Study of Passenger Expectations on Public Transportation Service in the City of Martapura

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***Abstract*—In order to improve the public transportation service in the city of Martapura, the expectations from the side of the users are required to know. These factors are essential because a good public transportation service according to the passenger expectations will encourage the users to utilize more public transportation. Therefore, this study has goals to understand the factors of choosing public transportation (minibus) from the user expectations, to investigate the lack of the service and performance of the existing public transportation and to find a solution of improving public transportation service in the city of Martapura. Partial Least Square (PLS) method was employed to perform data analysis of a questionnaire survey from the passengers. The study demonstrates that the most important factors expected by the passengers are schedule and waiting time, fare system, safety, environmental impact, mode's integration and connection, driver attitude, vehicle performance and capacity, access and performance of the bus stops, passenger comfort and information.**

***Keyword:* passenger expectation, public transport, PLS**

I. Introduction

Definition of public transportation is basically a means to move people or goods from one place to another. Public transport passenger is passenger transportation using public transportation which is done with a pay system. Included in the category of public transport passengers are city transportation (bus, minibus, etc.), train, water transport, and air transportation [1]. Public transport passenger is mass transportation so that the cost of transportation can be charged to more people or passengers, which causes the cost per passenger can be reduced as low as possible. Therefore, there is similarity among some passengers of origin and destination. This similarity is achieved by collecting at terminals and/or stops. Mass transit has a fixed route and departure schedule.

The importance of service quality aspects in various sectors of life has been realized in various countries. The theory about service quality has long been developed and is used by various disciplines to measure the satisfaction of users of services offered by certain parties to others [2]. Previous studies on passenger perceptions of the quality of public transport services in the city of Banjarmasin have been conducted based on reliability, assurance, tangibles, empathy and responsiveness with the Importance-performance (IP) analysis approach [3]. Furthermore, a study on the effect of service factors on public transportation has also been carried out using the logit method which results in an increase in the choice of public transportation services by including service factors based on sensitivity analysis of travel time and travel costs [4].

The purpose of this study is to identify passenger expectations of public transportation services in the city of Martapura. This research is needed in order to investigate the lack of services and performance of existing public transportation and to find solutions to improve public transportation services in the city of Martapura.

II. Literature Review

A. Data Analysis and Modeling SEM-PLS

The collected data is analyzed to obtain a structural equation model. The steps for modeling the structural equation based on SEM-PLS can be explained as follows [5][6][7]:

1) First step: modeling the relationship variables.

   The design of the variable relationship model includes structural model (inner model) and a measurement model (outer model), which is expressed in the path diagram.

2) Second step: conversion of path diagram into a system of equations.

   Conversion in the equation system is carried out on the outer model and the inner model. An outer model or outer relation defines the relationship between construct characteristics (latent variables) and their manifest variables (indicators).

3) Third step: estimation of parameters.

   Estimation in SEM-PLS uses the least square method. The calculation process is done by iteration until the convergent conditions are reached.

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Estimating parameters in SEM-PLS includes three phases, namely:

a) Weight estimation is employed to create a score of latent variables. The algorithm to determine the weighting, cross coefficient, and the value of the latent variable is the iterative estimation of the initial weighting and the initial latent variable values. Iteration starts from estimating the measurement model, structural model, then weighting the model. The measurement is repeated until a convergent condition is obtained.

b) Path estimation that connects among latent variables and loading estimation between latent variables and their indicators. Estimation of the line coefficient is done by Ordinary Least Squares (OLS). Each dependent variable in the model (endogenous latent variables or indicators in the reflective model) is regressed with an independent variable (exogenous latent variables or indicators in the formative model) until meaningful values of mean, scale and variance are obtained. The criteria is achieved if the loading value > 0.50 (strong enough) and by using Bootstrapping to assess significance [8][9][10].

c) Determining means and location parameters (regression constant values, intercepts) for indicators and latent variables. Mean is calculated first with the original data then using weight (the results of the first stage) the mean of each latent variable is computed. The location parameter values are obtained using the mean results and path coefficients in the second stage.

4) Fourth step: Goodness of Fit.

