Evaluation of Service Quality of Public Transportation (Study Case of Trans Padang)

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Abstract. The quality of a service affects user satisfaction. The quality can be assessed based on the user's perception. Paying attention to quality is important for any organization to survive and win the competition. The quality of a service can be defined as the gap between perception and expectations of a service. Perception is based on how customers perceived service based on services provided. Expectations are based on customer interest. This paper present service quality of Trans Padang, a transportation industry perceived by customer. We measure the level of quality using Fuzzy Servqual dan IPA Method. The aim is to find out the indicators that need to be improved for better service quality. The results show some aspects of service quality fall below customer expectations. We found the gaps of 12 indicators are negative. This indicate that the management need to pay serious attention in these areas to improve the service quality.

1. Introduction
Quality is as a term to express a level of customer satisfaction. It can be explained by examining certain indicators of products or services quality [1]. In many organizations, attention on aspects of quality has become so important since this will direct or indirectly affect customer loyalty or customer satisfaction. [2]. The level of service or product quality is measured by assessing user's perception [3]. The perceived quality experienced by customers during the process or after receiving the service can be assessed. Evaluation of gaps between quality perceived and what is expected by the customers leads to an understanding to find a way to improve the service quality. This is even more important in a highly competitive environment. In other to win the competition an organization must be able to expand its ability in delivering the best quality of service delivered to its existing customers [4]. Building competitive advantage can be managed by eliminating or reducing the gap between customers expectations and perceptions. [5]. Once achieved, it can promise great success for that organization [6]. Customer’s preference and judgments in many cases are difficult to be measured and estimated quantitatively. It is hard to express these variables in term of numerical values [7]. The reason is that we cannot fully retrieve the whole information about one’s preference leading to uncertainties. The perception, judgements are intangible in nature, so that, a careful and systematic approach is required to understand this problem [8].

Even though measuring the perceived service quality is not an easy task, we must realize that improving the quality needs to follow this stage. This also applicable in providing a better service in transportation industry, such as Trans Padang. This paper aims to measure the quality of mass transportation services, Trans Padang. We collect data through questionnaire. Data will be processed.
using fuzzy servqual. We use IPA method to explore service quality indicators, conduct the assessment for each indicator then analyze the result to obtain priority for improvements.

2. Literature Review

2.1. Service Quality

There are ten factors that can affect the existence of gaps between service expectation and service perception, namely [9]:

- Products quality
- Reliability, a variable that express the conformity of performance and persistence in providing service
- Responsiveness
- Competence, the capability to deliver the service, including adequacy of skills and knowledge
- Access, providing convenient access for service facility.
- Courtesy
- Communication, providing information to the customers
- Credibility, put the customers first
- Security, save from any type of danger
- Understanding the customer
- Tangible, an existence of physical evidence, facility for service

These dimensions of service quality are sometimes can be simplified into 5 dimensions [10-11]:

- Products quality
- Tangible
  Something that can be observed physically, including equipments, appearance of personnel and facilities.
- Responsiveness
  The ability of staff to provide service willingly, and give the best service
- Reliability
  Ability in performing service accurately and dependably
- Assurance
  Ability to provide customers with high confidence, with appropriate skills and knowledge
- Empathy
  Ability to provide best attention to the customers individually, put the customer first

2.2. Measuring Service Quality

Measuring the services quality is different with measure the product quality. This is because the product can be seen in the case while the service is not. One way of measuring the service quality is by using a gap analysis. Five of these gaps are [12]:

- Gap – 1
  The gap between customer vs what is expected by management
- Gap – 2
  The gap between organization perception vs what is specified in quality specifications
- Gap – 3
  The gap between service quality specification vs quality of service delivered
• Gap – 4
  The gap between delivery of service vs external communication
• Gap – 5
  The gap between Expected service vs customers perceived quality.

3. Methodology
In order to answer the research question, we apply fuzzy servqual and IPA method are used to measure service quality and determine quality improvement priorities for better quality.

