



Application of the Kano Model to Investigate the Service Quality of Light Rail Transit (LRT) Jabodebek

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Abstract. The Light Rail Transit (LRT) Jabodebek has garnered diverse sentiments on social media, encompassing both positive and negative feedback. These findings indicate that there are complaints from users regarding the suboptimal quality of the LRT Jabodebek services. Service quality is evaluated through five dimensions: responsiveness, assurance, tangibles, empathy, and reliability. The research questions focus on understanding the service quality performance delivered by LRT Jabodebek, the perception of service quality from the perspective of the customers, and the service attributes that need improvement to enhance customer satisfaction based on the Kano model approach. Application of the Kano model to assess the quality of services provided by the LRT Jabodebek. This approach provides a comprehensive understanding of customer preferences and the relative importance of different service attributes. This study adopts a quantitative research approach, employing a survey method to collect data from LRT Jabodebek users. The Confirmatory Factor Analysis (CFA) method was used to test the construct validity. The findings offer insights proportion of one-dimensional quality attributes (O) predominates in the service quality of LRT Jabodebek, necessitating the improvement of these attributes to enhance overall user satisfaction. The rankings, which highlight the importance of increasing consumer satisfaction and reducing dissatisfaction, are dominated by attributes such as tangibles, empathy, and assurance. The application of the Kano model identifies crucial service attributes for customer satisfaction that should be prioritized for service enhancement. These research findings can inform policymakers and service providers in developing strategies to address the identified service quality issues and improve the overall quality of LRT Jabodebek services.

Keywords: Service Quality, Kano Model, Light Rail Transit (LRT) Jabodebek, Transportation services, Customer satisfaction

1 Introduction

The design of large metropolitan areas faces primary issues related to the living standards of the city and its inhabitants' social lives. A city aiming for sustainability, with future planning that considers environmental aspects, is not merely focused on economic factors but has become a necessity for society. A sustainable public transportation system should positively impact the economy, society, culture, and environment of the community it serves [23]. One key criterion in this regard is public transportation;

without it, residents would travel randomly without a clear purpose. Numerous factors directly and indirectly influence public transportation, but one significant factor is human interaction within urban traffic [9]. Urban transportation facilities are the hub of mobility in cities in both developed and developing countries. The importance of public transportation in urban environments is highly significant [16].

The increasing population, the level of mobility in the Jakarta area has also risen. To support this growing mobility, seven public transportation systems have been developed: MRT Jakarta, LRT Jakarta, LRT Jabodetabek, BRT Jakarta, Commuter Rail (KRL), Airport Train, and Bus [10]. The government has developed various transportation options to facilitate urban mobility for residents in Jakarta and its surrounding areas, such as Depok, Bogor, Tangerang, and Bekasi. Sustainable public transportation is linked to various dimensions, such as economic and social factors. Cities with well-developed infrastructure can significantly enhance and promote the quality of life for their residents. This quality of life can be achieved through safety, comfort, a secure environment, smooth economic activities, and accessibility to transportation services [23].

In Jakarta, there is a pressing need for efficient, comfortable, and affordable transportation that reaches strategic areas and offers quick travel times. This shift is essential to encourage the transition from private to public transportation. According to KAI Public Relations [18], in August 2023, the LRT Jabodebek, a project initiated by PT Kereta Api Indonesia (Persero), commenced operations. The LRT Jabodebek is one of the national strategic projects aimed at improving transportation services to support development in the Jabodebek region (Jakarta, Bogor, Depok, Bekasi).

The LRT stations are strategically located in areas that encompass residential and business centers, aiming to facilitate user mobility to and from the capital and surrounding areas. These stations are integrated with various public transportation systems, such as Commuterline, Trans Jakarta, MRT Jakarta, Mikrotrans, Trans Patriot, Jakarta-Bandung High-Speed Rail, city transportation services, and privately managed public transportation. This integration aims to provide facilities that allow users to switch from one mode of transportation to another more smoothly and conveniently. The LRT Jabodebek is expected to become an efficient and environmentally friendly public transportation alternative, reducing the community's reliance on private vehicles and alleviating traffic congestion.

According to Yesidora [27], several issues arose during the first week of LRT Jabodebek operations. There were delays in the LRT schedule, an incident where an LRT train stopped at Cikunir 1 Station due to an automatic door malfunction, an unexpected stop of an LRT train from Bekasi to Dukuh Atas at Halim Station causing a power outage, and a brake issue with an LRT train emitting smoke while passing between Ciliwung and Cawang Stations. The LRT management apologized for these disruptions and is committed to providing the best service for passengers. The lack of sufficient trial periods was considered a cause of these technical problems..