Goodness of fit models are performed on the outer models (reflective and formative) and the inner outer with each indicator as follows [8][9][10]:

a) Evaluation of the outer model: reflective

Indicator reliability is measured by loading value of at least 0.70 to show a strong enough correlation. Internal consistency reliability is measured by the value of the composite reliability (ρc). The model is considered good enough if ρc > 0.70. Convergent validity is evaluated from the Average Variance Extracted (AVE) value. The model can be accepted if AVE > 0.50. In discriminant validity assessment, AVE value must be higher than the quadratic value of correlation of each other construct and cross loading of each indicator must have the highest loading value on the construct being measured.

b) Evaluation of the outer model: formative

The significance of the weight value uses the t-value procedure, p-value or standard errors. The significance assessment is carried out using the multicollinearity test approach with consideration of the Variance Inflation Factor (VIF), which its value must be < 5 or tolerance > 0.20 and condition index < 30 to indicate no multicollinearity. As a rule of thumb, the VIF value > 10 indicates fatal collinearity.

B. Concept of Determining the Influence Factor Attribute

The concept of determining the attributes used to describe the influence factors or the factors desired by users on the public transportation itself refers to the Indonesian National Transportation System (Sistranas) criteria. The city transportation (feeder) offered must meet the quality aspects of transportation services. Quality aspects of intra-modal transportation services, transportation of passengers and/or goods that use more than one mode in a continuous journey (inter-modal), or transportation of goods using at least 2 (two) modes (multi-modal) are formed by 15 Sistranas criteria [11]

The Sistranas criteria are set to create an effective transportation arrangement in the sense of safety, high accessibility, integrated, sufficient capacity, regular, smooth and fast, easy, timely, comfortable, affordable, orderly, secure, and low pollution, and in the sense of transportation efficient is a low public burden and high utility in a single national transportation network. Based on the Indonesian Minister of Transportation Regulation Number: KM. 49 of 2005 concerning Sistranas [12], the 15 Sistranas criteria are described as follows:

1) Safety, can be interpreted as the avoidance of transportation operations from accidents due to internal transportation factors.

2) High accessibility, can be interpreted as a wide range of transportation networks that can be served.

3) Integrated, can be explained as the level of intra-modal and inter-modal cohesiveness in the infrastructure and service network, which includes development, guidance and implementation so that it is more effective and efficient.

4) Sufficient capacity, can be defined as a sufficient level of capacity of transportation facilities and infrastructure available to meet the demand of service users.

5) Regular, can be described as a transportation service that has a scheduled time of departure and time of arrival.

6) Expeditious and rapid, can be interpreted as the travel time of a short vehicle with a high level of safety.

7) Easily accessed, can be explained as ease of service from/to the vehicle to the destination easily reached by service users through clear information, ease of getting a ticket, and ease of vehicle transfer.

8) On time, can be described as the accuracy of the schedule of transportation services carried out, both on departure and arrival, so that people can plan a trip with certainty.

9) Comfortable, can be interpreted as calm and pleasure for passengers while in transportation facilities.

10) Affordable fare, can be defined as affordability of transportation service provision rates that are in accordance with the purchasing power of the people according to their class, while still taking into account the development of the ability of transportation service providers.

11) Orderly, can be interpreted that the operation of transportation facilities is in accordance with the applicable laws and regulations and norms or values that apply in the community.

12) Secure, can be explained as a sense of safety of users of transportation from due to external transportation factors such as natural disturbances, human disturbance, and other disorders.

13) Low pollution, can be interpreted as the level of pollution caused by transportation facilities both pollution of exhaust gas, water, noise, and vibration pollution.

14) Public benefit, can be described as the ability to provide maximum benefits with certain consequences that must be borne by the government, operators, the community, and the environment, or provide certain benefits with minimum losses.

15) Utilization, can be interpreted as the level of use of the capacity of the transportation system that can be expressed with indicators such as passenger load factor, cargo load factor, and the level of user use of facilities and infrastructure.

III. Methodology

A. Performance Influence Factors Determining Public Transport

In this study, there are two types of variables used, namely endogenous variables and exogenous variables. Endogenous variables are the factors influencing the selection of public transport/PT (Y). While exogenous variables are variables whose values are not influenced/determined by other variables in the model, namely the characteristics of the transportation system (X1), the characteristics of the trip (X2), socio-demographic (particularly the behavior) of the driver (X3), vehicle performance (X4), and bus stop conditions (X5). The exogenous variables are measured by 44 indicators, as in TABLE I.

