

## Service Quality Analysis of Bus Rapid Transit

A Case in Semarang, Indonesia

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**Abstract**—Public transportation is considered to be able to handle several transportation problems, such as traffic congestion and environmental impacts. However, public transport bus service, especially in the developing countries are facing several problems, such as safety, reliability, and punctuality. In this sense, there is a need to improve the service quality of such service to achieve customer satisfaction. This study aims to assess the service quality of bus rapid transit using the well-known SERVQUAL instrument. The SERVQUAL comprises of five dimensions, i.e., tangibles, reliability, responsiveness, assurance, and empathy. The instrument was used since it provides customers' expectations and perceptions toward the service being offered as understanding those aspects are considered vital to improve the performance of the service. A case study was conducted in Semarang, Indonesia. The results showed that all dimensions need to be improved. Several recommendations to improve the quality of the service are provided as it can help the service provider to achieve customer satisfaction.

**Keywords**—bus rapid transit; customer satisfaction; service quality; SERVQUAL

### I. INTRODUCTION

Urban productivity is tightly related with the efficiency of its transportation system to move people and freight between multiple origins and destinations. However, this efficiency could be reduced by several problems, such as traffic congestion, long commutes, and urban freight distribution. Public transportation is considered as one of effective solutions to some of those problems. It also could give economic, social, as well as environmental benefits [1], [2]. In addition, public transportation can also satisfy the mobility needs of the poor or those who do not have private vehicles. Therefore, it can provide a valid alternative to the private vehicle as a major transportation mode.

Public transportation, particularly bus service, however, in the developing countries, are facing some challenges, including safety, service, and reliability concerns [3], [4]. This means of transportation, thus, needs some imperative improvement so that it could reduce people's dependency on their private vehicles that have been proven to have negative impacts on the environment. Consequently, a good quality of public transportation system must be established. If the

quality is lesser, private vehicles drivers will be more unwilling to shift modes, resulting more congestion.

Service quality is a central concern for public transport users, transport operators, and transport authorities [5]. This service quality has to be continuously improved as it is a vital aspect for the success of the service provider due to its close connection with customer satisfaction [6], [7]. Like any other public services, public transportation has to meet the expectations and needs of the community [8]. Evaluation of public transportation must be established to provide such information: service quality attributes, customer perception, and customer expectation that can be used by transportation authorities to improve the service [9], [10]. Therefore, to be able to provide the best quality of service for the customers, there is the need to explore their perceptions and expectations.

This research attempted to assess the service quality of bus rapid transit (BRT)—it is also called busway or transitway. It is a bus-based public transport system designed to improve capacity and reliability relative to a conventional bus system where it utilizes special and exclusive channels. The SERVQUAL instrument [11] was used to accomplish this objective. The SERVQUAL is preferred in this study because of its ability to measure expectations and perceptions of the customers, as well as it is found easily to be interpreted and implemented in a practical way [12].

A case study was conducted in Semarang, a capital city of Central Java Province, Indonesia. This research can be used to evaluate and display the service performance, to connect the service provider's achievements and difficulties that are faced, as well as to improve the service quality standards. The results could provide such valuable directions for future plans, such as transit line planning and financing.

### II. RESEARCH DESIGN

The objective of this study is to assess and analyze service quality of the BRT in Semarang. One of the well-known service quality frameworks is the gaps model. It identifies five gaps that may cause customers to experience poor service quality (see [13] for the detail explanation of the five gaps). In this study, only Gap 5, i.e., service quality gap, was assessed since it is on the customer's side (the other gaps are on the service provider's side).

The service quality then was assessed using the SERVQUAL instrument [11]. The instrument is widely applied by numerous studies to assess service quality in several fields (e.g., [14]–[16]). It constitutes of two parts, i.e., perceptions and expectations of the customers (or the passengers). Specifically, for each attribute, an  $SQ$  score represents perceived quality (it is the service quality). It can be calculated as  $SQ = P - E$ , where  $P$  and  $E$  are the average scores on the corresponding perception and expectation statements respectively. Note that all attributes were measured on a 5-point Likert scale, ranging from 1 which is indicated strongly disagree to 5 for strongly agree. When customers' expectations are greater than their perceptions, the service quality is deemed low. Conversely, when perceptions exceed expectations then the service quality is high.