1.1 Social Listening Analysis

The public transportation system of LRT Jabodebek has the capability to garner various sentiments from social media, encompassing both positive and negative feedback. Social listening involves the collection and analysis of data generated from online conversations, conducted in real-time or over a specific period, serving as a representation of a particular population [2]. This enables a digital analyst or marketer to anticipate the needs of the population for the betterment of the organization. Referring to the issues reported by Yesidora [27], a social listening analysis can be conducted by analyzing the negative sentiments regarding the service quality of LRT Jabodebek on social media.

The Utilization of Twitter for Sentiment Analysis in Research. Researchers utilize social media platforms like Twitter (now known as X) because the site generates a massive number of tweets daily, reaching significant volumes. This makes Twitter an extremely rich data source for sentiment analysis. Furthermore, the public nature of tweets published by Twitter users allows researchers to easily access and cite this data. The ability to disseminate tweets quickly and in real-time to the public is another advantage of Twitter, enabling researchers to observe the timeframe of issues as they unfold. On Twitter, users discuss various topics over different periods, providing researchers with the opportunity to analyze sentiment on specific issues effortlessly, as these topics are distributed across different time frames. Social media analysis was conducted using the Google Colab platform (<https://colab.research.google.com/>), which employs Tweet Harvest for data crawling. The data crawling performed through Google Colab was solely for research purposes. After running the cell to retrieve tweets related to LRT Jabodebek, the crawled Twitter data was downloaded. The search yielded 1,648 tweets related to the keyword "LRT Jabodebek" within the specified timeframe. From this data, sentiment analysis was performed to identify positive and negative sentiments. The negative sentiments revealed were then categorized based on service quality dimensions. The findings indicated user complaints related to the unsatisfactory service quality of LRT Jabodebek, as shown in the following table.

Table 1. Social Listening Analysis of LRT Jabodebek Service Quality Based on the Five Dimensions of Service Quality.

No	Dimension	Attributes	Indicators on social media Twitter (X)
1.	Reliability	Availability of route, schedule, and fare information for LRT Jabodebek.	● Lack of clarification during disruptions ● Schedule board information not updated.
		Punctuality of LRT Jabodebek departure and arrival times.	● LRT departure schedule delays.

2.	Responsiveness	Ability of LRT Jabodebek staff to respond to passenger complaints.	• Lack of staff in the train carriages.
		Readiness of staff to direct the use of priority seating.	• LRT staff not child-friendly regarding priority seating.
3.	Assurance	Comfort and safety during boarding and alighting from LRT Jabodebek.	• Disruption in LRT Jabodebek doors. • Automatic opening and closing of doors problem. • Rough braking.
		Appropriateness of the services provided.	• Inconsistent speed reduction.
4.	Empathy	LRT Jabodebek staff's attentiveness to the needs of service users.	• Unhelpful staff.
		LRT Jabodebek's operational hours' suitability for customers.	• Limited operating hours.
5.	Tangibles	Modern and visually appealing facilities.	• Facilities not pedestrian-friendly. • Availability of dispenser facilities at stations.
		Frequency of LRT Jabodebek departures per day.	• Excessive departure intervals.

Qualitative Pilot Test of Service Quality Dimensions: Evaluating LRT Jabodebek User Experiences. Prior to commencing the primary data collection through questionnaires, the initial step involved conducting a qualitative pilot test as a field trial. This pilot test aimed to evaluate and assess the quality indicators intended for use in the study. During this field trial, the researcher engaged in direct interviews with five respondents who are users of LRT Jabodebek. Interviews were conducted both face-to-face and through online platforms, depending on respondent preferences and availability. The five dimensions of service quality as proposed by Parasuraman et al. constituted the primary focus of the interviews [15]. Each respondent was directed to provide insights and experiences regarding their use of LRT Jabodebek, covering both positive and negative aspects. The findings from this pilot test offer preliminary insights to the researcher regarding potential issues that arise and will provide an opportunity to refine or adjust the dimensions of service quality before proceeding to further data collection. Negative responses continue to be found regarding dimensions such as reliability, responsiveness, assurance, empathy, and tangibles.

1.2 Service Quality in LRT Jabodebek: Dimensions and Customer Perspective

Service quality in LRT Jabodebek is a critical concern for its operators. Service quality is paramount as several studies indicate that focusing on service quality impacts customer satisfaction, customer loyalty, positive word of mouth for repeat purchases, attraction of new customers, corporate image, cost efficiency, and profitability [3]. Evaluating service quality should adopt a customer perspective. Service quality is a framework for measuring service excellence commonly applied in service quality research. Service quality can be assessed through five dimensions: responsiveness, assurance, tangibles, empathy, and reliability. Tangibles relate to physical facilities such as equipment and personnel appearance; reliability denotes the ability to consistently and accurately provide services; responsiveness emphasizes initiative in assisting customers and promptly responding to their needs; assurance involves knowledge, courtesy, and competence of employees; while empathy focuses on the company's ability to understand, care for, and pay individual attention to customers [3]. As noted by Kano et al. [11], various satisfaction elements exhibit different characteristics, thus their impacts on satisfaction also differ, underscoring the need to understand each service element's precise impact on satisfaction.

