



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 12, Issue 1, January 2023

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.118

9940 572 462

6381 907 438

ijirset@gmail.com

www.ijirset.com

Level of Service Teman Bus for Implementation of Smart Mobility in Makassar City, Indonesia

Rais Rachman¹, Alpius²

Associate Professor, Department of Civil Engineering, Universitas Kristen Indonesia Paulus, Makassar, Indonesia^{1,2}

ABSTRACT: Quality of service, customer satisfaction, and level of service are critical considerations for managers and owners of transportation companies in order for their operations to "survive" and develop. The research aims to analyze the service quality index, passenger satisfaction index and service level. The method used is Importance-Performance Analysis with a Service Quality Approach. The results of the study show that service quality includes ideal service and users are satisfied with using Teman Bus. From the Tangibles dimension, the buses used are good and proper, while the cleanliness of the vehicles, seats and the availability of air conditioners perform very well. Accessibility for people with disabilities is not optimized. The Empathy dimension, paying attention to and providing input to passengers who complain when the trip is less than ideal, the driver's polite and friendly attitude toward passengers, and the availability of passenger complaint services are all excellent. Dimensions of Responsiveness The driver always obeys traffic rules and does not pick up passengers when the vehicle's capacity has been exceeded. The driver does not pick up or drop off passengers anywhere other than the bus stop, which has been appropriately implemented. The dimensions of reliability, cheap and affordable fares and the waiting time for transportation at bus stops are not long; however, the travel time according to what passengers want is not maximized. Dimensional assurances always ensure passenger safety, and passengers always feel safe and comfortable while on board the vehicle or at a stop.

KEYWORDS: Bus, customer satisfaction, level of service, quality of service.

I. INTRODUCTION

The application of smart mobility must support the development and progress of a good region or area because it can integrate the population with various public services, in this case transportation and supporting infrastructure, as well as an alternative in solving traffic problems, particularly congestion and pollution [1]. The application of smart mobility is also a manifestation of the realization of a smart city which will lead to the realization of civil society for the region concerned. Civil society itself is a human civilization that already has a better level of intelligence because it is integrated with each other by utilizing information and communication technology in various aspects of life [2] [3].

The community's journey to carry out their daily activities necessitates good transportation facilities and infrastructure with good service [4][5]. Trans Mamminasata provides cashless urban transportation, making it affordable, simple, dependable, and comfortable for the community. It is also accessible to people with disabilities.

The mass transit service in Makassar City, named Trans Mamminasata, is available by providing 81 buses serving passengers on 4 (four) service routes with 261 bus stops with operating hours ranging from 06.00 to 23.00 WITA. Corridor 1: Mallengkeri Terminal - UNHAS (via Jl. Metro Tj. Bunga) with 21 buses, Corridor 2: Panakkukang Mall - Sultan Hasanuddin Airport with 18 buses, Corridor 3: Campus 2 PNUP - Campus 2 PIP with 25 buses and , Corridor 4: Soekarno Hatta Port - UIN Samata with 17 buses.

Quality of service, customer satisfaction, and level of service are critical considerations for managers and owners of transportation companies in order for their operations to "survive" and develop.

Users of this transportation service typically have diverse backgrounds, jobs, and personalities, so the importance of a service attribute and the level of satisfaction felt vary [6]. The main issue in this study is the disparity in perceptions felt by users of the Trans Mamminasata "Teman Bus" corridor 3, so it is deemed necessary to study it.