B. Data Collection Technique

Data was collected by using a questionnaire survey technique. The research instrument applies a Likert Scale from 1 to 5. The statements in the questionnaire were made to describe 44 variable indicators. The weighting results are presented in Likert scale with values of 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree), and 5 (strongly agree). Respondents must complete the entire list of questions in the questionnaire, then return it to the researcher.

C. Stages of Analysis with PLS

Model conceptualization is the first step in PLS analysis. In this stage the researcher must develop and measure the construct. In general, before conducting a model analysis, researcher first takes measurements of the indicators forming latent constructs. Outer models with reflective indicators are evaluated through convergent, discriminant validity, composite reliability, and Cronbach Alpha. Whereas the outer model with formative indicators is evaluated through its substantive content by comparing the relative weight and seeing the significance of the construct indicators [13]. The analysis was carried out in the Second Order Confirmatory Factor Analysis/SO-CFA approach. Furthermore, the analysis process was assisted with Smart PLS software [14]

TABLE I. Variables, Indicators and Description Remarks

Exogenous Variables	Indicator Variables		Description
Characteristics of the transportation system (X1)	Safety	X1.1	PT can ensure the safety of passengers and goods against accidents
	Scheduled	X1.2	PT services have scheduled departure and arrival
	Certainty of operation	X1.3	There is certainty of departure schedule
	Fare	X1.4	Affordable tariff
	Secure	x1.5	PT must guarantee security from outside interference
	Alternative vehicles	X1.6	Being an alternative vehicle (ease people)
	Environment-ally friendly	X1.7	Does not harm the environment
	Business friendly	X1.8	Not being a business competition
Characteristics of the Trip (X2)	Reach/broad	X2.1	PT service coverage should be broad or reach out to the destination
	Integrated	X2.2	PT must be integrated with other transportation (connected)
	Capacity	X2.3	The number of PT must be according to need (capacity is met)
	Fast	X2.4	Rapid service
	Easy	X2.5	Easily reached PT
	Orderly	X2.6	PT must be orderly
Socio-behavior of the Driver (X3)	Competition	X3.1	Not scrambling over picking up passengers
	Polite & friendly	X3.2	Drivers are courteous and friendly
	Skilled	X3.3	The driver must be trained in driving
	No reckless	X3.4	Not reckless
	Neat	X3.5	Uniformed driver
	Appearance	X3.6	The driver has a personal identity and it is clearly seen in the vehicle
Vehicle Performance (X4)	Seating order	X4.1	Seating in the regular order
	Convenient temp./Not hot	X4.2	The temperature inside the vehicle is convenient
	Quiet	X4.3	Quietness in the vehicle because it is not noisy among fellow passengers/drivers
	Air pollution	X4.4	Low exhaust pollution
	Not vibrated	X4.5	The vehicle does not vibrate when running

Exogenous Variables	Indicator Variables		Description
	Not noisy	X4.6	The vehicle does not make noise when running
	Smell	X4.7	Vehicles are not malodorous
	Well maintained	X4.8	The vehicle is in good condition (well maintained) and looks new
	Attractive colors	X4.9	Vehicles have an attractive color
	Clean	X4.10	Clean vehicle condition
	Separate sitting	X4.11	Passengers sit separately
	Boarding and Alighting	X4.12	Boarding and alighting access is easy and convenient
	Size	X4.13	Vehicle size proportional
	First Aid kit	X4.14	PT equipped with First Aid kit
	Fire extinguisher	X4.15	PT equipped with a portable fire extinguisher
	Safety belt	X4.16	PT equipped with a safety belt
	Glass breaker	X4.17	PT equipped with Glass Breaker
Bus Stop Performance (X5)	Comfortable and clean	X5.1	Comfortable and clean bus stop conditions
	Attractive	X5.2	Attractive bus stop appearance
	Information	X5.3	Departure and route information is available
	Allotment	X5.4	The function is devoted only to passengers and goods, not used as a place to trade etc.
	Access	X5.5	Convenient entrance access
	Protected	X5.6	Protected from rain and heat
	Seats	X5.7	Seats are available

IV. Results and Discussion

SO-CFA path diagram model to obtain the influence factor of the selection of public transportation as described in Figure 1.