2 Literature Review

2.1 Public Transportation

Public Transportation, as defined by encompasses all passenger and freight transportation services provided according to predetermined schedules and accessible for use by individuals or any organization [7]. Traditional public transportation as any mode of transportation available for hire and with compensation; in other words, any form of transportation accessible to the general public [17]. Public transportation includes not only buses and trains but also taxis, as well as air and sea services. This includes both passenger and freight services, although self-use freight services are typically not considered public transportation. Public transportation systems are essential services offered by governments to facilitate societal mobility and hold a vital place in daily life.

2.2 Service Quality

Service refers to actions provided by one entity to another that are intangible and not owned. The concept of service quality can be understood through consumer behavior, which encompasses the actions consumers undertake in discovering, purchasing, using, and evaluating services with the expectation that they will meet their needs and expectations. In a broader framework, services encompass various efforts aimed at enhancing customer satisfaction. Service quality is interpreted as an overall assessment and often considered a primary factor influencing overall customer satisfaction. Parasuraman et

al. [14] have defined service quality as an organization's ability to meet the expectations held by customers. Service quality is more complex for consumers compared to product quality [13]. This complexity arises from several unique characteristics of services: intangibility, variability, perishability, and simultaneous production and consumption.

2.3 Dimensions and Indicators of Service Quality

Measurement of service quality has garnered significant attention due to the need to evaluate customer expectations and find suitable methods to do so [15]. The core concept of the main dimensions of service quality, as elucidated by Parasuraman et al. [14], includes:

1. **Reliability:** The organization's ability to deliver services accurately from start to finish without errors and to fulfill promises made to customers regarding service delivery times.
 2. **Responsiveness:** How quickly and efficiently employees assist and respond to customer requests, as well as providing timely information about the services offered.
 3. **Assurance:** Employees' ability to build trust and provide a sense of security to customers in handling their issues.
 4. **Empathy:** The company's ability to provide personalized attention to its customers, facilitate effective communication, and understand customer issues and needs.
 5. **Tangibles:** Includes the equipment and facilities used by the company, the physical condition of the facilities available, and the appearance and attire of the employees.
- These dimensions serve as fundamental criteria for evaluating and improving service quality across various sectors and industries.

2.4 The Kano Model

The Kano theory discusses various factors influencing customer satisfaction with a product or service. This model aims to categorize product or service attributes based on their ability to meet or exceed customer needs. The Kano Diagram classifies specifications into several categories to illustrate the relationship between the quality of a product or service and the level of customer satisfaction. According to Kano [11], the model categorizes types of products that can influence consumer satisfaction.

1. Must-be Requirements

The Kano Model introduces the concept of must-be requirements, highlighting elements considered essential in a product. In this category, customer satisfaction is closely related to the performance and attributes of the service provided. Fulfilling these requirements, though essential, does not substantially increase customer satisfaction.

2. One-Dimensional Requirements

The category of one-dimensional requirements in the Kano Model applies the principle of "more is better," where customer satisfaction correlates linearly with attribute performance. Here, the higher the performance of a product or service attribute, the higher the perceived level of customer satisfaction. This concept implies that improving the quality or performance of specific attributes proportionally has a positive impact on

customer satisfaction. Therefore, emphasis on enhancing the quality or performance of attributes becomes critical in efforts to enhance customer satisfaction in this category.

3. Attractive Requirements

Attractive requirements in the Kano model are criteria for products that have the greatest impact on customer satisfaction when fulfilled. Meeting attractive requirements can result in a substantial increase in customer satisfaction, creating a positive experience that exceeds expectations. These dimensions serve as fundamental criteria for evaluating and improving service quality across various sectors and industries.

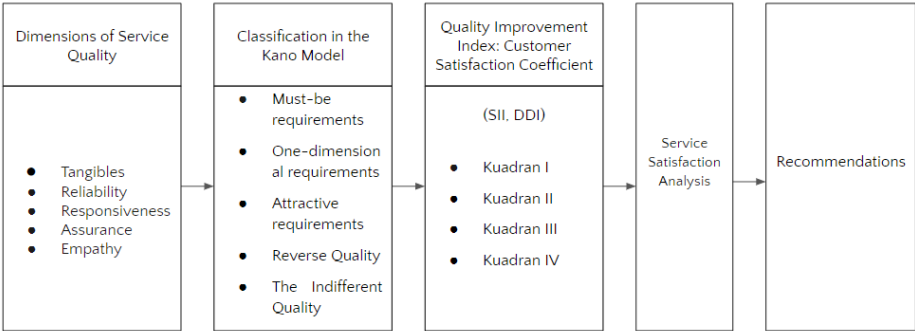


Fig. 1. Framework for Applying the Kano Model
Adapted from Chen et al. [4]

3 Method, Data, and Analysis

3.1 Sampling Methodology

The sampling method employed in this study is non-probability sampling. According to Stratton [21], non-probability sampling is a sampling technique where research subjects are selected based on specific criteria defined by the researcher according to the research needs, rather than through random selection from the target population. The sampling technique utilized in this research is purposive sampling. In purposive sampling, respondents are selected based on their interests, qualifications, or typicality (matching the profile of the type of participants who would typically use a product), to serve as samples that fulfill the specific objectives of the sought research [24]. Purposive sampling also allows for specific representativeness [19], ensuring that the sample can reflect particular characteristics of the population under study. The sample used in this study consists of users of the Light Rail Transit (LRT) Jabodetabek service.