Studies of bus transportation services that have been conducted include Analysis of the Service Quality of Transmusi Teman Bus on Community Satisfaction During the Covid-19 Pandemic In Palembang City [7]. Study of the Effect of Service on the Level of Satisfaction and User's Interest of Teman Bus based on Public Perception [8]. Identification of Conditions and Problems in the Implementation of the Smart Mobility Dimension in the

Development of the Smart City Concept in Bogor City [9]. Importance performance analysis for evaluating city bus service quality in Addis Ababa, Ethiopia [10]. Smart Mobility in Smart City. Action taxonomy, ICT intensity and public benefits [11]. Discrete Hopfield neural networks (DHNN) for Evaluation Service Quality of Public Transit [12]. The research aims to analyze the service quality index, passenger satisfaction index and service level of Teman Bus corridor 3 as the implementation of smart mobility in the application of Smart City in Makassar City. The method for assessing the level of user satisfaction with the quality of services provided is to use the Importance-Performance Analysis (IPA) method with the Service Quality approach. This method displays information related to service factors that significantly affect customer satisfaction and loyalty, and can identify service factors that, according to consumers, still need to be improved due to current conditions that are still unsatisfactory or factors that are felt not really important for consumers.

II. METHODOLOGY

1. Research location

This study was carried out in Makassar City, South Sulawesi Province, Indonesia, and focused on the operations of Trans Maminasata "Teman Bus" Corridor 3 with the operating area of Campus 2 PNUP-Campus 2 PIP (Shipping Science Polytechnic) round trip, with operating hours of 05.00 - 22.00 and passing 63 stopping points along the way. Figure 1 depicts the entire route map.

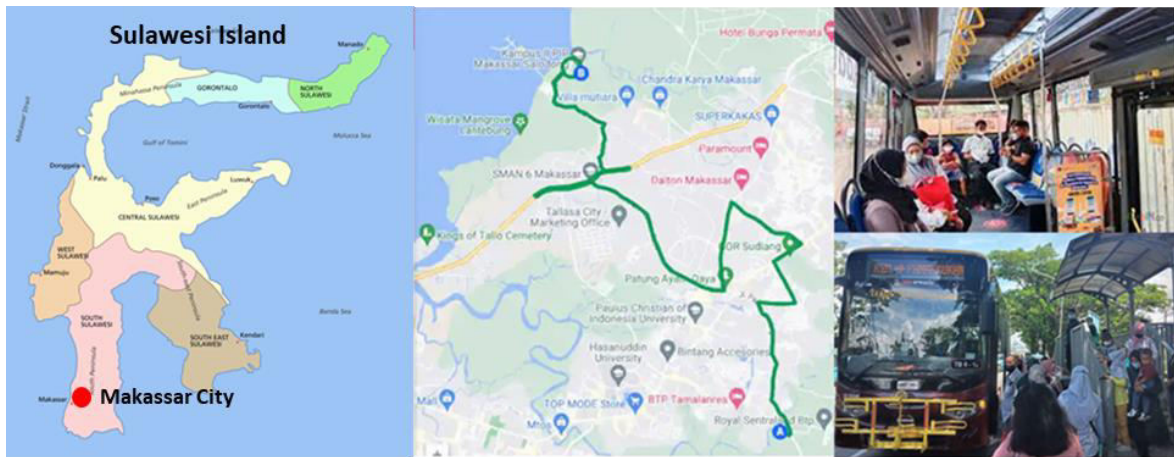


Fig. 1 Route of Teman Bus Corridor 3

2. Population, Sample and Variables

The population in this study is the bus that operates in Corridor 3 as many as 7 buses and the sample is the passengers who use this bus. The sampling is random, with a total of 80 samples. The variables used are Tangibles, Empathy, Responsiveness, Reliability and Assurances.

3. Analysis Technique

The data analysis technique used is GAB analysis to determine service quality, suitability level analysis to assess passenger satisfaction levels and analysis of consumer expectations with the performance of bus services using the Index Performance Analysis (IPA) method

a. Service Quality (SQ)

The difference between each variable's average performance value and the average expected value is used to calculate the service quality index [13].

$$SQ = P - E \dots\dots\dots(1)$$

$$P = \left[\frac{\sum_{i=1}^n X_i}{n} \right] \dots\dots\dots(2)$$

$$E = \left[\frac{\sum_{i=1}^n Y_i}{n} \right] \dots\dots\dots(3)$$



Annotation :

