

Study on the factors affecting the quality of public bus transportation service in Bali Province using factor analysis

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Abstract. The volume of mobility flows are increasing day by day and the condition of the number of people using private transport modes contribute to traffic congestion. With the limited capacity of the road, one of the alternatives solution to reduce congestion is to optimize the use of public transport. The purposes of this study are to determine the factors that influence user's satisfaction on the quality of public bus transportation service and determine variables that became identifier on the dominant factor affecting user's satisfaction. The study was conducted for the public bus transportation between districts in the province of Bali, which is among the eight regencies and one municipality, using a questionnaire as a data collection instrument. Service variables determinant of user's satisfaction in this study, described in 25 questions, which were analyzed using factor analysis. The results showed there were six factors that explain the satisfaction of users of public transport in Bali, with a total diversity of data that can be parsed by 61.436%. These factors are: Safety and comfort, Responsiveness, Capacity, Tangible, Safety, Reliability. The dominant factor affecting public transport user satisfaction is the safety and comfort, with the most influential variable is feeling concerned about the personal safety of users when on the bus.

1. Introduction

Transportation is a very important requirement for the community. One of the problems that often occur in all areas, especially urban areas is the need for transportation increases, caused by the increasing number and population growth. In addition, the Province of Bali as a favorite tourist destination and the rapid development of tourism industry contributed to the increase in the volume of mobility flows between districts. Volume of mobility flows vehicle or person will be increased each day, which became one of the causes of traffic congestion today, and potentially cause a bigger problem in the future if it does not handled properly.

With the limited capacity of the road, one of the alternatives solution to reduce congestion is to optimize the use of public transport. Real conditions in the field, interests and culture of the people using public transportation is still very low. Until now, only segments of society middle and lower level who use public transport services. According to Munawar [1], public transport is still less appealing because there are still shortcomings, particularly in terms of comfort, safety, speed, accuracy, ease, frequency and departures, and the facilities at the terminal and the bus stop.

In response to these circumstances, it is necessary to be handled more on the provision of public transport services. The study on the characteristics of users and the quality of public transport services



is necessary to do. Beside that, Le-Klähn et al.[2] explained customer surveys are especially important nowadays considering the depth and amount of information they can provide so public transport providers can understand which service aspects play a more critical role in passenger satisfaction.

Traffic conditions in Bali, especially in urban areas showed conditions worsened caused by most people, especially the upper middle class people who use private transport in everyday activities. On the other hand, the condition of the low interest of the public to switch to using public transportation and low culture in the use of public transportation also contributed to the above-mentioned conditions.

The tendency of people traveling by private transport in urban areas will continue to increase if the condition of the transport system no more fundamentally improved. Tamin [3] states that the increased likelihood of a trip by private transport caused by: (1) Increased economic activity underserved by adequate public transportation; (2) The increasing purchasing power and the level of privacy that can not be served by public transport; (3) The increase in the price of land so that the addition of the highway less; (4) The opening of the new road further stimulate the use of private transport because usually in the new road network there has been no public transport services at the time; (5) Non-availability of transport feeder that bridge to travel to the main lines of public transport services; and (6) Less ensuring the security needs, the need for timely, the need for a long journey experienced in public transport services. According Ditjen.Hubdat (Ferdiansyah [4]), public transport problems commonly faced by urban areas in Indonesia can be classified into three levels of low accessibility, low level of service, and cost.

The purposes of this study are to determine the factors that influence user's satisfaction on the quality of public bus transportation service and determine variables that became identifier on the dominant factor affecting user's satisfaction on the public bus transportation service.

2. Research Methods

This research was conducted for the public bus transportation between districts in the province of Bali, which is among the eight regencies and one municipality. The data in this study is obtained from primary sources, which are taken directly by the researchers using a questionnaire. Method of measuring user satisfaction of the public bus transportation modes in this study using customer satisfaction surveys with interviews to public bus users using a questionnaire. The data collected is the passenger's perception of public bus service quality.

Sampling in this study conducted by purposive sampling is a sampling technique where the sample selection is done with certain subjective judgment based on multiple traits/characteristics of the sample, which is seen as closely linked to traits/ characteristics of the population that has been previously known. Considerations that are used in the selection of respondents, respondents who currently use/ride and/or currently use the public bus service as a means of mobility between districts in the province of Bali. Service variables determinant of user satisfaction in this study, described in 25 questions.

