



## Effectiveness of Trans Jateng Bus Rapid Transit (BRT) services for customers with disabilities in Surakarta city

Yunita Primasanti<sup>1</sup>, Erna Indriastiningsih<sup>2</sup>, Darsini<sup>3</sup>

<sup>1,2</sup> Industrial Engineering, Universitas Sahid Surakarta, Surakarta, Indonesia,

<sup>3</sup> Industrial Engineering, Universitas Bangun Veteran, Sukoharjo, Indonesia,

email : [yunitaprimasanti@usahidsolo.ac.id](mailto:yunitaprimasanti@usahidsolo.ac.id) , [darsini@gmail.com](mailto:darsini@gmail.com)

**Abstract.** *BRT Trans Jateng is a government mode of transportation that cannot be separated from the principle of good and quality public services for customers with disabilities. The aim of this research is to measure the effectiveness of Trans Jateng BRT services for customers with disabilities, especially in the city of Surakarta. The design of this research is to use the Fuzzy SERVQUAL method to measure the level of satisfaction of disabled customers with BRT Trans Jateng services. The sampling technique used was purposive sampling using 30 samples of disabled customers in the city of Surakarta. Here it can be seen that all of the five dimensions measured require improvement. Improvements are carried out based on the priority of the largest gap value. From the results of data processing, the first rank is the tangible dimension with a gap value of -2.0167, then the second rank is the empathy dimension with a gap value of -1.9583, the third rank is the responsiveness dimension with a gap value of -1.95, in the fourth rank is the assurance dimension with a gap value of -1.92, and the fifth rank of the reliability dimension with a gap value of -1.89*

**Keywords:** *Disability; Trans Jateng; Transportation; Service*

### 1. INTRODUCTION

As one of the cities with a high level of comfort, Surakarta experiences a very significant population growth rate. The population growth of Surakarta City has increased in the last 2 years. Based on the data generated by BPS Surakarta City, the population growth rate of Surakarta City increased by 0.99 in 2020-2022. The total population of Surakarta City in 2020 is 522,364 and in 2021 is 522,728 and in 2022 is 523,008 (Surakarta City in Figures) (BPS, 2020). The growth of Surakarta City's population causes community activities to increase and become very diverse, resulting in an increase in high community mobility.

High mobility and diverse activities trigger the need for transportation which is a means of mobility between spaces in a region. As one element of the urban transportation system, public transportation plays a very important and strategic role (Robin et al., 2021). The central and local governments began to initiate the provision of mass transportation to reduce the number of private vehicles as a form of sustainable transportation management (Faiq & Ketut, 2021) (Habibullah, 2022). Mass transportation that is widely used in Indonesia is bus transportation or better known as BRT. BRT is designed to be

able to adjust to the intended market so that it can be implemented in various circumstances (Iskandar, 2020). Another definition of BRT is a mode of transportation that refers to the application of rail-based infrastructure to bus systems in the hope of providing high service and small costs (Currie & Delbosc, 2011).

However, as one of the public service facilities, the Trans Jateng transportation system must also pay attention to the principles of justice and non-discrimination as mandated by Law Number 25 of 2009 concerning Public Services (Sangadah et al., 2021). The law states that a public service is said to be good and quality if it fulfills the principles of public interest, legal certainty, equal rights, balance of rights and obligations, professionalism, participation, equality of treatment / non-discrimination, openness, accountability, facilities and special treatment for vulnerable groups, timeliness, speed convenience and affordability (Bazarah et al., 2021).

As a public service provider, Trans Jateng cannot be separated from the principles of good and quality public services (Sebriana, 2021). One of them is by prioritizing justice and providing special treatment to people with disabilities. Because people with disabilities are also included in the category of vulnerable groups, apart from the elderly, children and women.