In selecting the indicators, the initial analysis process is to correct the loading factor value of each indicator in the reflective model (service performance) and the magnitude of the P-value in the formative model (socio-demographic characteristics and trip characteristics). The loading factor and P-value values are obtained from the path diagram model (Figure 2) using the preference data for each approach condition. In the process, service performance indicators with a loading factor ≤ 0.70 and cross construct indicators < construct are reduced one by one until the specified conditions are met. Indicators of socio-demographic characteristics and trip characteristics that have a P-value > 0.05 one by one are also reduced from the model as a requirement of the PLS Goodness of Fit Model. The final results of the process of reducing this indicator are shown as Figure 2 and Figure 3 below.

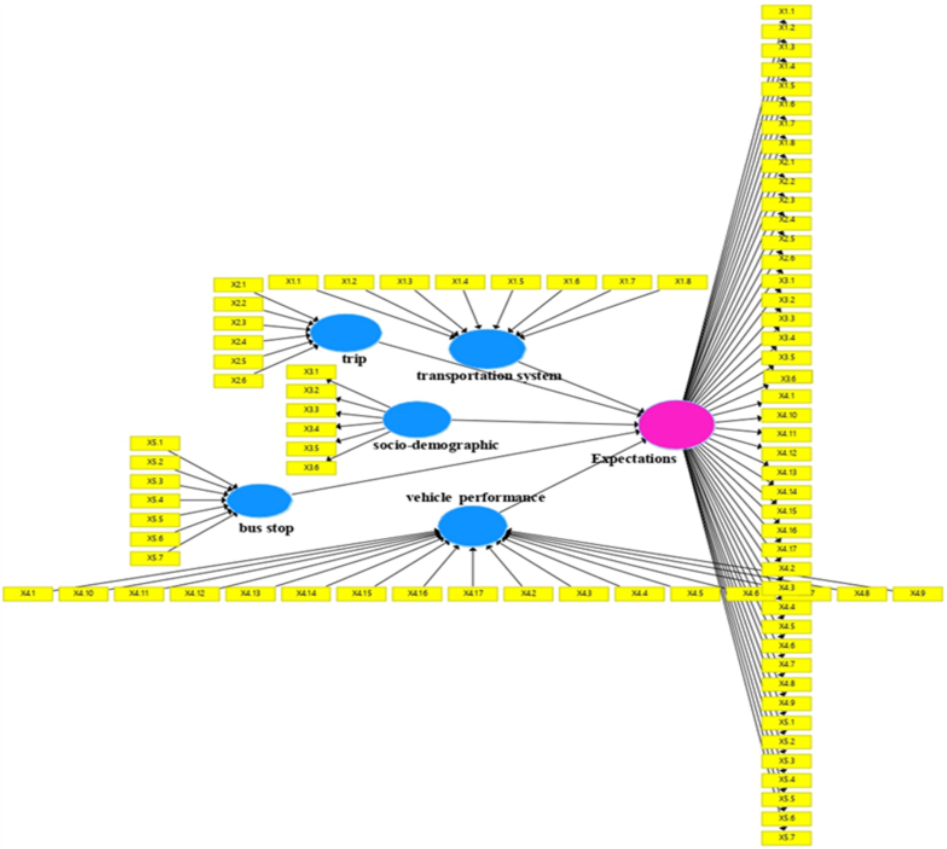

Fig. 1. Initial Model SO-CFA Path Diagram for Public Transport Selection

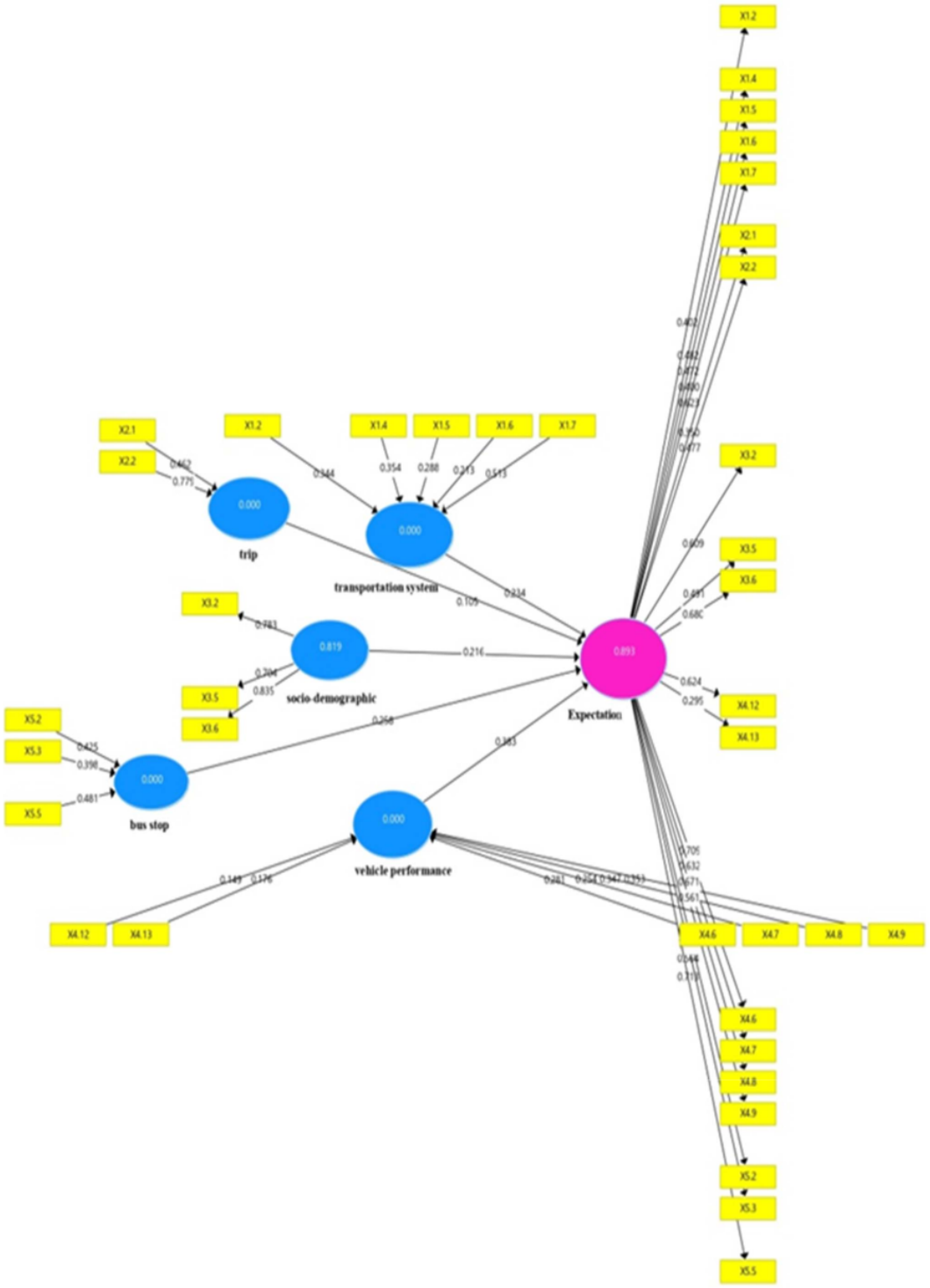

Fig. 2. Loading Factor in the SO-CFA Final Process

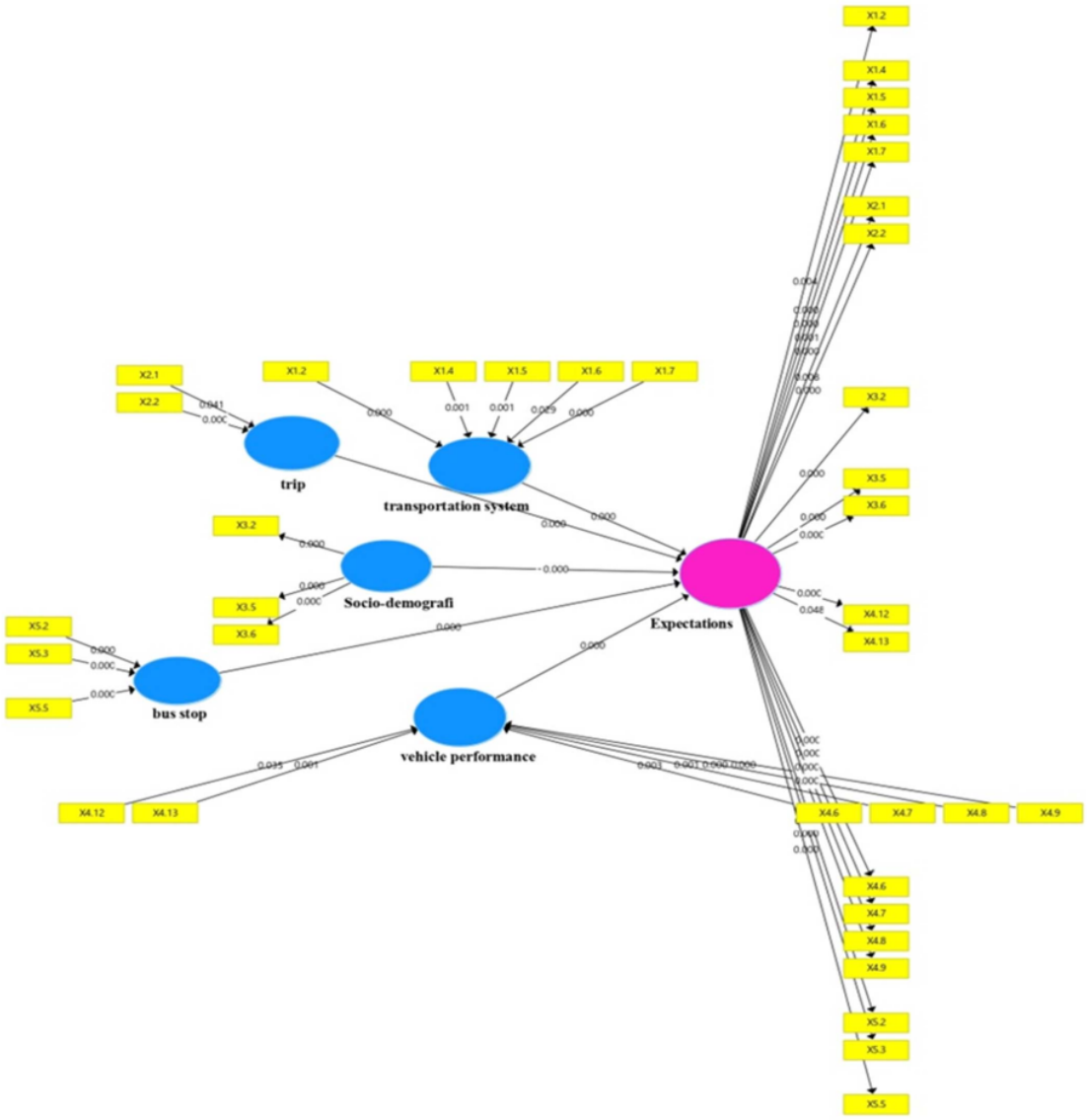

Fig. 3. P-values on the End Process SO-CFA

The full test results of the influence factor test model on using public transportation are described in TABLE II.

TABLE II. GOODNESS OF FIT MODEL SO-CFA

Criteria	Assessment Parameter	Indicator/Model	Value
Reflective Model (Driver)			
Convergent Validity	Loading factor > 0.70	X3.2 Polite & friendly X3.5 Neat X3.6 Appearance	0.738 0.704 0.835
	AVE > 0.50	Model	0.602
Discriminant Validity	Cross loading, loading factor indicator > its respective latent variable	X3.2 Polite & friendly X3.5 Neat X3.6 Appearance	0.738 > 0.609 0.704 > 0.491 0.835 > 0.680
Reliability	Composite reliability > 0.70	Model	0.819
Formative Model (transport system, trip, vehicles, and stop facilities)			