Data analysis techniques in this study, follow these steps:

- (1) Conducting multivariate analysis techniques using Factor Analysis. Factor analysis steps refers to Hair et al.[5], as follows:
 - a. Test variables have been determined, using the method of Bartlett Test of Sphericity, KMO and measure of sampling adequacy (MSA).
 - b. Perform core processes in the factor analysis, a reduction of one or more factors of the variables that have pass the previous variable test. Conducting process rotation factor to the factors that have been formed. The purpose rotation to clarify the variables that enter into a particular factor. There are two different methods of rotation are orthogonal and oblique rotation. Known maintained orthogonal rotation if the axis perpendicular to one another (angle 90 degrees). Orthogonal rotation produce factors that are not correlated with each other. Conversely said oblique rotation if the rotation axis is not maintained to be perpendicular to each other and uncorrelated factors. Oblique rotation should be used if the factors in the population strongly correlate.

- c. Interpretation of the factors that have been formed, by giving the name on the form factor, which is considered to represent variables members of these factors.
- (2) Processing of the data in this study using SPSS version 19.0 For Window.

3. Results and Discussion

The data were obtained by questionnaires, it is necessary to test the instruments to ensure the questionnaire used is valid and reliable. The research result is said to be valid if there are similarities between the data collected with the actual data in the object studied. The method is often used to provide an assessment of the validity of the questionnaire is product-moment correlation, with the following formula:

$$r_{xy} = \frac{N \sum XY - (\sum X)(\sum Y)}{\sqrt{N \sum X^2 - (\sum X)^2} \sqrt{N \sum Y^2 - (\sum Y)^2}}. \quad (1)$$

Remarks:

X = Score test items

Y = Score total items

N = Number of respondents

Furthermore, t-test was calculated by using the formula (2).

$$t = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}} \quad (2)$$

Wherein, r is the correlation coefficient results r_{xy} , and n is the number of respondents. Value t obtained will then be compared with the value t_{table} , if $t > t_{table}$ variables considered valid. The test results showed that the validity of 25 item questions to reveal more about the factors that affect the user satisfaction of public transport are all qualified validity so that it can be used for subsequent measurement.

The next test is to test reliability, the test is to indicate the extent to which an instrument is reliable or unreliable. If an instrument is used twice to measure the same phenomenon and the measurement results obtained by the same, then the instrument is said to have a high level of reliability.

Table 1. Value of reliability test

Cronbach's Alpha	N of Items
.856	25

Sources: Primary data (2016)

Reliability testing table above were obtained Cronbach Alpha value of 0.856 which is greater than the prescribed criteria of 0.5, meaning all variables showed strong reliability. This means the entire test instrument meets the requirements for use in decision making further research. The analysis conducted in this study is factor analysis, this analysis is done to see the most dominant factor in determining the satisfaction of users of public transport in Bali. The steps are as follows:

3.1. Eligibility test data

The first step is performed to see whether the data obtained deserve to be processed by factor analysis, is to look at the value of KMO.

Table 2. Value of KMO and Bartlett's

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.879
Bartlett's Test of Sphericity	Approx. Chi-Square	3346.591
	df	300
	Sig.	.000

Sources: Primary data (2016)

KMO is an index to compare the magnitude of the correlation coefficient observations with a partial coefficient, which means that a large overall correlation coefficient of variables in the correlation matrix to be significant. KMO test value ranges between 0 and 1 which questioned the feasibility of factor analysis. Score KMO required to be more than 0.5, if the value of the index ranged from 0.5 to 1.0, a factor analysis feasible. Conversely, if the value of KMO below 0.5, a factor analysis was not feasible.

Based on calculations by the software SPSS 19.0 for windows obtained KMO value of 0.879 so worthy of factor analysis done by category is very good.

3.2. Barlett test

Barlett Test is a statistical test to test whether the variables involved correlated. The null hypothesis (H_0) is no correlation between variables, whereas the alternative hypothesis (H_a) is a correlation between variables. Barlett Test value approximated by a chi-square value. Based on Table 2 obtained chi-square value is 3346.591 with significant 0,000, so that H_0 rejected and H_a accepted, meaning it is believed that there is a correlation between variables.

3.3. Factor extraction process

In determining the number of the desired factor as a result of the extract in this study using eigenvalues which aims to determine the most dominant factor in determining the satisfaction of users of public transport in Bali, meaning that only those factors with eigenvalues > 1 were considered significant. From the results of data analysis using Principal Component Analysis, obtained six major components that have more than one eigenvalue indicating the number of factors that determine the satisfaction of users of public transport in Bali.