The SERVQUAL instrument comprises of five dimensions, i.e., tangibles (T), reliability (RL), responsiveness (RS), assurance (A), and empathy (E). The first dimension, i.e., tangibles, is defined as the appearance of physical facilities, equipment, personnel, and communication materials. In this sense, it refers to the physically viable aspects of the staff and buses. This dimension comprises of four attributes, i.e., staff appear neat and smart (T1), buses are accessible by all category of users (T2), buses are spacious, safe, and comfortable (T3), and buses are always clean (T4).

Reliability, which is the second dimension of SERVQUAL, refers to the ability of the service provider to perform the promised service dependably and accurately. There are five attributes that compose this dimension, namely, buses are punctual (RL1), buses never break down during the journey (RL2), bus tickets are easily accessible (RL3), passengers' requests are promptly satisfied (RL4), and buses follow a schedule (RL5).

The third dimension is responsiveness. It is expressed as the willingness of the service provider to help customers, i.e., the passengers, and to provide prompt service. It consists of four attributes; they are: (i) staff provide individualized attention to passengers (RS1), (ii) service availability and changes are communicated in advance (RS2), (iii) services are timely and efficient (RS3), and (iv) staff act promptly and are ever ready to assist passengers (RS4).

The subsequent dimension is assurance, which refers to the knowledge, courtesy, skills, and trust-worthiness of the employees, as well as free from danger, risk, or doubt. It also includes the ability of the employee to convey trust and confidence. This dimension composes of four attributes, i.e., passengers' belongings are secured (A1), staff are always polite (A2), staff have training and knowledge (A3), and staff behavior instils confidence in passengers (A4).

The last dimension is empathy. It means the ease of relationships, good communication, personal attention, and understanding the need of the passengers. It can be observed from five attributes: (i) passengers' interests are prioritized (E1), (ii) bus schedules are convenient (E2), (iii) bus service information is readily available and accessible (E3), (iv) staff are always on hand to serve passengers (E4), and ticket office and other facilities are easily accessible (E5).

### III. CASE STUDY: RESULT AND DISCUSSION

A case study was conducted to assess the service quality of BRT in Semarang, Indonesia, using the SERVQUAL instrument. The BRT in Semarang which is managed by “*Badan Layanan Umum Trans Semarang*”, is mainly operated as a way of cost-effectively expanding public transit services to help relieve traffic congestion. It has seven corridors that run every day, from 05.30 a.m. on weekdays and 05.45 a.m. on weekends and holidays, to around 05.45 p.m. (vary from corridor to corridor). The operation of BRT which is expected to increase the use of public transportation was got fewer public interests; as there are some problems in its operation, such as low service level, poor time schedule, bad conditions of facilities and infrastructure, as well as some problems in human resources [17].

A questionnaire-based survey was conducted to accomplish the objective of the study. The questionnaire consists of three parts. The first part aims to collect demographic data of the respondents, such as age, gender, and occupation. The second and the third parts consist of expectation and perception statements according to 22 attributes of the SERVQUAL instrument. The words such as “should”, “be expected”, and “have to” are attached in the expectation statement. The sample statement could be “the staff should be polite to all passengers”. On the other hand, the sample perception statement would be “the staff of BRT are always polite to all passengers.”

The participants of the survey were required to have experience in traveling by the object of the research. Three hundred and one respondents were participated in this survey. However, one data had to be taken out due to incomplete submission, resulting in three hundred valid data. The respondents consist of students, employees, entrepreneurs, etc., indicates plenty diversity for the purpose of the research. The respondents' profile is shown in Table 1.