3.1. Questionnaire Design
The questionnaire was designed using five dimensions as presented in section 2 of this paper. They are dimensions of tangible, variables related to reliability, then, responsiveness, empathy, and assurance [13-16]. For the basis of questionnaire, we use The Servqual as our main framework (Table 1).

| No | Statements                                                                 |
|----|---------------------------------------------------------------------------|
| 1  | Availability of seating in the bus stop                                  |
| 2  | Sufficient lighting at the bus stop at night                             |
| 3  | Protection of prospective passengers from hot and rainy weather          |
| 4  | A cooler at the bus stop is available                                    |
| 5  | Easy to access the bus stop                                             |
| 6  | Bus stop area are clean                                                  |
| 7  | Ticket availability                                                      |
| 8  | Comfort on the bus                                                       |
| 9  | A cooler on the bus is available                                         |
| 10 | Availability of seating and comfort on the bus                           |
| 11 | P3K equipment on the bus is available                                    |
| 12 | Facilities used to save themselves in an emergency are available         |
| 13 | Cleanliness on the bus                                                   |
| 14 | Audio or television in the bus are complete                              |
| 15 | Bus capacity does not exceed the permitted capacity                      |
| 16 | The number of buses operating is sufficient                              |
| 17 | Bus physical condition is good                                           |
| 18 | Neat uniformed officers                                                  |
| 19 | Bus attendant's identity is clear                                        |
| 20 | Availability of standing space on the bus                                |
| 21 | Bus Stop is easy to reach                                                |
| 22 | Timetable and routes available                                           |
| 23 | Trans Padang reduces the use of other vehicles                           |
| 24 | Payment Method (Electronic Money)                                        |
| 25 | The number of bus stops is sufficient                                    |
| 26 | Bus driver professionalism                                               |
| 27 | Bus on time                                                              |
| 28 | Bus operating time according to passenger needs                          |
| 29 | Bus lanes according to passenger needs                                   |
| 30 | Travel time on time                                                      |
| 31 | Affordable bus fare                                                      |
| 32 | The bus does not stop waiting for passengers                             |
Respondents usually judge a service quality using linguistic variables. This linguistic language will be designed using fuzzy. Then, linguistic variables will be converted become fuzzy number. One of the fuzzy numbers is the Triangular Fuzzy Number (TFN) which is presented in the Table 2.

### Table 2. Fuzzy Servqual scale

|                     | Expectation Service (How Important the Service) | Perception Service (How Good the Performance Service Received) |
|---------------------|-----------------------------------------------|---------------------------------------------------------------|
|                     | ai    | bi   | Ci    | ai    | bi   | ci    |
| Very Not Important  | 0     | 1    | 2     | 0     | 1    | 2     |
| Not Important       | 1     | 2    | 3     | 1     | 2    | 3     |
| Moderate            | 2     | 3    | 4     | 2     | 3    | 4     |
| Important           | 3     | 4    | 5     | 3     | 4    | 5     |
| Very Important      | 4.5   | 5    | 5     | 4.5   | 5    | 5     |

The sample size is 100 respondents selected through random sampling. The results of the questionnaire were then measured for validity and reliability using IBM SPSS Statistics 23 software.

**3.2 Fuzzy Servqual**

Fuzzy servqual is a fuzzy set theory is used as a means of presenting uncertainty. It is a tool for modeling uncertainties relating to the vagueness, uncertainty and lack of the information relating to a particular element and problems faced [17]. Step-by-step using fuzzy servqual method as follows:

- **The lower limit (a):**
  \[ a_{l} = \frac{a_{i1} \times n_{1} + a_{i2} \times n_{2} + a_{i3} \times n_{3} + \ldots + a_{i(k+1)} \times n_{k}}{n_{1} + n_{2} + n_{3} + \ldots + n_{k}} \]  

- **The middle limit (b):**
  \[ b_{l} = \frac{b_{i1} \times n_{1} + b_{i2} \times n_{2} + b_{i3} \times n_{3} + \ldots + b_{i(k+1)} \times n_{k}}{n_{1} + n_{2} + n_{3} + \ldots + n_{k}} \]  