Table 3. Total variances explained major components

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Varian	Cumulativ %	Total	% of Varian	Cumulativ %	Total	% of Varian	Cumulativ %
1	8.412	33.648	33.648	8.412	33.648	33.648	5.289	21.155	21.155
2	1.764	7.057	40.705	1.764	7.057	40.705	3.185	12.741	33.896
3	1.623	6.493	47.198	1.623	6.493	47.198	2.608	10.433	44.329
4	1.316	5.265	52.463	1.316	5.265	52.463	1.710	6.838	51.167
5	1.177	4.706	57.169	1.177	4.706	57.169	1.336	5.346	56.513
6	1.067	4.267	61.436	1.067	4.267	61.436	1.231	4.923	61.436

Sources: Primary data (2016)

Based on Table 3, from 25 variables proposed, formed six factors. Factor 1 has a total of eigenvalues of 8.412 or 33.648%, meaning that one factor able to explain 33.648% of the total of the factors that will affect the satisfaction of users of public transport in Bali. Factor 2 has a total of eigenvalues of 1.764 or 7.057%, which means Factor 2 is able to explain the 7.057% of the total

factors that affect user satisfaction of public transportation in Bali. Factor 3 has a total value of eigenvalues of 1.623 or 6.493%, meaning that Factor 3 capable of explaining 6.493% of the total factors will affect the satisfaction of users of public transport in Bali. Factor 4, 5 and factor 6 with the same explanation can be seen in Table 3. The major cumulative contribution of six factors on consumer behavior amounted to 61.436%.

3.4. Factor rotation

Results obtained by using the method of eigenvalues showed 6 factors formed in relation to the satisfaction of users of public transport in Bali. However, the results of the mapping using matrix components obvious that all variables are clustered in a factor of 1, 2, 3, and 4, which can be seen in Table 4.

Table 4. Component matrix

	Component					
	1	2	3	4	5	6
X ₂₅	.788	.015	.080	.084	.124	-.105
X ₂₄	.754	.136	.029	.148	.126	-.072
X ₂₁	.742	.085	.291	.053	.017	-.069
X ₂₂	.733	.352	.149	.056	.055	.007
X ₁₂	.656	.221	.234	.063	-.205	.155
X ₂₀	.643	.302	.160	.035	.057	.118
X ₁₁	.637	.114	.328	.172	.048	.246
X ₁₉	.622	.378	.198	.037	-.075	.007
X ₁₃	.599	.305	.246	.025	-.164	.206
X ₁₄	.474	.365	.232	-.148	.200	-.180
X ₁₇	.241	.844	.125	.090	.052	.019
X ¹⁸	.220	.843	.137	.112	.073	.063
X ₁₆	.305	.798	.067	.002	.017	.066
X ₁₅	.101	.360	.305	-.075	-.196	.175
X ₆	.410	-.008	.697	.073	.022	.088
X ₇	.188	.321	.636	.039	-.097	.103
X ₈	.330	.120	.615	.208	.186	.165
X ₅	.261	.279	.539	.107	.066	-.270
X ₄	.088	.042	.445	.156	.397	-.314
X ₃	.142	.084	.264	.745	-.118	.002
X ₂	.094	.068	-.194	.686	.228	-.064
X ₁	.045	-.030	.258	.654	-.159	.219
X ₂₃	.151	.091	.102	-.044	.779	.026
X ₁₀	.182	.277	.173	.197	.019	.725
X ₉	.327	.166	.222	.099	-.479	-.449

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 10 iterations

The basis for deciding whether a variable is included in the factor 1, factor 2, or any other factor is to look at the value of loading factor. Prior grouped loading factor must meet the criteria of practical

significance and statistical significance. Criteria practical significance is the loading factor is greater than 0.35, as in this study using 297 samples. Membership of each factor is as follows: Item questions X_{25} , X_{24} , X_{21} , X_{22} , X_{12} , X_{20} , X_{11} , X_{19} , X_{13} and X_{14} are clustered in factor 1, indicating that the items to these questions is a component of Factor 1. The next factor is named factor 1 safety and comfort.