- P = The average score for each performance attribute
- E = The average value of each expectation attribute
- X_i = Performance attribute value X to i
- Y_i = Expected attribute value Y to i
- n = Number of respondents

There are three assessments of service quality based on a service perspective [14] namely

- 1) perceived service = expected service (ideal service quality)
- 2) perceived service > expected service (ideal service quality)
- 3) perceived service < expected service (less service quality)

b. Customes Satisfaction Index (CSI)

The Customs Satisfaction Index (CSI) is needed to determine the overall level of passenger satisfaction by considering the expectations and performance variables. CSI can be calculated using the following equation:

$$CSI = \frac{\sum P.E}{\sum E} \times 100 \dots\dots\dots (4)$$

To give an assessment of the CSI value is as follows

- 1) CSI value ≥ 100% passengers are very satisfied
- 2) CSI value >80% to 100% passengers are satisfied
- 3) CSI value >50% to 80% passengers are quite satisfied
- 4) CSI value <50 % poor service

c. Index Performance Analysis (IPA)

Using equations 2 and 3, IPA is examined for the average value of all performance variables and the average value of the expectation variable. Furthermore, as shown in Figure 2, the average value of the performance variable and the average value of the expectation variable is plotted on the IPA diagram, which is divided into four quadrants [15].

$$\bar{X} = \frac{\sum_{i=1}^n \bar{X}_i}{k} \dots\dots\dots (5)$$

$$\bar{Y} = \frac{\sum_{i=1}^n \bar{Y}_i}{k} \dots\dots\dots (6)$$

Annotation :

- \bar{X} = The average value of the performance score
- \bar{Y} = The average value of the expectation score
- X_i = The average score of the respondent's performance assessment
- Y_i = The average score of the respondent's expectation assessment
- k = Number of variables

The analysis results of equations (3) and (4) were then plotted on the IPA diagram, which has four quadrants. The X axis represents the Teman Bus’s performance and the Y axis represents the users' expectations. The average value of performance and the average value of expectations, or the results of service quality analysis, limit the limits of each quadrant.

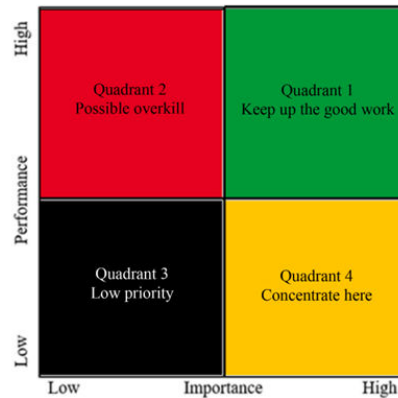


Fig. 2. IPA chart according to the colour scheme [16]

Quadrant 1, "Keep up The Good Work" (high importance & high satisfaction). Factors located in quadrant one are considered as supporting factors for user satisfaction so that managers are obliged to maintain the performance that has been achieved.

Quadrant 2, "Concentrate Here" (high importance & low satisfaction) Factors located in quadrant two are considered critical factors and are a priority for users, but currently they are not satisfactory, so the manager is obliged to improve the performance of these factors.

Quadrant 3, "Low Priority" (low importance & low satisfaction). Factors located in quadrant three have a low level of satisfaction and are considered unimportant to users, so managers do not need to prioritize these factors.

Quadrant 4, "Possible Overkill" (low importance & high satisfaction). Factors located in quadrant four are considered unimportant so managers need to allocate resources related to these factors to other factors that have a higher priority for treatment..

III. RESULT AND DISCUSSION

1. Service Quality Index

Analysis of the service quality index was analyzed by reducing the results between equation (2) and equation (3), the results of the analysis can be seen in Table 1.

