The study of the operation of Trans Koetaradja public bus transportation of the corridor II A and II B in Banda Aceh city

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Abstract. Aceh Government is trying to plan the integrated transportation system. Aceh Government has planned the construction of 6 Corridors of Trans Koetaradja Bus, some of them are Corridors II A and II B. The previous public transport cannot accommodate the transportation service needs of the route of Sultan Iskandar Muda Airport - city center - Ulee Lheue Crossing Port. However, currently, the Banda Aceh Trans Koetaradja Public Bus Transportation is projected to be able to improve the services optimally. The purpose of this study is to assess the level of performance and to improve the quality of the service up to the customers' satisfaction expectations. The method of this research comprises the survey, which is sampling Kouto and distributing questionnaires and data analysis. The questionnaire distribution uses statistic test method and Importance Performance Analysis (IPA) through the SERVQUAL approach, namely: reliability, responsiveness, assurance, empathy, and physical evidence. The result of the study is that the current performance of the services of Trans Koetaradja public bus transportation is rated as good; the importance of the service regarding the customers' expectation is rated good; the quality of service provided to customers is rated 94.52%. The conclusion of this study is that there are several shortages of transportation performance, such as the timeliness of arrival, waiting time at bus stops, passenger assistance, and available seats.

1. Introduction

Aceh Government seeks to plan the integrated transportation system. Trans Koetaradja, the public bus transportation system in Banda Aceh City, is expected to provide optimal service to the community. Previous public transportation was not enough to accommodate the service needed in Corridor II A and II B.

Banda Aceh is a capital city, which has been being developed since the days of the Aceh kingdom. Banda Aceh is a center of activity for the surrounding suburbs, with radial-shaped city structures that reach out in all directions [1]. At present, the city has developed as a modern city, which has various forms of public transport services organized by both the government and the community. One of the public transportation services is the Trans Koetaradja Banda Aceh public transportation.
The Trans Koetaradja Bus begins in 2017. The plans will operate until 2021. The bus transportation system serves 6 corridors. Some of the corridors are the Corridor II A and Corridor II B that serve the routes connecting the Greater Aceh Region and Banda Aceh City, namely: Sultan Iskandar Muda Airport - Type A Batoh Terminal - APK Keudah Terminal - Baiturrahman Grand Mosque - Ulee Lheu Ferry Port.

According to Black [2], the public wants good transportation, so it is very important to involve the public in reviewing public transport services in order to obtain recommendations that need to be considered by transportation service providers. The aspects to be reviewed are security, accuracy, regularity, comfort, speed, pleasure, and user satisfaction. The performance of public transportation services should match users’ expectations. The intended performance includes a sufficient level of service, travel time, waiting time, guaranteed safety, and comfort.

The purpose of this research is to conduct to identify customer perceptions of the performance of the Trans Koetaradja Bus – corridor II A and II B and to review the bus system’s level of service performance and level of service quality performance. The public perception was considered in the SERVQUAL approach: reliability, responsiveness, assurance, empathy, and tangible evidence.

2. Methodology
The study began with a preliminary survey, identification of problems, study of literature, determination of data collection methods, and determination of population and samples using kouto sampling. According to Sugiyono [3], kouto sampling is a technique for determining samples from populations that have certain characteristics up to the number desired. According to Margono [4], kouto sampling is the technique of population numbers not taken into account but classified in several groups.

The samples were several groups in the research area. The samples were divided into two groups, namely: the respondents at the bus stop and the respondents inside the Trans Koetaradja Bus serving the corridors II A and II B. The questionnaires were based on Likert scale measurement. The questionnaire consisted of questions about respondent characteristics and public perceptions about the level of service performance and the level of importance of service quality using the SERVQUAL indicator according to Parasuraman [5], namely: reliability, responsiveness, assurance, empathy, and physical evidence.

2.1. Validity test
The collected data will be tested for validity using the formula below which is according to Sugiyono [3].

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

Information:
- $r_{xy}$ = Correlation coefficients between variables X and Y;
- $N$ = Number of respondents;
- $\sum X$ = Number of scores obtained from respondents tested; and
- $\sum Y$ = Total total score of all items from all respondents tested.