Before analyzing further, the reliability test with Cronbach's alpha [18] was conducted. The data used to calculate the Cronbach's alpha were in the form of difference scores, i.e., the  $SQ$ . The results of coefficient alpha which are computed using IBM Statistics version 21, for each dimension are 0.638, 0.688, 0.674, 0.666, and 0.715 for the dimension of tangibles, reliability, responsiveness, assurance, and empathy, respectively. Note that all of the dimensions have the value of Cronbach's alpha more than 0.6, indicating that the questionnaire being utilized is reliable [19].

The questionnaire was then processed to calculate the value of  $SQ$  for each indicator. The average values are then computed by summing all the  $SQ$  values throughout all respondents and then dividing it by the number of respondents. The results for each dimension and attribute are shown in Table 2 and Fig. 1. Unfortunately, the values for each dimension and indicator are negative. It means that the respondents are still not satisfied with the services they perceived. Efforts to improve service quality are needed to improve customer satisfaction. The following is an analysis for each dimension along with the recommended improvement suggestions.

TABLE I. PROFILE OF THE RESPONDENTS

Socio-demographic Variable	Percentage
Gender:	
Male	32.67%
Female	67.33%
Age:	
< 17 years	1.67%
17 – 30 years	98.00%
> 30 years	0.33%
Frequency of using the service:	
Every day	5.00%
Once a week	10.00%
More than once a week	8.67%
Once a month	27.67%
Three times a month	16.00%
Six times a month	14.67%
Once a year	18.00%

TABLE II. SERVQUAL RESULT

Dimensions/ Attributes	Perception		Expectation		Gaps
	Mean	Standard Deviation	Mean	Standard Deviation	
Tangibles:	3.976	0.655	4.651	1.019	-0.675
T1	4.124	0.856	4.676	0.542	-0.552
T2	4.007	1.020	4.652	0.737	-0.645
T3	3.659	1.051	4.522	0.697	-0.863
T4	3.712	1.058	4.756	0.577	-1.044
Reliability:	3.682	0.831	4.396	0.991	-0.715
RL1	3.528	1.021	4.605	0.669	-1.077
RL2	3.612	1.113	4.375	0.916	-0.763
RL3	4.214	0.778	4.555	0.723	-0.341
RL4	3.425	0.850	3.860	0.871	-0.435
RL5	3.629	0.959	4.589	0.691	-0.960
Responsive- ness:	3.476	0.902	4.216	1.022	-0.740
RS1	3.294	0.966	3.425	0.998	-0.131
RS2	3.130	1.093	4.498	0.711	-1.368
RS3	3.689	0.920	4.498	0.771	-0.809
RS4	3.883	0.873	4.542	0.676	-0.659
Assurance:	3.642	0.731	4.468	0.917	-0.826
A1	3.314	1.011	4.301	0.779	-0.987
A2	4.020	0.759	4.488	0.779	-0.468
A3	3.622	0.864	4.532	0.630	-0.910
A4	3.612	0.880	4.552	0.697	-0.940
Empathy:	3.733	0.725	4.497	0.896	-0.764
E1	3.462	0.832	4.344	0.745	-0.882
E2	3.535	0.949	4.488	0.779	-0.953
E3	3.870	0.790	4.565	0.664	-0.695
E4	3.886	0.867	4.515	0.711	-0.629
E5	3.910	0.935	4.575	0.653	-0.665

The tangibles dimension is a dimension that describes the physical appearance of a service. In this research, customers' expectation for this dimension was very high. (The average value is 4.651.) However, in reality, their expectations are not realized. Many customers complain about the cleanliness and comfortless of the bus, as well as the appearance of the staff, resulting the average value of perception with only 3.976. Therefore, the gap was negative, i.e., -0.775. The following are recommended improvement to be made:

- The company should pay attention to the cleanliness of the bus and other equipment, such as chairs and handrails so that the customers would feel comfortable.