Syafi'ie argues that difable is an abbreviation of English, namely different ability people or differently abled people. Literally, difable means something different, namely people who are categorized as having different abilities from humans in general (Syafi'ie, 2020). People with disabilities are also known as persons with disabilities, a term listed in Law No. 8/2016 on Persons with Disabilities. The law explains that what is meant by persons with disabilities is every person who experiences physical, intellectual, mental, and / or sensory limitations for a long period of time who in interacting with the environment can experience obstacles and difficulties to participate fully and effectively with other citizens based on equal rights (Allo, 2022) (Farrisqi & Pribadi, 2021).

The benefits of using Trans Jateng so far have not been felt by people with disabilities. Some problems related to the use of Trans Jateng by persons with disabilities can be in the form of bus stops that have not fully provided easy access for people with disabilities, the absence of wheelchairs and special seats for people with disabilities on the bus, or even the ability of Trans Jateng officers who do not comprehensively know and are able to serve users with disabilities properly and correctly.

The interest or interest in the use of Trans Jateng by persons with disabilities is still very minimal. It is rare to find persons with disabilities at bus stops waiting for the arrival of Trans Jateng. Psychologically, it is natural that people with disabilities are embarrassed and even afraid to use public facilities such as Trans Jateng. This fear can be caused by an environment that is not conducive and considered resistant to their existence. It could also be their concern to be able to use the Trans Jateng facilities independently, starting from boarding the bus stop using the ramp to the limitations in knowing the Trans Jateng route. Therefore, in encouraging

Trans Jateng which is friendly to people with disabilities, it is necessary to measure the effectiveness of Trans Jateng BRT services for people with disabilities in order to provide input and develop the concept of Trans Jateng BRT in the future. So that the problem formulations in this study are:

1. How to measure the service quality of Trans Jateng BRT services using the fuzzification Servqual model.
2. Provide recommendations to the Central Java Transportation Agency to improve services, especially to customers with disabilities.

There have been many studies on the Trans Jateng BRT service, one of which was conducted by yunita et al (Primasanti et al., 2021) (Wahhab & Juanita, 2022) (Yulianto et al., 2023) (Sari & Afriandini, 2020). However, research that focuses on measuring the level of satisfaction of Trans Jateng BRT services conducted to customers with disabilities has never been conducted. Therefore, this research is expected to complement the literature and scientific data that discuss customers with disabilities in public services which can then be carried out in the development of sustainable research. The novelty of this research lies in the object of research, namely customers with disabilities who use the Trans Jateng BRT transportation mode. The results of future research are expected to make a scientific contribution and the development of public facilities for the convenience of people with disabilities.

## **2. LITERATURE REVIEW**

Transportation is a system of moving goods or people from one place to another that includes land, sea, air and rail. The main function of transportation is to support mobility and economic, social and cultural activities by providing access to resources, jobs and services. According to Rodrigue (2020), transportation plays an important role in connecting regions and supporting trade, as well as being one of the main pillars of economic development.

There are several main types of transportation:

- Land transportation: includes motorized vehicles such as cars, buses, and trains.
- Sea transportation: uses ships to move between regions or countries.
- Air transportation: relies on aircraft for fast movement between distant regions.
- Railway transportation: provides mass mobility with high efficiency.

Trans Jateng buses are land public transportation. Trans Jateng is a bus rapid transit (BRT) transportation system operating in the Central Java Province area. This program was launched by the provincial government to improve the accessibility of affordable and

convenient public transportation for the community, especially in urban areas and between regions in Central Java.

Trans Jateng was initiated as part of the government's efforts to reduce congestion, air pollution, and dependence on private vehicles. The service connects major cities in Central Java such as Semarang, Purwokerto, and Solo, with affordable fares and subsidies for certain groups of people, including students and workers. The BRT system is designed with strategic stops, environmentally friendly buses, and accessibility facilities for people with disabilities.

According to the World Health Organization (WHO), disability is defined as a limitation of a person's activity or participation due to a physical, mental, intellectual, or sensory impairment that lasts for a long period of time. Disability is not just an individual health problem, but a complex phenomenon that includes interactions between a person and their social environment that hinder full and effective participation in society. (WHO. (2020). *Disability and Health*).