Table 1. $r$ value distribution.

| df = (N-2) | 0.05  | 0.025 | 0.01  | 0.005 | 0.0005 |
|-----------|-------|-------|-------|-------|--------|
|           | 0.1   | 0.05  | 0.02  | 0.01  | 0.001  |
| 117       | 0.1515| 0.1801| 0.2131| 0.2353| 0.2979 |
| 118       | 0.1509| **0.1793**| 0.2122| 0.2343| 0.2967 |
| 119       | 0.1502| 0.1786| 0.2113| 0.2333| 0.2955 |
| 120       | 0.1496| 0.1779| 0.2104| 0.2324| 0.2943 |
| 121       | 0.1490| 0.1771| 0.2096| 0.2315| 0.2931 |
2.2. Reliability test

The reliability test was calculated using the formula below, which is according to Sugiyono [3].

\[
 r_i = \frac{k}{(k-1)} \left[ 1 - \frac{\sum \sigma_b^2}{\sigma_t^2} \right]
\]  
(2)

Information:
- \( r_i \) = Instrument reliability coefficient (alpha cronbach);
- \( k \) = Number of questions;
- \( \sum \sigma_b^2 \) = Amount of variance; and
- \( \sigma_t^2 \) = Total variance.

| Interval Coefficients | Relationship Level |
|-----------------------|--------------------|
| 0.00 – 0.199          | Very low           |
| 0.20 – 0.399          | Low                |
| 0.40 – 0.599          | Enough             |
| 0.60 – 0.799          | Strong             |
| 0.80 – 1.000          | Very strong        |

2.3. Statistic test

The Importance Performance Analysis (IPA) method was calculated using statistical tests to find out the quadrants I, II, II, IV that interprets the characteristics of respondents and public perceptions about current service performance and service quality. According to Martilla and James [6], the IPA method was represented by variables X and Y, where:
- \( X = \) Current performance services of Trans Koetaradja Bus; and
- \( Y = \) The important aspect of the service according to the customers of the Trans Koetaradja Bus.

The formula used are:

\[
 T_{ki} = \frac{X_i}{Y_i} \times 100\%
\]  
(3)

Where:
- \( T_{ki} \) = The level of suitability of respondents;
- \( X_i \) = Score of the performance level of the Trans Koetaradja Bus; and
- \( Y_i \) = Score of the value of customer interests.

The horizontal axis (X) will be filled with the score of the implementation of the performance level. The upright axis (Y) will be filled with the importance level score. The formula is as follow:

\[
 \bar{X} = \frac{\sum X_i}{n}
\]  
(4)

\[
 \bar{Y} = \frac{\sum Y_i}{n}
\]  
(5)

Where:
- \( \bar{X} \) = Average level of implementation/performance;
- \( \bar{Y} \) = Average level of importance score; and
- \( n \) = Number of respondents.
The Cartesian diagram is divided into four sections that are bounded by two lines that intersect perpendicular to the average point X and Y, which is the average score of performance/importance of passenger satisfaction from all factors or attributes. The formulas are as follows:

\[
\bar{X} = \frac{\sum_{i=1}^{N} X_i}{K} \tag{6}
\]

\[
\bar{Y} = \frac{\sum_{i=1}^{N} Y_i}{K} \tag{7}
\]

Where:

\(K\) = The attributes or facts that can affect customer satisfaction.

The final stage is the collaboration of each attribute in the Cartesian diagram as shown in figure 1.

\[\begin{array}{|c|c|c|}
\hline
\text{Interests} & \text{High} & \text{Low} \\
\hline
\text{Y} & \text{High priority} & \text{Tends to be excessive} \\
\text{4} & \text{II/ (A)} & \text{IV/ (D)} \\
\text{3} & \text{Low priority} & \text{IV/ (C)} \\
\text{2} & \text{I/ (B)} & \text{III/ (C)} \\
\text{1} & \text{I/ (A)} & \text{III/ (C)} \\
\hline
\end{array}\]

\[\begin{align*}
\text{X} & = \text{High priority and not satisfied (High priority/increase performance)} \\
\text{Y} & = \text{Very important and very satisfied (Maintain performance)} \\
\text{III} & = \text{Not important and dissatisfied (Low priority)} \\
\text{IV} & = \text{Not important and very satisfied (tends to be overdone)} \\
\end{align*}\]

**Figure 1.** Cartesian diagram.

**Table 3.** Cartesian quadrant [6].

| Quadrant | Interpretation |
|----------|----------------|
| I        | Very important and not satisfied (High priority/increase performance) |
| II       | Very important and very satisfied (Maintain performance) |
| III      | Not important and dissatisfied (Low priority) |
| IV       | Not important and very satisfied (tends to be overdone) |

**3. Results and discussion**

The survey was conducted in the operational area of Trans Koetaradja Bus of Corridor II A and II B, which routes can be seen in the below table.