3.2 Sampling Methodology

This research refers to Chen et al. [4], where quality attributes are classified into attractive, must-be, one-dimensional, indifferent, and reverse qualities. They are further analyzed to determine the customer satisfaction coefficient, using the Quality Improvement Index. Subsequently, the Satisfaction Importance Index (SII) and Dissatisfaction Importance Index (DII) are estimated and plotted on the x and y axes to evaluate quality attributes needing improvement and prioritize them from the consumer perspective. Finally, the study conducts a comprehensive analysis of satisfaction with actual services and determines priority rankings for these service items accordingly. The techniques in this research are divided into three stages: data collection techniques, data processing techniques, and data analysis techniques.

The data collection technique. The data collection technique employed in this study involves distributing questionnaires to users of the LRT Jabodebek service. The questionnaire items initially derive from service quality attributes identified by Parasuraman et al. [15]. These attributes are further elaborated based on studies by de Oña et al. [6], Chen et al. [4], and Wisutwattanasak et al. [25] to suit the specific context of the research. The questionnaire is structured into four parts. The first part captures respondent information, documenting basic details such as name/initials, address/city of residence, gender, age, occupation/profession, and income level. These demographic data will be used to explore the relationship between various attribute types and satisfaction levels. The subsequent three parts focus on the transportation services provided by LRT Jabodebek, prompting respondents to provide feedback on these services. These sections present a variety of questions related to LRT Jabodebek transportation services based on the research conducted by Chen et al. [4]. For example, respondents are asked about the adequacy of the LRT service in reaching destinations, the adequacy of the transportation service overall, the punctuality of train departures and arrivals, and so forth. Respondents are instructed to choose their responses based on the Kano Model categories: "I like it", "I consider it as expected", "I don't feel anything about it", "I'm not enthusiastic about it", and "I dislike it". The questions in the second part focus on dysfunctional attributes. For example, respondents are asked for their opinions on scenarios such as inadequate transportation coverage by LRT Jabodebek, insufficient transportation services, and train departures and arrivals not adhering to schedules. Response options mirror those in the previous section and include: "I don't like it," "I barely accept it," "I have no feeling about it," "I take it for granted," and "I like it very much. The third part concentrates on assessing consumer satisfaction levels with LRT Jabodebek transportation services. For instance, respondents are prompted to report their current satisfaction levels regarding each service item. Their responses are evaluated using a scale with multiple items to measure consumer satisfaction. Respondents select from responses based on a five-point Likert scale: "very dissatisfied," "dissatisfied," "neither satisfied nor dissatisfied," "satisfied," and "very satisfied".

Data Processing Techniques. The data were collected by administering a questionnaire containing functional and dysfunctional questions related to each service attribute and customer satisfaction provided by LRT Jabodebek. Subsequently, the data obtained were categorized using the Kano evaluation table based on Matzler et al. [12]. According to the results of the Kano quality classification, each item has a different quality classification.

Product requirement ▼ →		Dysfunctional form of the question				
		1. I like it that way	2. It must be that way	3. I am neutral	4. I can live with it that way	5. I dislike it that way
Functional form of the question	1. I like it that way	Q	A	A	A	O
	2. It must be that way	R	I	I	I	M
	3. I am neutral	R	I	I	I	M
	4. I can live with it that way	R	I	I	I	M
	5. I dislike it that way	R	R	R	R	Q

Fig. 2. Kano Evaluation
Source: Chen et al. [4]

Data Analysis Techniques. In this research, several analyses applied by the researcher include validity testing, reliability testing, as well as analysis of service quality dimensions.

Customer satisfaction coefficient. Sireli et al. [20] emphasize that reducing dissatisfaction among customers is crucial to ensuring their satisfaction, thus highlighting the importance of focusing on factors with high coefficients of dissatisfaction or satisfaction by adapted a formula for two indices: the Decreasing Dissatisfaction Index (DDI) and the Satisfaction Increment Index (SII). The modifications proposed by Suh et al. [22] were applied in this study, with the formulas as follows:

a. *Satisfaction increment index (SII)*

$$\text{Satisfaction increment index (SII): } \frac{A + O}{A + O + M + I}$$

b. *Decreasing dissatisfaction index (DDI)*

$$\text{Decreasing dissatisfaction index (DDI): } \frac{O + M}{A + O + M + I}$$

M = *Must-be requirements*
O = *One-dimensional requirements*
A = *Attractive requirements*
I = *Indifferent Quality*

Based on Chen et al. [4], a satisfaction increment coefficient approaching 1 indicates that the presence of quality attributes has a greater impact on customer satisfaction, whereas a value approaching 0 signifies a lower impact. Conversely, for the decreasing dissatisfaction coefficient, a value approaching 1 indicates that the absence of a quality attribute has a higher impact on customer dissatisfaction, whereas a value approaching 0 indicates a lower impact.