Table 1. Service Quality Index

Dimension	Notation	Variable	Performance	Expectation	SQ
Tangibles (X1)	XI.1	Using a good car and worth using	4.88	4.86	0.01
	XI.2	Keeping the inside and outside of the car clean	4.88	4.56	0.31
	XI.3	Comfortable seating	4.88	4.44	0.44
	XI.4	Availability of air conditioner (AC)	4.90	4.44	0.46
	XI.5	Availability of Disability Facilities	4.76	4.46	0.30
Emphaty (X2)	X2.1	Give attention and input to passengers who complain while traveling	4.79	4.36	0.43
	X2.2	The driver is always polite and friendly to passengers	4.88	4.83	0.05
	X2.3	Availability of complaint service	4.88	4.50	0.38
Responsiveness (X3)	X3.1	The driver always obeys the traffic rules	4.91	4.95	-0.04
	X3.2	Do not take passengers if it exceeds the capacity of the vehicle	4.89	4.80	0.09
	X3.3	Do not pick up and drop passengers at any place without going through the bus stop	4.89	4.48	0.41
Reliability (X4)	X4.1	Cheap and affordable rates	4.94	4.93	0.01
	X4.2	Waiting time for transportation at the bus stop	4.88	4.75	0.13



Dimension	Notation	Variable	Performance	Expectation	SQ
		is not long			
	X4.3	Travel time as desired by passengers	4.76	4.54	0.23
Assurances (X5)	X5.1	Always guarantee the safety of passengers	4.89	4.68	0.21
	X5.2	Passengers always feel safe and comfortable when on board the vehicle or at the stop	4.94	4.85	0.09
		Average	4.87	4.65	0.22

From Table 1 it can be seen that the average Service Quality Index perceived by passengers is 4.87 while what passengers expect is 4.65

From Table 1, it is found that the difference between Performance and Expectation is 0.22, so basically the service is ideal. However, several variables, such as X3.1, have a negative difference, indicating that the service quality performance has not met passenger expectations. In the indicator of obedience to traffic rules (X3.1) basically almost all traffic rules are obeyed by the driver, but several things such as leaving the specified lane still occur frequently and entering the fast lane

2. Customers Satisfaction Index

The results of the CSI analysis use equation (4) as shown in Table 2

Table 2. Analysis Customers Satisfaction Index

Dimension	Notation	Variable	Performance	Expectation	CSI
(1)	(2)	(3)	(4)	(5)	(4x5)
Tangibles (X1)	X1.1	Using a good car and worth using	4.88	4.86	23.70
	X1.2	Keeping the inside and outside of the car clean	4.88	4.56	22.24
	X1.3	Comfortable seating	4.88	4.44	21.63
	X1.4	Availability of air conditioner (AC)	4.90	4.44	21.74
	X1.5	Availability of Disability Facilities	4.76	4.46	21.25
Emphaty (X2)	X2.1	Give attention and input to passengers who complain while traveling	4.79	4.36	20.89
	X2.2	The driver is always polite and friendly to passengers	4.88	4.83	23.52
	X2.3	Availability of complaint service	4.88	4.50	21.94
Responsiveness (X3)	X3.1	The driver always obeys the traffic rules	4.91	4.95	24.32
	X3.2	Do not take passengers if it exceeds the capacity of the vehicle	4.89	4.80	23.46
	X3.3	Do not pick up and drop passengers at any place without going through the bus stop	4.89	4.48	21.87
Reliability (X4)	X4.1	Cheap and affordable rates	4.94	4.93	24.32
	X4.2	Waiting time for transportation at the bus stop is not long	4.88	4.75	23.16
	X4.3	Travel time as desired by passengers	4.76	4.54	21.61
Assurances (X5)	X5.1	Always guarantee the safety of passengers	4.89	4.68	22.85
	X5.2	Passengers always feel safe and comfortable when on board the vehicle or at the stop	4.94	4.85	23.95
		Total	77.91		362.45

Using equation (4), the CSI value is calculated as 93.04%. This value indicates that passengers are satisfied with the service provided by Teman Bus, despite the fact that it is not optimal overall. To provide a higher level of satisfaction, the Teman Bus operator must continue to improve subpar services.