**Table 4.** Routes.

| Routes          | Street Name                  | Bus Stop | Information |
|-----------------|------------------------------|----------|-------------|
| Airport – City center | Bandara Sultan Iskandar Muda St. | 1       | Permanent   |
|                  | T. Mohammad Daud Beureueh St. | 5       |             |
|                  | Go                           | Return   |             |
3.1. Sample
The samples were collected using kouto sampling for three days, which can be seen in the below table.

| Sub-District         | Kouto Sampling | in Bus Stop | in Bus | Sample |
|----------------------|----------------|-------------|--------|--------|
| Blang Bintang        | 7              | 8           | 15     |
| Ingin Jaya           | 7              | 8           | 15     |
| Darul Imarah         | 7              | 8           | 15     |
| Lueng Bata           | 7              | 8           | 15     |
| Kuta Alam            | 7              | 8           | 15     |
| Kuta Raja            | 7              | 8           | 15     |
| Baiturrahman         | 7              | 8           | 15     |
| Meuraxa              | 7              | 8           | 15     |
| Total                | 56             | 64          | 120    |

Source: Primary Data (2019)

3.2. Respondents questionnaire
120 respondents answered the questions from the questionnaires. The respondents' characteristics can be seen in tables 6, 7, 8 and 9.

| Gender      | Total | %  |
|-------------|-------|----|
| Male        | 48    | 40 |
| Female      | 72    | 60 |
| Total       | 120   | 100|

| Age          | Total | %  |
|--------------|-------|----|
| < 18 Years old | 16    | 13 |
| 19 - 29 Years old | 60    | 50 |
| 30 - 39 Years old | 27    | 23 |
| 40 - 49 Years old | 12    | 10 |
| 50 - 59 Years old | 5     | 4  |
| > 60 Years old | 0     | 0  |
| Total        | 120   | 100|

Source: Primary Data (2019)
### Table 8. Work.

| Work                     | Total | %  |
|--------------------------|-------|----|
| Employees (PNS)          | 18    | 15 |
| Private employees        | 22    | 18 |
| Lecturer/Teacher         | 16    | 14 |
| Entrepreneur/Trader      | 10    | 8  |
| Laborers/Farmers         | 12    | 10 |
| Student                  | 42    | 35 |
| **Total**                | 120   | 100|

### Table 9. Income.

| Income                     | Total | %  |
|----------------------------|-------|----|
| < 1.000.000                | 54    | 45 |
| 1.000.000 - 2.000.000      | 40    | 33 |
| 2.000.000 - 3.000.000      | 20    | 17 |
| > 3.000.000                | 6     | 5  |
| **Total**                  | 120   | 100|

Source: Primary Data (2019)*6,7,8 and 9

### 3.3. Validity and reliability tests

The form of measurement to determine the validity and reliability of data for 120 respondents with a significant amount of 5% in detail can be seen in table 1 of Rtable Distribution. The results of the detail can be seen in table 10, 11, 12 and 13 below.

#### Table 10. SERVQUAL questionnaire indicators.

| No | Item Questions                                                                 | R count of performance | R count of satisfaction | Rtable (df = N - 2) | Information performance | Information satisfaction |
|----|--------------------------------------------------------------------------------|------------------------|-------------------------|----------------------|--------------------------|--------------------------|
| I  | **Reliability**                                                                 |                        |                         |                      |                          |                          |
| 1  | x Timeliness departure of Trans Koetaradja Bus                                  | 0.713                  | 0.116                   | Valid                | Invalid                  |
| 2  | 1 Timeliness arrival of Trans Koetaradja Bus                                   | 0.747                  | 0.596                   | 0.179                | Valid                    | Valid                    |
| 3  | 2 Waiting time for the Trans Koetaradja Bus at the bus stop                     | 0.695                  | 0.596                   | Valid                | Valid                    |
| 4  | 3 Travel time for Trans Koetaradja Bus                                         | 0.757                  | 0.681                   | Valid                | Valid                    |
| 5  | 4 The accuracy of Trans Koetaradja Bus officers in providing information       | 0.757                  | 0.255                   | Valid                | Valid                    |
| 6  | 5 Availability of Trans Koetaradja Bus schedule and route information           | 0.418                  | 0.219                   | Valid                | Valid                    |

#### II Responsiveness
|   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|
| 7 | 6 | The skill / ability of the driver in operating the Trans Koetaradja Bus | 0.713 | 0.402 | 0.179 | Valid | Valid |
| 8 | 7 | Driver discipline (driver's obedience to traffic regulations) | 0.401 | 0.402 | 0.179 | Valid | Valid |
| 9 | 8 | The Trans Koetaradja Bus operator assistance to the passengers | 0.713 | 0.596 | Valid | Valid |
| 10 | x | The Trans Koetaradja Bus operator reminds the destination of the stop | 0.031 | 0.377 | Invalid | Valid |
| 11 | 9 | The operator regulates passenger density in the Trans Koetaradja Bus | 0.713 | 0.291 | Valid | Valid |
| 12 | x | Trans Koetaradja Bus Operators provide guidance to customers on the ease of switching routes to other corridors | 0.058 | 0.130 | Invalid | Invalid |