Quality Improvement Index: Customer Satisfaction Coefficient. Using the method outlined by Chen et al. [4], the SII is plotted on the x-axis and the DDI on the y-axis; for both indices, the average values are taken as the central points. These coordinates for each service form a graph depicting customer satisfaction coefficients.

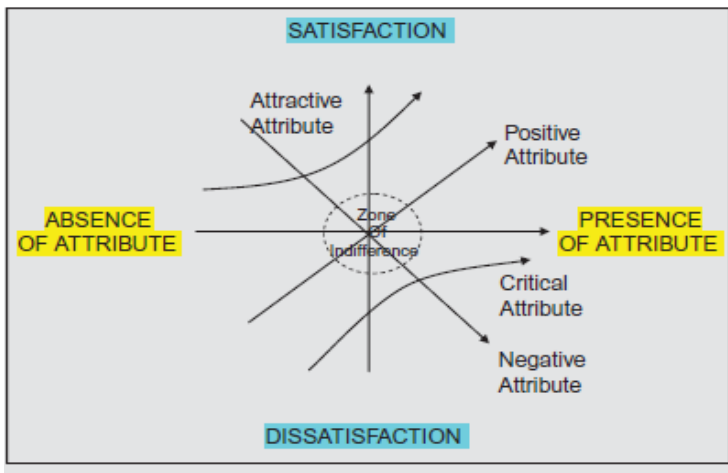


Fig. 3. Modified Kano Model

Source: Gregory et al. [8]

The modified Kano Model based on Gregory et al. [8], utilized in Chen et al. [4], retains all the positive contributions of the original Kano model while incorporating additional specific factors. This modified Kano Model updates attributes previously presented in earlier Kano models without compromising the original contributions offered by the model.

4 Result and Discussion

The study was conducted from April 2024 to May 2024 over a period of two weeks. Respondent data collection was conducted via Google Form, yielding a total of 630 respondents. The questionnaire included filters to ensure that respondents had previously used the LRT Jabodebek services.

Table 2. Profile of Respondents

		Frequency	Percentage (%)
City of Residence	Jakarta Pusat	61	9.7
	Jakarta Timur	81	12.9
	Jakarta Barat	44	7.0
	Jakarta Utara	39	6.2
	Jakarta Selatan	80	12.7
	Kota Bogor	53	8.4
	Depok	61	9.7
	Kota Bekasi	78	12.4
	Kabupaten Bekasi	20	3.2
	Kabupaten Bogor	20	3.2
	Kota Tangerang	34	5.4
	Kabupaten Tangerang	24	3.8
	Kota Tangerang Selatan	31	4.9
	Other	4	0.6
Gender	Male	221	35.1
	Female	409	64.9
Age	17-25	328	52.1
	26-40	232	36.8
	41-55	66	10.5
	>55	4	0.6

Occupation/Profession	Student	215	34.1
	Civil Servant/Government Employee	45	7.1
	Private Sector Employee	267	42.4
	Entrepreneur	65	10.3
	Other	38	6.0
Income Level	< 3.000.000 IDR	246	39.0
	3.000.000 - 5.000.000 IDR	175	27.8
	5.000.001 - 7.000.000 IDR	107	17.0
	> 7.000.000 IDR	102	16.2

Construct reliability can be evaluated using Cronbach's alpha, which is considered to indicate adequate reliability if its values reach or exceed the threshold of 0.7, as suggested by dell'Olio [5]. In this study, the obtained alpha values ranged from 0.72 to 0.96, indicating that the instrument's reliability in this research can be categorized as good. Based on the factor loadings, composite reliability (CR), and average variance extracted (AVE) calculations used to verify convergent validity, as shown in Table 2, all factor loadings exceed the standard of 0.50. All measurements in the study, AVE, ranged from 0.547 to 0.795, and CR ranged from 0.723 to 0.89.

