Public perception of the transit bus plan in the city of Lhokseumawe

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Abstract. Community dependence on private transportation is a major factor in traffic congestion. Community perception is one of many important aspects in policy-making because by involving the community, the decision-makers will be able to capture the views, needs, and expectations of the community. The purpose of this study is to examine people's perceptions of the transit bus plan. The data collection method used is Stated Preference (SP) with a total of 100 respondents in stratified random sampling. The SP questionnaire contains information about socio-economic status and respondents' perceptions. The results of the perception survey show that the overall psychological questions have values above 2.5 from the 4 scale Likert, which means that respondents' perceptions of the transit bus plan are very positive. The respondents agree that the transit bus can be received with positive values.

1. Introduction

Transportation is a very important means of supporting the success of development [1]. In urban areas, poor public transportation services result in the increasing of the ownership of private vehicles every year. Problems then arise due to traffic congestion, air pollution, traffic accidents, and the cost of repairing road infrastructure. Transportation problems need special attention from the government. There are several problems related to the transportation system in Lhokseumawe City, which is one of the Centers of National Activities (CNA), and also the place of Arun Lhokseumawe Special Economic Zones (SEZ). Lhokseumawe city serves the flow of people, goods, and services from outside into the city area and vice versa for both domestic and international purposes. As a policy measure to alleviate these problems, the Government of Lhokseumawe City plans to create transit mass bus transport, which aims to advance the system and management of public transportation and improve the quality of transportation services to be comfortable, fast, timely, and affordable for the community. The transit bus is planned to provide a new bus service that is different and better than other public transportation services in Lhokseumawe City.

The perception of community acceptance is one of the keys to the successful implementation of transportation policies [2]. Understanding community needs is one of the ways to achieve the best policy because, by involving the community, the decision-makers will be able to capture the views, needs, and expectations of the community, following the logic that the views and preferences of the community become valuable input that then enables the realization of responsive decisions. The use of public transportation is determined by the satisfaction of its users [3]. Therefore, this information is very important and useful to develop the transit bus plan into acceptable policies because of valuable input from the community. This study analyzes the public perceptions of the transit bus plan by using
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descriptive statistical analysis with a Likert scale. The discussion and conclusions of the study are presented at the end of the paper.

![Figure 1. Lhokseumawe city (map data © 2019 Google).](image1)

![Figure 2. Area of survey (map data © 2019 Google).](image2)

2. Methodology
Community perception is the response or environmental knowledge from a group of individuals who interact with each other because they have values, norms, ways, and procedures. The degree of user satisfaction is one of the determinants of the model of selection [4]. The stated preference (SP) technique is an approach to have the best option of respondents’ choice by making an alternative hypothetical situation. The hypotheses of the situation are based on an experimental design that guides the questionnaire to be given to respondents. The revealed preference data is collected using a questionnaire survey based on the Likert scale choices [5]. The questionnaire inquired about what choices respondents prefer or what ranking/rating they would give for a series of variables or certain choices in one or several possible situations. The study was conducted in 2019. Lhokseumawe city was the area of the study and the survey, which explanation can be seen in table 1 and 2.
Table 1. Summary of the SP survey.

| Description                      | Detail                                      |
|----------------------------------|---------------------------------------------|
| The year of survey               | 2019                                        |
| Target location                  | Lhokseumawe city                            |
| Distribution sampling method     | Direct interviews and collected by the      |
|                                 | enumerators                                 |
| Sampling aggregation             | 100 samples                                 |
| Distribution                     | Weekdays (75%); Weekends (25%)              |

Table 1 describes the SP survey which consists of the time of data collection, survey location, sampling number, and distribution of the sample’s information. The target respondents consisted of commuters, commercial visitors, students, employees within the targeted area of study. More than 100 respondents were asked about their level of satisfaction and how important different aspects were to them; the respondents’ respond was in terms of a 4-point Likert scale from 1 to 4 (1 representing strongly unsatisfied/strongly unimportant; 4 representing strongly satisfied/strongly important). Furthermore, the measured variables are translated into the indicator variables. This questionnaire included questions regarding the socio-demographic characteristics of respondents and travel behavior included during the survey. The questionnaire was designed to attain several bus system service elements, as shown in table 2.