3. Index Performance Analysis

The performance value is obtained by using equation (2) and the expectation value is obtained by using equation (3) as shown in Table 1. The boundaries for each quadrant are obtained from the average performance value and the average expectation value using equation (5) and equation (6)) as shown in Table 1. The values obtained are then plotted on the IPA diagram as shown in Figure 3.

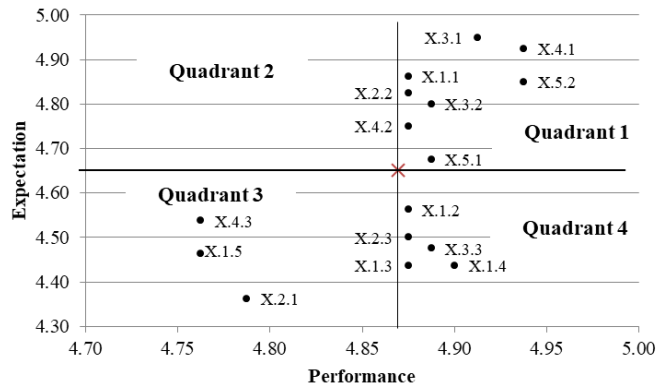


Fig. 3. IPA's Diagram

From Figure 3, it can be seen that the attributes are only found in quadrants 1, 3 and 4, which are explained in Table 3.

Table 3. Index Performance Analysis

Dimension	Notation	Variable	Quadrant			
			1	2	3	4
Tangibles (X1)	XI.1	Using a good car and worth using	√			
	XI.2	Keeping the inside and outside of the car clean				√
	XI.3	Comfortable seating				√
	XI.4	Availability of air conditioner (AC)				√
	XI.5	Availability of Disability Facilities			√	
Empathy (X2)	X2.1	Give attention and input to passengers who complain while traveling			√	
	X2.2	The driver is always polite and friendly to passengers	√			
	X2.3	Availability of complaint service				√
Responsiveness (X3)	X3.1	The driver always obeys the traffic rules	√			
	X3.2	Do not take passengers if it exceeds the capacity of the vehicle	√			
	X3.3	Do not pick up and drop passengers at any place without going through the bus stop				√
Reliability (X4)	X4.1	Cheap and affordable rates	√			
	X4.2	Waiting time for transportation at the bus stop is not long	√			
	X4.3	Travel time as desired by passengers			√	
Assurances (X5)	X5.1	Always guarantee the safety of passengers	√			
	X5.2	Passengers always feel safe and comfortable when on board the vehicle or at the stop	√			

IV. CONCLUSION

From Service Quality The service level of "Teman Bus" includes ideal service and users are satisfied using this Bus. From the Tangibles dimension, the buses used are good and proper while the cleanliness of the vehicles, seats and the availability of air conditioners perform very well. Availability for persons with disabilities is not maximized. The Empathy dimension, giving attention and input to passengers who complain when the trip is not optimal, the driver's polite and friendly attitude to passengers is good and the availability of passenger complaint services is excellent. Responsiveness Dimensions The driver obeys traffic rules and does not pick up passengers when the vehicle's capacity has exceeded. Reliability dimensions, cheap and affordable fares and the waiting time for transportation at bus stops is not long, it's just that the travel time according to what passengers want is not maximized. Assurances dimension, always guarantees the safety of passengers and passengers feel safe and comfortable while on board the vehicle or at the stop.