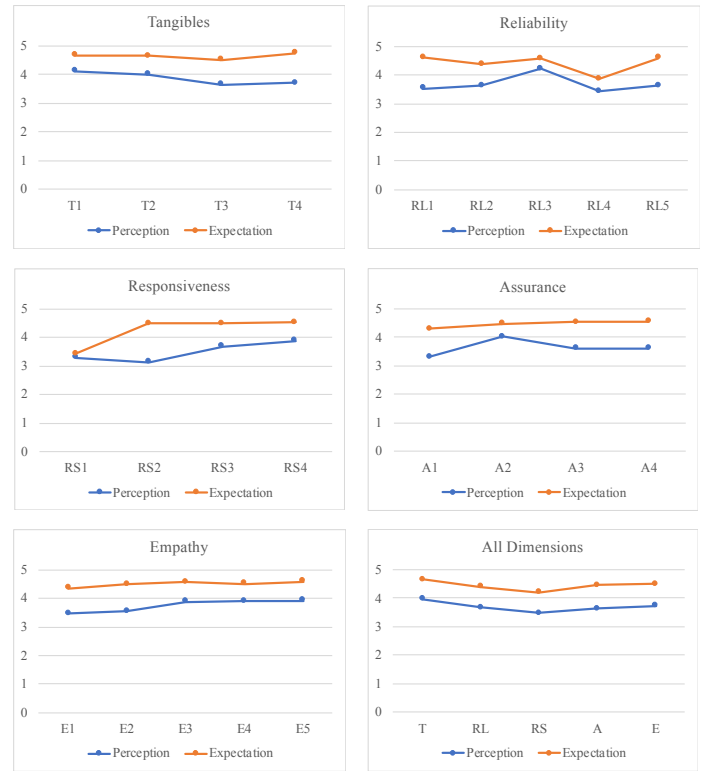


Figure 1. Graphs of the SERVQUAL result

- The company also should educate the customers by providing flyers or reading materials so that they can keep the cleanliness that the company has provided.
- The staff should pay attention to their appearance, i.e., to look better.

A service provider is considered reliable when it is able to provide service in accordance with what it has been promised to the customers immediately, accurately, and satisfactorily. The average value of the expectation part for this dimension is 4.397. However, the customers do not feel to be served as what they expect. Some examples to be mentioned here are: the arrival of a bus is often not in accordance with the schedule, i.e., it does not arrive on time, and sometimes some buses are break down during the journey. As a consequence, the average value for the perception part is only 3.682; resulting the gap is also negative, i.e., -0.715. Due to this negative value, the firm needs to make some improvements as following.

- Investing in a technological innovation that can detect where the location of the bus so that customers can estimate when the bus would arrive.
- The company should regularly check the condition of the bus.

The next dimension is responsiveness. The average value of the expectations of the customers in this dimension is 4.216; yet again, the reality that the customers feel is not as what they expect. Several non-responsiveness examples are there is no announcement when there are changes in service as well as some activities of the staff that are less efficient

while they were serving the customers. Therefore, the customers only give a low value in the perception part (the average value is 3.476). The gap obtained is -0.740. The followings are recommended improvement to be made:

- The company should provide training for the staff about how to deal with problems quickly and precisely.
- Providing rewards and punishments so that the staff would remain enthusiastic in carrying out their jobs.
- Listening to and dealing with the customers who have complaints.

The assurance dimension can be defined as a guarantee of knowledge, attitudes, courtesy, as well as the ability of employees to foster a customer's trust in the company. Customers' expectations for this dimension are very high, which the average value is 4.469. Unfortunately, the reality that the customers feel is not like what they hope to be fulfilled. There are many complaints coming from the customers, such as: there is no guaranteed security for the customers' luggage, the skills of the staff are inadequate, and the staff has less knowledge about their jobs. Therefore, the customers give the average value of 3.642. The gap obtained based on the average value of expectation and perception is also negative. The followings are remedial efforts that are suggested to be pursued by the company:

- The company should conduct periodic evaluations and briefings for the staff who deal directly with the customers.
- CCTV must be installed on every bus and bus stop.