Table 2. Itemed questions related to the bus service satisfaction and importance measures.

| Element ID | Description | *Content of Element Question |
|------------|-------------|-----------------------------|
| Q1         | Acceptability | Planned operation of the transit bus |
| Q2         | Security1 | Security aspect from crime while in the bus |
| Q3         | Security2 | Security aspect from crime while at the bus stop |
| Q4         | Safety | Feeling safe aspect |
| Q5         | Convenience1 | The convenience of bus cleanliness |
| Q6         | Convenience2 | Convenience while boarding the bus |
| Q7         | Convenience3 | Bus capacity comfortable |
| Q8         | Convenience4 | The convenience of bus facilities |
| Q9         | Convenience5 | The convenience of bus stop facilities |
| Q10        | Accessibility | Easy for passengers to reach the bus stop |
| Q11        | Punctuality1 | Easy to obtain the route and the timetable of the bus |
| Q12        | Punctuality2 | The accuracy of bus schedules |
| Q13        | Equality | Facilities for disabilities and elderly people |
| Q14        | Time Regularity1 | Travel time within the bus stops |
| Q15        | Time Regularity2 | The headway between consecutive bus |

* using a 4-point Likert scale such as 1 to 4 (strongly unsatisfied/unimportant to strongly satisfied/important)

Researchers used descriptive statistics to analyze data by describing the data that had been collected. Descriptive statistics present the results of the survey through a form of frequency distribution and percentage of recapitulation results of respondents’ SP questionnaires. Frequency distribution provides both statistical and graphic figures. This frequency will be used to see the overall picture of the parameters, which were gender, age, the highest level of education, type of work, transportation costs, frequency of usage, income per household, and travel behavior.

According to [6], the Likert scale is a scale used to measure the attitudes, opinions, and perceptions of a person or group about social events or symptoms. Likert scale measurement is used for the purposes of quantitative analysis. Then, the answer can be given as a score, for example, strongly agree with a score of 4, agree with a score of 3, disagree with a score of 2, and strongly disagree with a score of 1.
A Structural Equation Modeling (SEM) framework is applied to model and analyze the collected data. The regression parameters were calibrated by using the applied maximum likelihood estimator (MLE) and were performed by using Amose 24. This method aimed to test a model hypothesis. This method also aimed to find out the vector of indicator variables (y) connected by a latent variable (y), with a covariate (x) included in the analysis calculation. The SEM model tested the consistency of structural theory and measurement through data and had the purpose of estimating parameters (coefficients, variances) and assessing the fit of the model.

Table 3. Respondent’s Socio-demographic distribution.

| Item                             | Category                     | Respondent’s Share |
|----------------------------------|------------------------------|--------------------|
| Gender                           | Male                         | 59 (59%)           |
|                                  | Female                       | 41 (41%)           |
| Age                              | 16 - 25 years                | 29 (29%)           |
|                                  | 26 - 35 years                | 13 (13%)           |
|                                  | 36 - 45 years                | 34 (34%)           |
|                                  | 46 - 55 years                | 17 (17%)           |
|                                  | 56 years or more             | 7 (7%)             |
| Highest level of Education       | Primary School               | 38 (38%)           |
|                                  | College                      | 16 (16%)           |
|                                  | University/Bachelor          | 42 (42%)           |
|                                  | University/postgraduate       | 4 (4%)             |
| Monthly Income                   | 1 million IDR or less        | 12 (12%)           |
|                                  | 1 - 1.9 million IDR          | 23 (23%)           |
|                                  | 2 - 2.9 million IDR          | 26 (26%)           |
|                                  | 3 - 3.9 million IDR          | 33 (33%)           |
|                                  | 4 million IDR or more        | 6 (6%)             |
| Vehicle Ownership                | Has no vehicle               | 0                  |
|                                  | Has motorcycle               | 76 (76%)           |
|                                  | Has car                      | 3 (3%)             |
|                                  | Has car and motorcycle       | 21 (21%)           |
| Occupation                       | College/University Student   | 33 (33%)           |
|                                  | Non-Government               | 38 (38%)           |
|                                  | Employee                     | 17 (17%)           |
|                                  | Government Employee          | 12 (12%)           |
|                                  | Housewife                    |                    |
| Driver’s License                 | Has the driver’s license     | 87 (87%)           |
|                                  | Has no driver’s license      | 13 (13%)           |
| Purpose of traveling on the day  | Studying and lessons         | 37 (37%)           |
| of the questionnaire survey      | Work                         | 49 (49%)           |
|                                  | Shopping/Entertainment        | 7 (7%)             |
|                                  | Other reasons for traveling  | 7 (7%)             |