Fuzzy SERVQUAL theory is a combination of fuzzy logic and the SERVQUAL model which is used to measure service quality based on customer perceptions and expectations. The SERVQUAL model was developed by Parasuraman, Zeithaml, & Berry (1988), which consists of five main dimensions: reliability, responsiveness, assurance, empathy, and tangibles. However, in a real environment, it is often difficult to get an exact judgment from customers due to the subjective nature of service perception.

The use of fuzzy logic in the SERVQUAL model helps handle uncertainty and ambiguity in assessing service quality. With this method, customer perception and expectation values can be handled within a range of membership degrees (0 to 1), which allows for a more flexible and accurate assessment. Fuzzy SERVQUAL is suitable for use in situations where customer answers are not unequivocal, such as "quite good" or "somewhat satisfied," thus providing more realistic and informative results for management for service improvement.

### **3. METHODS**

#### **Research model and approach**

This study uses the Servqual method which is a method to determine the criteria that must be improved service satisfaction that occurs between perceptions and expectations. Data collection uses purposive sampling because purposive sampling depends on the availability of relevant individuals in the population group to provide useful data for research. The sample population in this case is people with disabilities who meet the criteria of physical disability (having limitations / impairments of body function) and sensory disability (limited function of

the five senses). The research conducted is quantitative research based on data that can be calculated to produce a strong quantitative assessment. This research uses primary data as the source of research data. The reason for the quantitative research approach that researchers use is because they want to explain the effect of service quality using the dimensions of Tangible, Reliability, Responsiveness, Assurance and Empathy on customer satisfaction with disabilities. This research uses fuzzy theory analysis techniques. The effectiveness of BRT services is measured by the GAP/gap between customer expectations and customer satisfaction. If the results of the assessment of customer perceptions and expectations are positive ( $P > H$ ), then the service provided is said to be very satisfying. If the results of the assessment of perceptions and customer expectations are zero ( $P = H$ ), then the service provided is said to be satisfactory. If the results of the assessment of customer perceptions and expectations are negative ( $P < H$ ), then the service provided is said to be unsatisfactory

### **The course of research**

The research began with a literature study and a survey of disabled customers with research locations in the Solo-Sragen and Solo-Wonogiri corridors. Based on preliminary data, the number of disabled customers in this corridor is the highest compared to other corridors. The questionnaire was tested for validity and reliability using the SPSS Version 21 tool. If the questionnaire was valid and reliable, the questionnaire was distributed to 30 disabled customer respondents. The data processing stage starts from recapitulating the questionnaire data and then conducting a data normality test and multicollinearity test to determine whether the data is normally distributed.

### **Data analysis**

Fuzzy logic theory provides a means for presenting uncertainty and is an excellent tool for modeling uncertainty associated with vagueness. Fuzzy logic provides a simple way to draw definite conclusions from ambiguous, vague, or inaccurate information. In identifying customer perceptions and expectations using linguistic variables such as strongly agree, agree, unsure, disagree and strongly disagree. The nature of the truth contained in these linguistic variables is not firm, therefore fuzzy theory is needed to convert valuable linguistic variables into numerical variables. The stages in fuzzy are as follows:

1. The stage of determining fuzzy sets for linguistic variables and measurement scales.
2. The fuzzyfication stage is the stage for forming triangular fuzzy numbers from the perception value and customer expectation value.
3. The defuzzification stage is the stage to get a single representative value.

In this process, the fuzzyfication value will be confirmed by the defuzzification calculation process and the results of the defuzzification will be input for the assessment of customer perceptions and expectations using the Arithmetic Mean formula. The fuzzyfication calculation process is carried out using the Overall Effectiveness Measure (OEM) formula which produces a lower limit value (a), a middle limit value (b), and an upper limit value (c) for the fuzzy variable, the Overall Effectiveness Measure (OEM) formulation for the fuzzyfication stage is as follows:

$$a. = (aj1 \times nj1) + (aj2 \times nj2) + \dots + (aji \times nji) (aj1 + aj2 + \dots + aji) \dots\dots(1)$$

$$b. = (bj1 \times nj1) + (bj2 \times nj2) + \dots + (bji \times nji) (bj1 + bj2 + \dots + bji) \dots\dots(2)$$

$$c. = (cj1 \times nj1) + (cj2 \times nj2) + \dots + (cji \times nji) (cj1 + cj2 + \dots + cji) \dots\dots(3)$$