The last dimension is empathy, that can be defined as the ease of establishing relationships, good communication, and the ability to provide attention and personal needs to the customers. Customer's expectations for this dimension are very high, which the average value is 4.497. It indicates that the customers expect the company to provide personalized services. However, what is felt by the customers turns out to be not in line with their expectations. Many customers still complain for several reasons, for instance, their needs are not a priority for the company and the bus schedule sometimes is not appropriate for all passengers. Therefore, the customers give the average value for the perception part of 3.733. The gaps obtained is also negative, i.e., -0.764. The followings are efforts that can be performed by the company to improve the performance especially according to the empathy dimension.

- The company should conduct periodic briefings to all employees so that they have a proper knowledge about how to treat the customers.
- The training to increase employee's communication skills as well as information delivery must be provided.

#### IV. CONCLUSION & FUTURE RESEARCH DIRECTION

This paper has demonstrated to assess the service quality of bus rapid transit using the SERVQUAL instrument. A case study was conducted in Semarang, a capital city of Central Java Province, Indonesia. The SERVQUAL that consists of five dimensions and twenty-two attributes

measures the perception and expectation of the customers being served by the service provider. It has been found that it could provide a relatively simple and inexpensive means of doing service quality assessment.

The results show that the assessment has many potential advantages for the service provider. Identifying customers' perceptions toward the performance of service quality for a particular attribute (and dimension) could allow the management to better adapt its marketing efforts and to confirm that the expectations of the customers are met. This includes identifying, prioritizing, and improving areas of service's weaknesses to ensure that the valuable resources are allocated in the most effective areas. In addition, promotional messages can be refined so that the customers have realistic expectations of the service offered. (Suggestions are offered in Section 3.)

It is suggested for the future research to combine the instrument with the importance-performance analysis (IPA) model [20]. The inclusion of IPA model is based on the fact that every firm is constrained by limited resources. As a result, it has to be well decided how those limited resources are best utilized to achieve the highest level of customer satisfaction. This IPA model is considered as an effective method to set the company's priorities. It can be used to prioritize the service attributes based on the importance and the performance. Although the model was introduced more than thirty years ago, it is still popular to be applied nowadays due to its simplicity as well as easy to use and be interpreted; see [21]–[24] for the applications of this model.

#### REFERENCES

- [1] S. T. E. G. Linda, "Can public transport compete with the private car?" *IATSS Research*, vol. 27, no. 2, pp. 27-35, 2003.
- [2] D. T. Le-Klähn, C. M. Hall, and R. Gerike, "Analysis of visitor satisfaction with public transport in Munich," *Journal of Public Transportation*, vol. 17, no. 3, pp. 68-85, 2014.
- [3] R. Iles, *Public Transport in Developing Countries (Vol. 478)*, Amsterdam: Elsevier, 2005.
- [4] B. J. Simpson and B. Simpson, *Urban Public Transport Today*. Routledge, 2003.
- [5] V. Aguilera, S. Allio, V. Benezech, F. Combes, and C. Miliou, "Using cell phone data to measure quality of service and passenger flows of Paris transit system," *Transportation Research Part C: Emerging Technologies*, vol. 43, pp. 198-211, 2014.
- [6] G. R. Gilbert and C. Veloutsou, "A cross-industry comparison of customer satisfaction," *Journal of Services Marketing*, vol. 20, no. 5, pp. 298-308, 2006.
- [7] I. H. S. Chow, V. P. Lau, T. W. C. Lo, Z. Sha, and H. Yun, "Service quality in restaurant operations in China: Decision-and experiential-oriented perspectives," *International Journal of Hospitality Management*, vol. 26, no. 3, pp. 698-710, 2007.
- [8] F. Fonseca, S. S. Pinto, and C. Brito, "Service quality in public transportation services – aligning the operations perspective with customer expectations," *Proc. 17th International EurOMA Conference*, Porto, 2010.
- [9] M. R. Islam, M. Hadiuzzaman, R. Banik, M. M. Hasnat, S. R. Musabbir, and S. Hossain, "Bus service quality prediction and attribute ranking: A neural network approach," *Public Transport*, vol. 8, no. 2, pp. 295-313, 2016.