Table 3 shows the distribution of respondent’s socio-demographic and mobility attributes. Of the respondents, 59% were male and 41% were female. It can be seen that the questionnaire has been distributed equally, so it is expected that there are various different travel characteristics. More than 76% of respondents were young people below the age of 45 years. Concerning education and occupation, both datasets show that respondents having education of high school and college are predominant; and many of the respondents are employed. As a result, it can be seen that the age ratio of respondents interviewed can represent the number of respondents having a productive age.

Based on the respondents’ monthly income variable, the largest plurality of respondents, at 33%, had an income of 3-3.9 million IDR per month per household; 26% of respondents had a middle monthly income of 2-2.9 million IDR per month per household; 23% of respondents had a low monthly income
of 1-1.9 million IDR per month per household [6]. It can be seen that the respondents' family income was taken as a sample variable. However, 76% of the respondents have a motorcycle, and the remaining, 13%, have at least a car. Regarding owning a driver’s license, nearly 87% of the respondents have a driver’s license. Finally, for the purpose of traveling on the day of the questionnaire survey performed, about 86% of the respondents were traveling on a mandatory trip, meaning for the purpose of studying for university/college students and for the purpose of working. Thus, it can be seen that the travel destination of the respondents varies greatly.

3. Results and discussion

3.1. Likert scale

This part describes the research results obtained after the process of data collection, data processing, and data analysis to determine the frequency associated with the characteristics of respondents. The results obtained from field observations were then recapitulated. One hundred samples of respondents were obtained. This analysis is intended to determine the frequency of perceptions of the plan that the transit bus plan has proposed to the public. Perception is a related psychological concept used to observe respondents' intentions related to psychological determinants and scenarios. Table 4 shows that the respondents agree that the transit bus plan is acceptable and give an average value of 3.55, meaning that the transit bus plan is an agreeable policy. For the safety factor, the transit bus plan was rated as 3.23 and 3.40. In terms of safety, the majority of respondents agreed that mitigating the possibility of accidents caused by human, vehicle, road, and environmental factors, is very important or valued as 3.48.

Another part of the respondent's desire for transit bus is convenience, namely for cleanliness, which earned a value of 3.41. This means that the respondents expect the availability of garbage bins on the bus, so that bus cleanliness can be maintained. Another part of convenience is the convenience in boarding the bus, which is rated as 3.46; the respondents recommend the distance between the bus door and the bus stop must not be so far. Other indicators, related to convenience, is bus capacity, which rated as 3.2, and bus facilities, which rated as 3.5. Finally, the convenience at the bus stop facilities was rated as 2.94. From the five indicators of convenience, it can be seen that convenience is an important thing desired by respondents for transit bus services.

In terms of accessibility, ease of reaching the bus stop had a value of 3.17. Punctuality of route and timetable was rated as 2.97, and the accuracy of the timetable was rated as 2.79. Concerning equality, the majority of respondents rated the availability of infrastructure facilities for people with disabilities, pregnant women, elderly as 3.41. In terms of time regularity, e.g. travel time and headway, the respondents rated as 3.2 and 2.84.

Descriptive analysis of community perception indicators shows that all indicators have values above 2.5 from the 1-4 Likert scale, which means that respondents' perceptions of the transit bus plan are very positive at 3.23 with an average percentage value of 80.86 of the reference Likert scale 1-4. The greatest indicator of acceptance level was 3.55, which means the respondents agree that the transit bus has many positive aspects. The punctuality, travel time, and waiting time (headway) should be the primary attribute to improve in order to attract transit bus ridership. It is likely that the transit bus is the new bus system to be introduced by the government and it will replace existing public transport because the existing public transport lacks reliability in terms of punctuality, travel time, waiting time, and bus facilities (convenience).