Table 3. Convergent validity analysis

	Factor loadings	AVE	CR
Assurance		0,547	0,723
A1	0,711		
A2	0,726		
A3	0,732		
A4	0,787		
Empathy		0,729	0,876
E1	0,810		

E2	0,860		
E3	0,877		
E4	0,867		
Reliability		0,795	0,870
R1	0,874		
R2	0,913		
R3	0,887		
Responsiveness		0,751	0,890
RS1	0,872		
RS2	0,844		
RS3	0,867		
RS4	0,884		
Tangibles		0,576	0,853
T1	0,756		
T2	0,772		
T3	0,778		
T4	0,767		
T5	0,768		
T6	0,712		

The heterotrait-monotrait ratio (HTMT) as the average correlation between items across constructs (i.e., heterotrait-heteromethod correlation) relative to the (geometric) average correlation for items measuring the same construct (i.e., monotrait-heteromethod correlation). Discriminant validity issues arise when HTMT values are high threshold of 0.90 for structural models with highly conceptually similar constructs, such as cognitive satisfaction, affective satisfaction, and loyalty. In this context, HTMT values above 0.90 suggest a lack of discriminant validity. However, for constructs that are more conceptually distinct, a lower and more conservative threshold, such as 0.85, is

Table 4. Discriminant Validity Analysis using HTMT

Assurance Empathy Reliability Responsiveness Tangible

After testing the validity and reliability of the instrument, the Kano questionnaire results from 630 respondents, users of the Light Rail Transit (LRT) in the Jabodebek area, were applied to the Kano model. Based on Table 5 summarizing the calculation of Kano quality attributes, it can be seen that overall, respondents perceive each attribute falls under the category of one-dimensional quality (O). This finding suggests that improvements in the performance of attributes categorized as One-Dimensional Quality (O) are needed for enhancing overall user satisfaction with LRT Jabodebek.

	A	O	M	I	R	Q	Total
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	A	O	M	I	R	Q	Total
Assurance							
A1 Traveling on the LRT Jabodebek train keeps you safe despite unusual situations	70	198	92	80	93	97	630
A2 LRT Jabodebek employees serve politely	72	259	59	69	89	82	630
A3 LRT Jabodebek employees have been trained and become proficient	97	208	69	84	99	73	630
A4 LRT Jabodebek staff make passengers feel comfortable during the trip.	95	235	54	76	83	87	630
Empathy							

	Every LRT Jabodebek employee is always vigilant even if no problems occur	57	199	76	65	71	162	630
E2	LRT Jabodebek ride provides comfort for all passengers including children, elderly, people with disabilities and pregnant women.	35	242	59	43	70	181	630
E3	LRT Jabodebek employees always prioritize the interests of passengers	47	195	86	50	69	183	630
E4	LRT Jabodebek officials make it easy to plan a trip	63	211	48	41	71	196	630
Reliability								
R1	LRT Jabodebek service reaches its destination	72	107	87	126	146	92	630
R2	LRT Jabodebek train schedule is adequate	50	126	58	188	199	9	630
R3	LRT Jabodebek departs and arrives on time	31	159	115	138	124	63	630
Responsiveness								
RS1	LRT Jabodebek employees are prompt in helping	56	145	78	280	54	17	630
RS2	LRT Jabodebek employees are responsive in providing services if there are complaints	45	155	58	291	59	22	630
RS3	LRT Jabodebek staff always on standby to help	60	149	61	282	58	20	630
RS4	LRT Jabodebek employees can provide timely and efficient services	48	161	59	139	181	42	630
Tangibles								
T1	LRT train stations are clean	79	276	49	54	87	85	630

T2	LRT train stations are well lit	90	244	58	78	96	64	630
T3	LRT trains are well lit	85	250	54	80	95	66	630
T4	Condition of the LRT train is clean	62	298	48	56	93	73	630
T5	LRT trains and stations have good temperature and ventilation systems	79	271	61	59	96	64	630
T6	LRT trains are driven well	53	286	61	64	68	98	630

From the summary of attribute frequencies presented in Table 4, proportion analysis and percentage calculations of the Kano quality attributes have been conducted. These percentages are obtained by dividing the number of each Kano quality attribute by the total number of observed Kano quality attributes. Based on Yang et al. [26], the attractive quality attribute (A) is a quality element that, when fulfilled, provides satisfaction but its absence does not decrease satisfaction. The one-dimensional quality attribute (O) is a quality element that generates satisfaction when fulfilled and dissatisfaction when not fulfilled. The must-be quality attribute (M) is a quality element that is expected and leads to dissatisfaction if not fulfilled. The indifferent quality attribute (I) is a quality element that does not affect satisfaction regardless of whether it is fulfilled or not. The questionable attribute (Q) is a doubtful or contradictory element, and the reverse quality attribute (R) is a quality element that causes dissatisfaction when fulfilled and satisfaction when not fulfilled.

Table 6. Proportion and percentage of Kano quality attributes for service quality LRT Jabodebek (%)

	A	O	M	I	R	Q
Assurance						
A1 : Traveling on the LRT Jabodebek train keeps you safe despite unusual situations	0.11	0.31	0.15	0.13	0.15	0.15
A2 : LRT Jabodebek employees serve politely	0.11	0.41	0.09	0.11	0.14	0.13
A3 : LRT Jabodebek employees have been trained and become	0.15	0.33	0.11	0.13	0.16	0.12

proficient

A4 : LRT Jabodebek staff make passengers feel comfortable during the trip.

