7.	Discipline	Public transportation

8.	Polite	passengers are discipline and no cramming Well-behaved, respectful and friendly to passengers.
9.	Driver ID	Showing driver ID and license
10.	Hygiene	Clean of public transportation
11.	Convenience	Convenient of public transportation
12.	Discipline	No cramming during getting on/off the vehicle
13.	Well-maintained	Well-maintained facilities
14.	Attractive colour	Attractive colour of vehicle
15.	Quiet	The atmosphere is not noisy
16.	Smartphone	Accessible on smartphone
17.	Passenger List	Passenger list per route

Based on the 17 factors above, the factors that need to be considered apart from guidelines, Minimum Service Standards, and previous research are smartphone applications, it is expected to be an application that provides information related to routes, departures, arrivals, and ticket purchase for public transportation passengers in Banjarmasin.

V. CONCLUSION

From the analysis results and discussion, conclusions that can be drawn is that the priority of public transportation management based on the preferences of people in Banjarmasin requires punctual and accurate departure and arrival schedules, availability of service information including departure and arrival schedules, fares, routes, accessible information on smartphones, quiet atmosphere, attractive vehicle colors, clean and convenient public transportation, well-maintained facilities, discipline during getting on/off the vehicle, public transportation passengers feel safe from outside disturbances such as thugs or pickpockets, have passenger list per route, and drivers have a driver ID.

From the results of the study, there are 17 factors that influence people in using public transportation that need to be considered apart from guidelines, Minimum Service Standards, and previous research are smartphone applications, it is expected to be an application that provides information related to routes, departures, arrivals, and ticket purchase for public transportation passengers in Banjarmasin.

Collecting data in this study takes a long time because there are many variables, it is expected that further research will be more consider the saturation tendency of prospective respondents in answering questionnaires.

REFERENCES

- [1] Miro. Fidel, *Transportation Design*, Padang: Erlangga (2005).
- [2] Munawar Ahmad, *Sustainable Transportation Development*, Gajah Mada University: Yogyakarta (2007).
- [3] Law of the Republic of Indonesia, law no. 22 of 2009, *Road Traffic and Transportation*, Jakarta (2009)
- [4] Government Regulation of the Republic of Indonesia, Government Regulation No. 41 of 1993, *Road Transportation*, Jakarta (1993)
- [5] Tamin. OZ, *Transportation Planning & Modeling*, ITB: Bandung (2000).
- [6] Zakky, *The Phenomenon of Rural-City Transport in Boyolali Regency*, Dipenogoro University: Semarang (2005).
- [7] Warpani. Suwardjoko, *Planning the Transportation System*, ITB: Bandung (1990).
- [8] Agresti. A, *Categorical Data Analysis*. Second Edition, New York: John Wiley and Sons. Inc (2002).
- [9] Medenhall, William & Sincich, Terry, *A Second Course in Statistics Regression Analysis*, Seventh Edition, United States of America: Pearson Education (2012).
- [10] Radam, F, Iphan, Agus T. Mulyono, & Bagus H. Setiadji, *Influence Of Service Factors In The Model of Public Transport Mode A Banjarmasin-Banjarbaru Route Case Study*. *International Journal for Traffic and Transport Engineering*. 5 (2) (2015) 108-119.