**Description:**

a: lower bound fuzzyfication value.

b: center boundary fuzzyfication value.

c: upper bound fuzzyfication value.

n: number of respondents.

i: criteria (1, 2, 3, ..., k).

j: linguistic variable.

**The Arithmetic Mean formula is explained as follows:**

$$\text{defuzzification} = a + b + c \div 3 \dots\dots(4)$$

**Description:**

a: lower bound fuzzification value.

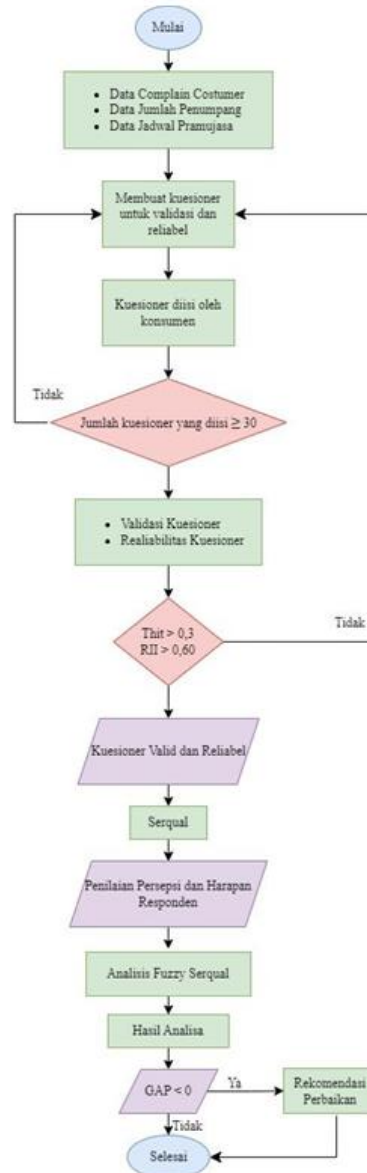
b: middle limit fuzzification value.

c: upper limit fuzzification value.

SERVQUAL is stated by Zeithaml (1990) as “customer assessment of the overall excellence or superiority of a service”. Servqual is defined as how far the difference between reality and customer expectations is obtained. The difference between perceptions and expectations is called the GAP or service satisfaction gap, which is formulated as follows:

$$\text{GAP} = P - H \dots\dots(5)$$

where GAP is the difference between perceived value (P) and customer expectations (H).



Gambar 1. Diagram Alir Penelitian

#### 4. RESULTS

At this point, it discusses the research results and data processing steps using the Fuzzy Servqual method, namely:

##### a. Variable Identification Results

Research variables are obtained based on the services provided by the Trans Jateng BRT crew and access to public services for persons with disabilities for customers who use Trans Jateng BRT services, then grouped based on the five dimensions of Servqual, namely Tangibles, Reliability, Responsiveness, Assurance, and Emphaty.

## Validity and Reliability Test

### a. Validity Test

The purpose of this validity test is to determine the level of accuracy of a questionnaire. In this study, the number of samples taken was 30 respondents. The validity test uses a level of significant 5% and  $N = 30$ . After doing the calculation, the  $r$  table is obtained at 0.361. To determine whether the questionnaire is valid or not, a comparison is made between  $r$  table and  $r$  count. If  $r$  count  $>$   $r$  table then the questionnaire is said to be valid, and vice versa.