0.15 0.37 0.09 0.12 0.13 0.14

Empathy

E1 : Every LRT Jabodebek employee is always vigilant even if no problems occur

0.09 0.32 0.12 0.10 0.11 0.26

E2 : LRT Jabodebek ride provides comfort for all passengers including children, elderly, people with disabilities and pregnant women.

0.06 0.38 0.09 0.07 0.11 0.29

E3 : LRT Jabodebek employees always prioritize the interests of passengers

0.07 0.30 0.13 0.08 0.11 0.28

E4 : LRT Jabodebek officials make it easy to plan a trip

0.10 0.32 0.07 0.06 0.11 0.30

Reliability

R1 : LRT Jabodebek service reaches its destination

0.11 0.17 0.14 0.20 0.23 0.15

R2 : LRT Jabodebek train schedule is adequate

0.08 0.20 0.09 0.30 0.32 0.01

R3 : LRT Jabodebek departs and arrives on time

0.05 0.25 0.18 0.22 0.20 0.10

Responsiveness

RS1: LRT Jabodebek employees are prompt in helping

0.09 0.23 0.12 0.44 0.09 0.03

RS2: LRT Jabodebek employees are responsive in providing services if there are complaints

0.07 0.25 0.09 0.46 0.09 0.03

RS3: LRT Jabodebek staff always on standby to help

0.10 0.24 0.10 0.45 0.09 0.03

RS4: LRT Jabodebek employees can provide timely and efficient services

0.08 0.26 0.09 0.22 0.29 0.07

Tangibles						
T1 : LRT train stations are clean	0.12	0.42	0.08	0.08	0.13	0.13
T2 : LRT train stations are well lit	0.14	0.38	0.09	0.12	0.15	0.10
T3 : LRT trains are well lit	0.13	0.38	0.08	0.12	0.15	0.10
T4 : Condition of the LRT train is clean	0.10	0.46	0.07	0.09	0.14	0.11
T5 : LRT trains and stations have good temperature and ventilation systems	0.12	0.42	0.09	0.09	0.15	0.10
T6 : LRT trains are driven well	0.08	0.44	0.09	0.10	0.10	0.15

This study employs two indicators in service quality analysis: Satisfaction Increment Index (SII) and Decreasing Dissatisfaction Index (DDI). Table 7 illustrates that in this study, concerning LRT Jabodebek, there is variation in the Satisfaction Increment Index (SII) coefficients ranging from 0.36 to 0.78, and variation in Decreasing Dissatisfaction Index (DDI) coefficients ranging from 0.32 to 0.73. The total average value for Satisfaction Increment Index (SII) coefficients is 0.612, and for Decreasing Dissatisfaction Index (DDI) coefficients is 0.582.

Table 7. Calculation Results for SII and DDI on the Service Quality of LRT Jabodebek

		SII	DDI
Assurance	A1 : Traveling on the LRT Jabodebek train keeps you safe despite unusual situations	0.61	0.63
	A2 : LRT Jabodebek employees serve politely	0.72	0.67
	A3 : LRT Jabodebek employees have been trained and become proficient	0.67	0.60
	A4 : LRT Jabodebek staff make passengers feel comfortable during the trip.	0.72	0.65
Empathy	E1 : Every LRT Jabodebek employee is always vigilant even if no problems occur	0.64	0.67
	E2 : LRT Jabodebek ride provides comfort for all passengers including children, elderly, people with disabilities and pregnant women.	0.73	0.73

	E3 : LRT Jabodebek employees always prioritize the interests of passengers	0.64	0.70
	E4 : LRT Jabodebek officials make it easy to plan a trip	0.75	0.70
Reliability	R1 : LRT Jabodebek service reaches its destination	0.46	0.42
	R2 : LRT Jabodebek train schedule is adequate	0.42	0.32
	R3 : LRT Jabodebek departs and arrives on time	0.43	0.51
	RS1: LRT Jabodebek employees are prompt in helping	0.36	0.40
	RS2: LRT Jabodebek employees are responsive in providing services if there are complaints	0.36	0.38
	RS3: LRT Jabodebek staff always on standby to help	0.38	0.38
Responsive-ness	RS4: LRT Jabodebek employees can provide timely and efficient services	0.51	0.41
	T1 : LRT train stations are clean	0.78	0.70
Tangibles	T2 : LRT train stations are well lit	0.71	0.63
	T3 : LRT trains are well lit	0.71	0.63
	T4 : Condition of the LRT train is clean	0.78	0.70
	T5 : LRT trains and stations have good temperature and ventilation systems	0.74	0.68
	T6 : LRT trains are driven well	0.73	0.72
	Mean	0.612	0.582