Table 4. The mean value and percentage of the factors that the respondents desire for the transit bus service.

| ID  | Description                  | Mean Likert scale | Percentage (%) |
|-----|------------------------------|-------------------|----------------|
| P1  | Acceptability (transit bus plan) | 3.55              | 88.75          |
3.2. Measurement model (confirmatory factor analysis/CFA part)

The results of the measurement model calibration are presented using the Structural Equation Modeling (SEM) approach. The latent variables such as security, convenience, accessibility and time regularity were measured by using several indicators. As expected, most of the indicators in this latent construction group have a significant factor loading (t-value > 1.96; at a significant error of 5%) to the measured latent construct. There are four latent variables built. The variables represent 14 indicators. In table 5, there are twelve observed variables with loading factors ≥ 0.5 and t-value ≥ 1.96. The twelve measurement models show that the calibrated parameters are standardized (standardized loading factor) by adding a value of 1 for the first indicator within a group of latent construction.

| Latent Variable | Indicators | Coefficient | t-value |
|-----------------|------------|-------------|---------|
| Latent1 Security | Crime in bus stop | 1.00 | 1.13 |
|                  | Safety | 0.88 | |
| Latent2 Convenience | | | |
|                  | Cleanliness | 1.00 | |
|                  | Boarding the bus | 0.86 | 6.56 |
|                  | Bus capacity | 1.04 | |
|                  | Bus facilities | 1.46 | |
|                  | Disabilities and elderly people | 1.05 | 6.69 |
| Latent3 Accessibility | | | |
|                  | Ease reach the bus stop | 1.00 | |
|                  | Route and timetable | 0.90 | 10.35 |
|                  | Accuracy of timetable | 0.50 | |
| Latent4 Time Regularity | | | |
|                  | Travel time | 1.00 | |
|                  | Headway | 1.43 | 6.35 |

Table 5. Calibrated parameters of the measurement model (CFA part).

Table 5 illustrates the correlation between individual perception as indicators and latent construction such as ‘security (latent1)’, ‘convenience (latent2)’, ‘accessibility (latent3)’ and ‘time regularity (latent4)’. Looking to the latent variables of latent1 to latent4, the latent3 variable of ‘accessibility’ has been significantly influenced by three indicators such as ease to reach the bus stop, route and timetable, and accuracy of the timetable.
4. Conclusion

Based on the results of the discussion and analysis of the data conducted, several conclusions can be drawn. Because the Likert scale measurement is used for the purposes of quantitative analysis, then the answer can be given as a score, for example, strongly agree with a score of 4, agree with a score of 3, disagree with a score of 2 and strongly disagree with a score of 1. The answer to each variable that uses the Likert scale has a gradation from very negative to very positive. Each answer is linked to a question or an attitude of support. More than 59% of respondents were male and 41% of respondents were female. It can be seen that the questionnaire has been distributed equally, so it is expected to provide different travel characteristics. More than 76% of respondents are young people aged below 45 years. Based on their monthly income, the majority respondent, 33%, have an income of 3-3.9 million IDR per month per household. Regarding owning a driver’s license, nearly 87% of the respondents have the driver’s license. Finally, as the purpose of traveling on the day of the questionnaire survey performed, about 86% of the respondents have conducted the mandatory trip.

Regarding the descriptive analysis of community perception indicators, all indicators have values above 2.5 of the 4 scale Likert, which means that respondents’ perceptions of the transit bus plan are very positive at 3.23 with an average percentage value of 80.86 of the reference Likert scale 1-4 with the greatest indicator of acceptance level of 3.55. This fact means that the respondents agree that the transit bus can be received with positive values. The punctuality, travel time, and waiting time (headway) were the primary attribute to attract transit bus ridership. The fact might be because the transit bus is the new bus system introduced by the government to replace existing public transport that lacks reliability in terms of punctuality, travel time, waiting time, and bus facilities (convenience). This quality of service measured from the system encounter remains a future work of this study.

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