- **The upper limit (c):**
  \[ c_{l} = \frac{c_{i1} \times n_{1} + c_{i2} \times n_{2} + c_{i3} \times n_{3} + \ldots + c_{i(k+1)} \times n_{k}}{n_{1} + n_{2} + n_{3} + \ldots + n_{k}} \]
• Defuzzification: Use arithmetic mean formulation. The formulation to calculate defuzzification value is: The results in the previous stage are used to calculate a single value. This stage is called defuzzification. There are several types of formulas for obtaining defuzzification values such as center of gravity and arithmetic mean. However, this research uses the arithmetic mean formula which is based on several previous studies relating to service quality. Some of them are [22, 23, 24, 25, 26].

\[
\text{Si} = \frac{a + b + c}{3} \tag{4}
\]

• Calculating the value gap between expectation and hope.

\[
\text{Gap} = \text{Si perception} - \text{Si expectation} \tag{5}
\]

3.3 IPA Method

Important Performance Analysis (IPA) Method is applied in finding out the priority for quality improvement. This method uses a matrix has two axes, namely the x-axis and y-axis. The x-axis represents the customer satisfaction while the y-axis represent customer level of interest [27]. Important Performance Analysis matrix is depicted in Figure 1.

![Figure 1. Important performance analysis (IPA) matrix](image)

Explanation of each quadrant is as follows [28]:

• Quadrant 1 (High Priority)
The area of quadrant 1 contains factors that are important to consumers, but in reality, these factors are not following the expectations of customers. It indicates that customer satisfaction level is still low. This shows us areas for improvement.

• Quadrant 2 (Preserve Achievement)
The area of quadrant 2 contains factors that are considered important for consumers and considered in accordance with perceived consumer. Variable included in this quadrant must be maintained for all the variables to make a superior product or service in the eyes of customers.

• Quadrant 3 (Low Priority)
The area quadrant 3 contains factors that are considered less important by consumers and the performance is not too special. Increased variable included in this quadrant can be considered again for the benefits perceived by consumers is very small.

• Quadrant 4 (Redundant Services)
The area of quadrant 4 contains variables that are classified as less important according to customers, but it considered to be too much. Variable included in this quadrant can be reduced so that companies can save costs.

Stages in the importance-performance analysis method that is [27]:

• Determining the level of concordance between the level of interest and the level of performance attributes are examined by comparing the performance score with a score of interests. The equation to get the level of conformity, namely:
\[ Tki = \left( \frac{x}{y} \right) \times 100\% \] \hspace{1cm} (6)

- Perform analysis quadrant by calculating the average level of importance and performance ratings for each item attributes using the equation:
  \[ \bar{X}_i = \frac{\sum_{i=1}^{k} X_i}{n} \] \hspace{1cm} (7)
  \[ \bar{Y}_i = \frac{\sum_{i=1}^{k} Y_i}{n} \] \hspace{1cm} (8)

- Evaluate the average assessment of significance and overall performance using these equations:
  \[ \bar{\bar{X}}_i = \frac{\sum_{i=1}^{m} \bar{X}_i}{m} \] \hspace{1cm} (9)
  \[ \bar{\bar{Y}}_i = \frac{\sum_{i=1}^{m} \bar{Y}_i}{m} \] \hspace{1cm} (10)

- Having gained weight and importance of performance attributes as well as the average value of the performance and interests, then the values are plotted into a cartesian quadrant.
- Concluded, based on Figure1.

4. Result
This research uses a questionnaire designed from several previous researchs about the service quality in public transportation. This research involved 100 respondents as research sampling. All respondents were Trans Padang passengers. that there are 80 female respondents and 20 male respondents. The Trans Padang customer consists of 47% students and 53% public passengers. To measure the accuracy of the instrument (questionnaire) validity test is performed using IBM SPSS Statistics 23 software. Reliability represents consistency of the results of measurements if they are conducted repeated. This research conducts reliability testing with one test using alpha cronbach method in SPSS program. the questionnaire could be said to be reliable if the Cronbach Alphabet value was greater than 0.7 [29].