### b. Reliability Test

Reliability test is a tool used to measure the consistency of a questionnaire which is an indicator of a variable or construct. Guidelines for measuring data reliability according to Sugiyono, 2010. The results of the reliability test for the perception and expectation questionnaires are as follows:

Tabel 1. Reliability Test

Questionnaire	Alpha Value	Information
Perseption	0,894	Very Strong
Hope	0,652	Strong

Based on Table 1, it can be seen that the alpha value for perception is 0.894, which means that the questionnaire is said to be highly reliable. Likewise for expectations, the alpha value is 0.652 so it is said to be very reliable.

## Defuzzification

The next stage is to calculate the defuzzification value of perceptions and expectations. This defuzzification is done to get a single representative value. The gap value per statement variable is obtained based on the difference between the perception value and the expectation value. This is used to determine the quality of service on BRT Trans Jateng. To see the results of the calculation of the gap value per statement variable, it can be seen in the table below:

In the table it can be seen that the average gap results from perceptions and expectations are negative. From this it can be concluded that BRT Trans Jateng customers are not satisfied with the 15 statement variables. Results of Gap Value Calculation Based on Five Servqual Dimensions From the results of the calculation of the gap between the Servqual dimensions, the gap value and ranking are obtained as follows:



Table 2. Measurement Results

<b>Dimention</b>	<b>Perception</b>	<b>Ekspektation</b>	<b>Gap</b>	<b>Rank</b>
<i>Tangible</i>	0,7361	2,75	-2,0167	1
<i>Emphaty</i>	0,7916	2,75	-1.9583	2
<i>Responsiveness</i>	0,8	2,75	-1.95	3
<i>Assurance</i>	0,825	2,75	-1.92	4
<i>Reability</i>	0,852	2,75	-1.89	5

## 5. DISCUSSION

After processing the data on each dimension, the table above shows that all dimensions have negative values. Here it can be seen that the five dimensions measured all require improvement. Improvements are made based on the priority of the largest gap value. From the results of data processing, the first rank is the tangible dimension with a gap value of -2.0167, then the second rank is the empathy dimension with a gap value of -1.9583, the third rank is the responsiveness dimension with a gap value of -1.95, in the fourth rank is the assurance dimension with a gap value of -1.92, and in the fifth rank is the reliability dimension with a gap value of -1.89. From this data it can be concluded that all dimensions have not met the expectations of Trans Jateng BRT customers with disabilities. Thus the dimensions that are prioritized for improvement are tangible dimensions.

## 6. CONCLUSION

Based on the results of the research conducted, the conclusion is, based on the measurement of the five dimensions of service quality, it is found that all dimensions have negative values. Thus, what is expected by customers with disabilities who use Trans Jateng BRT services is not in accordance with the reality received. In the five Servqual dimensions, the highest gap value is the tangible dimension with a value of -2.0167 and the lowest gap value is the reliability dimension with a value of -1.89.

From these results, the tangible dimension is a concern for the Trans Jateng BRT crew to further improve its service quality. From the gap value of various dimensions, a negative value is generated, from this it can be concluded that the statement variable has not reached the level of satisfaction of Trans Jateng BRT customers, especially for people with disabilities. The largest gap value is in the tangible dimension, which means that BRT Trans Jateng must

immediately make improvements, especially in the provision of public infrastructure for disabilities such as the availability of lanes to the bus for wheelchair users, the availability of complete signs both at stops and inside the bus and so on.

The next dimension that requires improvement is the empathy dimension where the service from the service staff or crew of the bus is still minimal for bus users, especially for people with disabilities so that special service training needs to be carried out for bus users with disabilities.

Suggestions for further research include the need to convert between the fuzzy servqual method and other servqual methods so that better results can be obtained and further researchers can find the advantages and disadvantages of each method used.

## **7. LIMITATION**

This study has limitations that need to be considered, as well as being a consideration for further research. The next dimension that requires improvement is the empathy dimension, where the service of the service personnel or crew of the bus is still minimal for bus users, especially for people with disabilities so that special service training needs to be carried out for bus users with disabilities. Suggestions for further research include the need to convert between the fuzzy servqual method and other servqual methods so that better results can be obtained and further researchers can find the advantages and disadvantages of each method used.

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