### III Assurance

|   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|
| 13 | 10 | Passenger safety/security while inside the Trans Koetaradja Bus | 0.757 | 0.681 | 0.179 | Valid | Valid |
| 14 | 11 | Safety/security for Trans Koetaraja Bus passengers when they stop at the bus stop | 0.205 | 0.402 | Valid | Valid |
| 15 | 12 | Security in Trans Koetaradja Bus and at the stops | 0.401 | 0.681 | Valid | Valid |
| 16 | 13 | Comfort in Trans Koetaradja Bus or at stops | 0.713 | 0.402 | Valid | Valid |

### IV Emphaty

|   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|
| 17 | 14 | Good service from the driver (friendly, polite and caring) while user inside the Trans Koetaradja Bus | 0.695 | 0.413 | 0.179 | Valid | Valid |

### V Tangible

|   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|
| 18 | 15 | Available seating is decent | 0.757 | 0.413 | 0.179 | Valid | Valid |
| 19 | 16 | Trans Koetaradja Bus Feasibility (color, glass and door) | 0.401 | 0.681 | Valid | Valid |
| 20 | x | The availability of security facilities such as Light Fire Extinguisher (APAR) and CCTV | 0.334 | 0.095 | Valid | Invalid |
| 21 | 17 | Additional convenience facilities are provided such as AC or WiFi | 0.205 | 0.402 | Valid | Valid |

### Condition of Trans Koetaradja Bus Stop

|   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|
| 22 | 18 | Bus stops that are currently available are easy to reach | 0.195 | 0.681 | 0.179 | Valid | Valid |
| 23 | 19 | Availability of a waiting room with a decent number of seats | 0.205 | 0.314 | Valid | Valid |
Community perception of service level

The results of the research on community perceptions of the level of public transport services are carried out by the SURVQUAL approach, along with the results of the questionnaire distribution recapitulation, which can be seen in the below table.

Table 13. Perception of Trans Koetaradja's BRT public service level.

| Item         | Current Service performance (X) | Service Interest importance (Y) | Suitability Level (%) |
|--------------|---------------------------------|---------------------------------|-----------------------|
| Reliability  | 3.60                            | 3.62                            | 100.27                |
| Responsiveness| 3.32                            | 3.70                            | 89.79                 |
| Assurance    | 3.64                            | 3.33                            | 109.37                |
| Empathy      | 3.28                            | 4.38                            | 74.90                 |
| Tangible     | 3.81                            | 4.18                            | 92.08                 |
| **rata-rata**| **3.58**                        | **3.84**                        | **94.52**             |

Source: Primary Data (2019)
Based on table 14, the average value of the level of suitability is in the range of values 90-100 which is 94.52%, so that it can be concluded as a whole that these attributes fall into the "satisfied" category.

3.5. Cartesian diagram

The diagram shows that the distribution of question items about the Trans Koetaradja Bus for Corridors II A and II B. The average value of services from community perceptions about the level of performance and the importance of customer expectations can be seen in the cartesian diagram in figure 2.

![Figure 2. Results of the cartesian diagram.](image)

![Figure 3. Results of the cartesian diagram.](image)

(1) Quadrant I(B): The question items of number 1, 2, 8 and 15 for service elements that are considered very important, but the management has not implemented the interests of customer desires.

(2) Quadrant II(D): The question items of number 4, 12, 17 and 18 which constitute the main service elements that have been successfully carried out by companies.

(3) Quadrant III(C): The question items of number 6, 9, 12, 13, 16, 19 and 20 are not important for customers, but the implementation is classified as mediocre, considered to be less important and less satisfying.

(4) Quadrant IV(D): The question items of number 3, 5, 7, and 10 that were factors that considered as less important, but the implementation tends to be excessive.

4. Conclusion

Based on the results of the study, it was found that the public assessed that the current performance service on Trans Koetaradja Bus public transportation was considered good at 3.54. The community
assesses that service interests for the expectation of Trans Koetaradja Bus Public Transport services to customers are valued highly rated at 3.84 with the quality of services provided to customers on Trans Koetaradja Bus public transportation being satisfied meeting expectations of 94.52%. But there are some things that there are still deficiencies that need to be considered to improve performance for the better, on the punctuality of arrival, waiting time at the bus stop, the operator helps passengers and available seats, becoming a very satisfying service of hope.

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