- [10] K. J. Krizek and A. El-Geneidy, "Segmenting preferences and habits of transit users and non-users," *Journal of Public Transportation*, vol. 10, no. 3, pp. 71-94, 2007.
- [11] A. Parasuraman, V. A. Zeithaml, and L. L. Berry, "SERVQUAL: A multiple-item scale for measuring consumer perceptions of service quality," *Journal of Retailing*, vol. 64, no. 1, pp. 12-40, 1988.
- [12] B. Barabino, E. Deiana, and P. Tilocca, "Measuring service quality in urban bus transport: a modified SERVQUAL approach," *International Journal of Quality and Service Sciences*, vol. 4, no. 3, pp. 238-252, 2012.
- [13] A. Parasuraman, V. A. Zeithaml, and L. L. Berry, "A conceptual model of service quality and its implications for future research," *Journal of Marketing*, vol. 49, no. 4, pp. 41-50, 1985.
- [14] R. B. Galeeva, "SERVQUAL application and adaptation for educational service quality assessments in Russian higher education," *Quality Assurance in Education*, vol. 24, no. 3, pp. 329-348, 2016.
- [15] M. Kumar, F. Tat Kee, and A. Taap Manshor, "Determining the relative importance of critical factors in delivering service quality of banks: An application of dominance analysis in SERVQUAL model," *Managing Service Quality: An International Journal*, vol. 19, no. 2, pp. 211-228, 2009.
- [16] M. Chand, "Measuring the service quality of Indian tourism destinations: an application of SERVQUAL model," *International Journal of Services Technology and Management*, vol. 13, no. 3-4, pp. 218-233, 2010.
- [17] D. I. K. Dewi, A. R. Rakhmatulloh, and P. Anggraini, "Mapping between bus rapid transit shelter and high school location in Semarang," *IOP Conference Series: Earth and Environmental Science*, vol. 123, no. 1, p. 012013, 2018.
- [18] L. J. Cronbach, "Coefficient alpha and the internal structure of tests," *Psychometrika*, vol. 16, no. 3, pp. 297-334, 1951.
- [19] J. Nagpal, A. Kumar, S. Kakar, and A. Bhartia, "The development of 'Quality of Life Instrument for Indian Diabetes patients (QOLID): a validation and reliability study in middle and higher income groups," *J. Assoc. Physicians India*, vol. 58, pp. 295-304, 2010.
- [20] J. A. Martilla and J. C. James, "Importance-performance analysis," *Journal of Marketing*, vol. 41, no. 1, pp. 77-70, 1977.
- [21] R. Dabestani, A. Shahin, M. Saljoughian, and H. Shirouyehzad, "Importance-performance analysis of service quality dimensions for the customer groups segmented by DEA," *International Journal of Quality & Reliability Management*, vol. 33, no. 2, pp. 160-177, 2016.
- [22] D. R. Rasyida, M. M. Ulkhaq, P. R. Setiowati, and N. A. Setyorini, "Assessing service quality: A combination of SERVPERF and importance-performance analysis," *2016 3rd International Conference on Industrial Engineering and Applications (ICIEA)*, Hong Kong, 2016, pp. 06003, doi: 10.1051/mateconf/20166806003.
- [23] M. M. Ulkhaq, W. R. Wijayanti, A. Kusumawati, F. S. Aulia, R. S. Wijayanti, and R. Wiganingrum, "Combining the eTransQual scale and importance-performance analysis to assess service quality of online shopping," *2017 4th International Conference on Industrial Engineering and Applications (ICIEA)*, Nagoya, 2017, pp. 146-150, doi: 10.1109/IEA.2017.7939196.
- [24] S. N. W. Pramono, M. M. Ulkhaq, R. Trianto, D. R. Rasyida, N. A. Setyorini, P. R. Setiowati, and W. A. Jauhari, "Integrating the analytic hierarchy process and importance-performance analysis into ISO 14001 framework for assessing campus sustainability," *2017 3rd International Materials, Industrial and Manufacturing Engineering Conference (IMIMEC)*, Miri, 2017, pp. 020035, doi: 10.1063/1.5010652.