REFERENCES

- [1] R. Rachman, "BidangTransportasi," in PengembanganInnovasidanTeknologi di Era Industri 4.0 (KonsepdanPenerapan), Makassar: Tohar Media, 2021, pp. 39–50.
- [2] Kaledi, Dewanti, and Y. Herwangi, "Smart Mobility Development Strategy Based on Public Transportation in The City Of Yogyakarta," Region, vol. 14, no. 1, pp. 113–123, 2019.
- [3] R. Rachman, "Study of Commuter Travel Characteristics of Makassar Suburban," Int. J. Innov. Res. Sci. Eng. Technol., vol. 7, no. 2, pp. 1535–1542, 2018, <https://doi:10.15680/IJIRSET.2018.0702092>.
- [4] R. Rachman, H. Parung, S. Trisutomo, and N. Ali, "Study On The Travel Behavior Of Worker Living In The Makassar Suburban," J. Civ. Eng. Technol. IAEME Publ., vol. 8, no. 6, pp. 986–995, 2017.
- [5] R. Rachman, R. Mangontan, and A. Toding, "An analysis of the travel time in the Unhas lecturer housing of Makassar city," in ICCEE 2019, Bali, Indonesia, 2020, vol. 419. <https://doi:10.1088/1755-1315/419/1/012087>.
- [6] A. Suhendra and D. Prasetyanto, "Study of the Level of Satisfaction of Trans Metro Bandung Corridor 2 Users Using the Approach Importance-Performance Analysis," Rekaracana, vol. 2, no. 2, pp. 59–70, 2006.
- [7] W. Saputra, "Analysis of the Service Quality of TransmusiTeman Bus on Community Satisfaction During the Covid-19 Pandemic In Palembang City," Skripsi, Program StudiTeknikSipilFakultasTeknikUniversitasTridinanti Palembang, Palembang, 2022.
- [8] M. S. Amir, L. B. Said, and I. Syafei, "Study of the Effect of Service on the Level of Satisfaction and User's Interest of Teman Bus based on Public Perception," J. Konstr. JK-TIS, vol. 1, no. 3, pp. 31–42, 2022.
- [9] J. T. Hidayat, Mujio, and J. Sidiq, "Identification of Conditions and Problems in the Implementation of the Smart Mobility Dimension in the Development of the Smart City Concept in Bogor City," J. Tek., vol. 22, no. 2, pp. 18–24, 2021.
- [10] M. Girma, B. Woldetensae, G. Nuriye, and T. Lika, "Importance performance analysis for evaluating city bus service quality in Addis Ababa, Ethiopia," Urban Plan. Transp. Res., vol. 10, no. 1, pp. 451–465, 2022, <https://doi:10.1080/21650020.2022.2099968>.
- [11] C. Benevolo, R. Dameri, and B. D'Auria, "Smart Mobility in Smart City. Action taxonomy, ICT intensity and public benefits," in ECISM 11th European Conference on Information Systems Management, Paris, Jan. 2016, vol. 11, pp. 13–28. <https://doi:10.1007/978-3-319-23784-82>.
- [12] J. Shen and W. Li, "Discrete Hopfield neural networks (DHNN) for Evaluation Service Quality of Public Transit," Int. J. Multimed. Ubiquitous Eng., vol. 9, no. 2, pp. 331–340, 2014.
- [13] Supranto, J. Limakrisna, and Nanden, Consumer Behavior and Marketing Strategy. Jakarta: MitraWacana Media, 2007.
- [14] Budiono and F. Lukman, "User perceptions and expectations of the quality of data services on smartphones in Jakarta," Bul. Pos Dan Telekomun., vol. 11, no. 2, pp. 93–108, 2013.
- [15] J. Esmailpour, K. Aghabayk, and M. A. Vajari, "Importance – Performance Analysis (IPA) of bus service attributes: A case study in a developing country," Transp. Res. Part Policy Pract., vol. 142, pp. 129–150, 2020, <https://doi:10.1016/j.tra.2020.10.020>
- [16] M. Aghajanzadeha, K. Aghabayka, J. Esmailpoua, and C. D. Gruyterb, "Importance – Performance Analysis (IPA) of metro service attributes during the COVID-19 pandemic," Case Studi. Transp. Policy, vol. 10, no. 3, pp. 1661–1672, 2022, doi: <https://doi.org/10.1016/j.cstp.2022.06.005>.



INNO SPACE
SJIF Scientific Journal Impact Factor
Impact Factor: 8.118



ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 **9940 572 462**  **6381 907 438**  **ijirset@gmail.com**



www.ijirset.com

Scan to save the contact details