Criteria	Assessment Parameter	Indicator/Model	Value
Significance Weighting Values	*p-value* < 0.05	X1.2 Scheduled X1.4 Fare X1.5 Secure X1.6 Alternative vehicles X1.7 Environmentally friendly X2.1 Reach/Broad X2.2 Integrated X4.6 Not noisy X4.7 Smell X4.8 Well maintained X4.9 Attractive colors X4.12 Boarding and Alighting X4.13 Size X5.2 Attractive X5.3 Information X5.5 Access	0.000 0.001 0.001 0.029 0.000 0.041 0.000 0.000 0.000 0.000 0.003 0.001 0.000 0.000 0.035 0.001
Multi-collinearity	VIF < 5	X1.2 Scheduled X1.4 Fare X1.5 Secure X1.6 Alternative vehicles X1.7 Environmentally friendly X2.1 Reach/Broad X2.2 Integrated X4.6 Not noisy X4.7 Smell X4.8 Well maintained X4.9 Attractive colors X4.12 Boarding and Alighting X4.13 Size X5.2 Attractive X5.3 Information X5.5 Access	1.109 1.091 1.124 1.488 1.250 1.067 1.067 1.847 1.595 1.391 1.283 2.714 1.050 1.377 1.152 1.498

From the results of the model tests in Table 2 it can be explained that of the 44 indicators of all exogenous variables only 19 relevant indicators affect the use of public transportation. The 19 indicators can be seen in TABLE III.

TABLE III. RELEVANT VARIABLES AFFECT THE USE OF PUBLIC TRANSPORTATION

Exogenous variables	**Indicator Variable**		**Description**
Characteristics of the transportation system (X1)	Safety	X1.1	PT can ensure the safety of passengers and goods against accidents
	Fare	X1.4	Affordable tariff
	Secure	X1.5	PT must guarantee security from outside interference
	Alternative vehicles	X1.6	Being an alternative vehicle (ease people)
	Environment-ally friendly	X1.7	Does not harm the environment
Characteristics of the Trip (X2)	Reach/Broad	X2.1	PT service coverage should be broad or reach out to the destination
	Integrated	X2.2	PT must be integrated with other transportation (connected)
Socio-behavior of the Driver (X3)	Polite & friendly	X3.2	Drivers were courteous and friendly
	Neat	X3.5	Uniformed driver
	Appearance	X3.6	The driver has a personal identity and it is clearly in the vehicle
Vehicle Performance (X4)	Not noisy	X4.6	The vehicle does not make noise when running
	Smell	X4.7	Vehicles are not malodorous
	Well maintained	X4.8	The vehicle is in good condition (well maintained) and looks new
	Attractive colors	X4.9	Vehicles have an attractive color
	Boarding and Alighting	X4.12	Boarding and alighting access is easy and convenient
	Size	X4.13	Vehicle size proportional
Bus Stop Performance (X5)	Attractive	X5.2	Attractive bus stop appearance
	Information	X5.3	Departure and route information is available
	Access	X5.5	Convenient entrance access

V. CONCLUSION

In connection with the intention to improve rural public transportation services in the City of Martapura, based on the results of the analysis of factors that influence the use of public transportation, minimal services must be performed as follows:

1. Of the transportation system, including:
   a. Public transport must have a clear departure and arrival schedule.
   b. The applied fares must be affordable by the public.
   c. Public transport must ensure the safety of passengers from outside interference.
   d. Public transport is expected to be an alternative transportation mode for users other than private vehicle.
   e. Public transport should be clear where the stops, which does not harm the surrounding environment.
2. Of the characteristics of trip, among others:
   a. Public transportation routes must be broad and spread so that they can shorten the trip.
   b. Public transport must be integrated with other transportation modes (connected).
3. Of the socio-demographic (behavior) of the drivers, including:
   a. The driver must present a respectful manner, polite and friendly to passengers.
   b. The driver should have a clear and neat uniform.
   c. The driver is equipped with a self-identity as a driver and it is also clearly exposed in the vehicle.
4. Of the performance of the vehicle, among others:
   a. The vehicles do not produce the sound of a noisy engine or car body.
   b. The vehicles do not emit bad odor.
   c. Well-maintained vehicles.

d. The colors of the vehicles are made attractive.

e. Access to get in/off the vehicle must be easy and comfortable.

f. Vehicle size must be proportional, in the sense that it needs rejuvenation of public transport which is bigger.

5. Of the bus stop facilities, including:

a. The stops are designed with an attractive appearance.

b. The bus stop is equipped with information on scheduled departure/arrival and the routes.

c. Access to exit/entrance the bus stop must be easy and convenient.

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