4.1. Measure Service Quality
The results of calculations using the fuzzy servqual method can be seen in table 3. Based on our calculations, all indicators of Trans Padang service quality return negative values. This means that all indicators do not satisfy the customers [30]. The difference between the indicator that has the lowest Gap value and the indicator that has the highest Gap value is quite large.

| Code | Perception | Importance | GAP     |
|------|------------|------------|---------|
| TN 1 | 3.050      | 4,102      | -1,052  |
| TN 2 | 3.063      | 4,033      | -0,970  |
| TN 3 | 3.440      | 4,152      | -0,712  |
| TN 5 | 3.063      | 3,865      | -0,802  |
| TN 6 | 2,848      | 4,118      | -1,270  |
| TN 7 | 3,862      | 3,993      | -0,132  |
| TN 8 | 3,290      | 3,883      | -0,593  |
| TN 9 | 3,127      | 3,968      | -0,842  |
| TN 10| 3,295      | 4,065      | -0,770  |
| TN 11| 2,773      | 3,888      | -1,115  |
| TN 12| 3,217      | 3,985      | -0,768  |
| TN 13| 3,300      | 4,052      | -0,752  |
| TN 14| 3,072      | 3,577      | -0,505  |

Table 3. Fuzzy servqual results
Indicators that are priority for improvement are indicators that provide low service to its users while those indicators are considered important by them. The recommendation for improvement of Trans Padang services is determined based on analysis of the results of IPA method. All service parameters that are categorized into quadrant I are those aspects that have higher level of priority for improvement.

Table 4. Summary of service quality indicators in quadrant I

| Codes | Statement                                     | Perception | Importance | GAP  |
|-------|-----------------------------------------------|------------|------------|------|
| TN 1  | Availability of seating in the bus stop       | 3.050      | 4.102      | -1.052 |
| TN 2  | Sufficient lighting at the bus stop at night  | 3.063      | 4.033      | -0.970 |
| TN 6  | Bus stop area are clean                       | 2.848      | 4.118      | -1.270 |
| TN 10 | Availability of seating and comfort on the bus| 3.295      | 4.065      | -0.770 |
| TN 13 | Cleanliness on the bus                        | 3.300      | 4.052      | -0.752 |
Table 4 provide valuable information regarding areas that require improvement according to the customers. There are 12 indicators that need priority improvement. All indicators are in the tangible and reliability dimensions. The top priority is related to cleanliness of bus stop. Customers have high expectation on the cleanliness of the facility with the score of 4.118 (second highest), however the perceived quality rated only 2.848 leads to the largest gap of -1.270. The company can respond this issue by paying more attention on monitoring and assign personnel to maintain the cleanliness. Moreover, conducting campaign of clean habits for the customers is also important to build people awareness that cleanliness is everybody’s responsibility.

The respondents agree that operations of busses with excess capacity is against safety principle. The gap between reality and expectation is quite high (-1.087). The management may respond this issue by implementing close control on the buss operating capacity and apply better discipline to prevent such unpleasant situation. A comprehensive evaluation may be required to assess the overall capacity and study the matching between supply demand as the basis for long term capacity expansion. These results provide a clear direction to the Trans Padang management to plan appropriate actions to improve its service quality.

5. Conclusion
This paper aims to find out the level of quality of Trans Padang services perceived by its customers. The quality was assessed based on user perception and determine service indicators that are priority improvements for better service quality going forward. The results obtained show that all Trans Padang service quality indicators (49 indicators) produce a negative Gap value. This means users are not satisfied with the services provided. Therefore, there is a need for improvement that must be done by Trans Padang. Based on the results of data processing, obtained 12 indicators of service quality which are priority improvements. These 12 indicators are priority improvements because they provide services that are less satisfying to users, while those indicators are considered important by their users. These indicators include eight indicators derived from tangible dimensions and four indicators derived from reliability dimensions.

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