Variables X_{17} , X_{18} , X_{16} and X_{15} clustered in factor 2 and is a component of the factor 2, factor 2 is named Factor Responsiveness. The components of Factor 3 consists of variables X_6 , X_7 , X_8 , X_5 , and X_4 , and named Factor Capacity. Item questions X_3 , X_2 , and X_1 are clustered in factor 4, show items such questions are components of the Factor 4, Factor 4 is named Tangible. While the question items X_{23} that are in the component Factor 5, this factor was named Safety, and the last is the item question X_{10} and X_9 clustered on the components Factor 6, further Factor 6 is named by a Factor Reliability. The grouping of variables into a component of a factor can be seen in Table 5.

Table 5. Grouping variable become a component factor

Factor	Number of question	Pernyataan
Factor 1 Safety and Comfort	X_{25} , X_{24} , X_{21} , X_{22} , X_{12} , X_{20} , X_{11} , X_{19} , X_{13} , X_{14}	X_{25} = feelings of self-users are concerned about security when in the bus X_{24} = feelings are concerned about security when the user luggage in the bus X_{21} = comfort in the bus during the trip X_{22} = bus attendant quite responsive in helping users X_{12} = bus attendant able to be patient and courteous in serving users X_{11} = Hygiene of bus X_{19} = bus attendant can be kind to each user X_{13} = bus attendant is able to communicate well with users X_{14} = treatments bus attendant in the serving regardless user's social status
Factor 2 <i>Responsiveness</i>	X_{17} , X_{18} , X_{16} , X_{15}	X_{17} = bus attendant quickly respond to complaints X_{18} = bus attendant willing to follow up on complaints from users X_{16} = bus attendant willing to listen to complaints from users X_{15} = user can submit a complaint easily
Factor 3 Capacity	X_6 , X_7 , X_8 , X_5 , dan X_4	X_6 = Capacity of bus X_7 = Adequacy of seating and standing X_8 = complete facilities in bus X_5 = suitability travel expenses with service
Factor 4 <i>Tangibles</i>	X_3 , X_2 , dan X_1	X_3 = Position stop, strategic and easy to reach, access speed X_2 = stop position is easy to find X_1 = Region coverage
Factor 5 Safety	X_{23}	X_{23} = misgivings users to the speed of the bus driver to drive the bus
Factor 6 Reliability	X_{10} dan X_9	X_{10} = Timeliness arrived X_9 = Completeness of facilities at bus stop

Sources: Primary data (2016)

Table 5 shows the variables that are components in the sixth form factor based eigenvalues greater than one. In Factor 1, the safety and comfort factor having the greatest eigen value of 8.412 or can

explain the variance data at 33.648%, with the most dominant variable is feeling concerned about the personal safety of users when on the bus. In addition to safety, comfort is also a variable that exists in this first factor. This indicates that people are very concerned about security and comfort in using public transport, especially buses.

The second factor is a factor of public transport user satisfaction is Responsiveness. The speed and sensitivity of officers in the bus respond to customer complaints is the main point in this second factor. The amount of variance can be explained by the second factor is 7.057%. Other factors that also affect user satisfaction in using public transport is the capacity, tangibles, safety and reliability.

The results of this study are in line with Redman et al.[6] presented a comprehensive review on service quality in public transportation and determined that reliability, frequency, price, speed, access, comfort, and convenience were the factors that attract car users to use public transportation. In a study by de Oña et al.[7], to determine the most important service quality factors explained that from a general perspective, comfort, personnel, information, and service were determined as the most important factors. Besides, Hassan et al.[8] explained that the most desirable service quality factors of public transportation services were reliability, frequency, capacity, price, cleanliness, comfort, security, staff, information, and ticketing system, with loading/ridership, travel time, travel distance, and service duration indicated as “efficiency” indicators

4. Conclusions

Based on the discussion in the previous chapter, the conclusions that can be drawn is: Results of factor analysis showed there are six factors that explain the satisfaction of users of public transport in Bali, with a total diversity of data that can be explained by 61.436%. These factors are: Safety and comfort; Responsiveness; Capacity; Tangible; Safety; Reliability. The dominant factor influencing customer satisfaction of public transport users is Safety and comfort, with the most influential variable is feeling concerned about the personal safety of customers while on the bus.

Based on the findings of this study suggested to the government to pay attention to the safety factor and passenger comfort when using public transport. The variables on these factors is the feeling of self-users are concerned about security when on the bus; feeling worried about the security of customer's belongings when in the bus; Comfort in the bus during the trip; bus attendant quite responsive in helping users; operator/supervisor of bus able to be patient and courteous in serving users; Cleanliness bus; bus attendant can be kind to each user; operator/supervisor able to communicate well with users; operator/supervisor treatment in the serving regardless of the user's social status.

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