In recommending improvements to the service quality of LRT Jabodebek, graphs were constructed to evaluate the dimensions of SII and DDI coefficients. This graph features an x-axis depicting average SII values and a y-axis depicting average DDI values. Figure 4 illustrates the distribution of 21 service quality variables based on research findings. The graph provides a visual representation of efforts to enhance customer satisfaction through the Satisfaction Increment Index (SII) and reduce consumer dissatisfaction via the Decreasing Dissatisfaction Index (DDI). The analysis focuses on four quadrants of customer satisfaction coefficients: Quadrants I, II, IV, and III, as indicated in the accompanying figure. Analysis based on SII and DDI coefficients can

provide a comprehensive overview of the service quality of LRT Jabodebek. Therefore, this analysis can help enhance user satisfaction and improve overall service quality. The distribution of 21 service quality variables, as depicted in Figure 4 and classified into four quadrants of customer satisfaction coefficients (Quadrants I, II, IV, and III), offers insights.

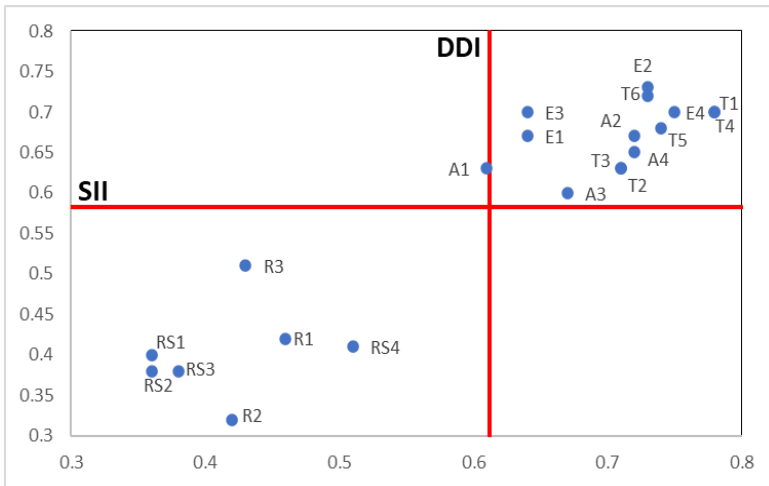


Fig. 4. Coefficient of Satisfaction Increment Index (SII) and Decreasing Dissatisfaction Index (DDI) of LRT Jabodebek Service Quality

Table 8. Customer Satisfaction Coefficient for LRT Jabodebek Service Quality

Quadrant II: Reduce dissatisfaction	Quadrant I: Reinforce priority
A1 : Traveling on the Jabodebek LRT train keeps you safe despite unusual situations	T1 : LRT train stations are clean
	T2 : LRT train stations are well lit
	T3 : LRT trains are well lit
	T4 : Condition of the LRT train is clean
	T5 : LRT trains and stations have good temperature and ventilation systems
	T6 : LRT trains are driven well
	E1 : Every LRT Jabodebek employee is always vigilant even if no problems occur
	E2 : LRT Jabodebek ride provides comfort for all passengers including children, elderly, people with disabilities and pregnant women.

- E3 : LRT Jabodebek employees always prioritize the interests of passengers
- E4 : LRT Jabodebek officials make it easy to plan a trip
- A2 : LRT Jabodebek employees serve politely
- A3 : LRT Jabodebek employees have been trained and become proficient
- A4 : LRT Jabodebek staff make passengers feel comfortable during the trip.

Quadrant III: Can ignore	Quadrant IV: Develop actively
R1 : LRT Jabodebek service reaches its destination	
R2 : LRT Jabodebek train schedule is adequate	
R3 : LRT Jabodebek departs and arrives on time	
RS1: LRT Jabodebek employees are prompt in helping	
RS2: LRT Jabodebek employees are responsive in providing services if there are complaints	
RS3: LRT Jabodebek staff always on standby to help	
RS4: LRT Jabodebek employees can provide timely and efficient services	

In the context of this study on LRT Jabodebek on Table 8, Quadrant I includes six tangible variables, four empathy variables, and three assurance variables. Quadrant II only has one assurance variable. In Quadrant III, there are three reliability variables and three responsiveness variables. The ranking order based on quadrants, according to Chen et al. [4], is Quadrant I, followed by Quadrant II, then Quadrant IV, and finally Quadrant III. From the studies by Chen et al. [4] and the LRT Jabodebek research, it can be concluded that the most important service quality dimensions are tangibles, empathy, and assurance. This conclusion is supported by the number of variables in these dimensions across both studies. Service managers should continuously strive to improve service quality across all dimensions, even though the dimensions in Quadrants I, II, and IV are more important than those in Quadrant III.

According to Chen et al. [4], when the coordinates of various service items fall within the same quadrant, the priority for quality improvement is set according to the proportion of Kano quality attributes. Quality attributes become the focus of improvement as indicated by the Kano model. For Quadrants I, II, and III, the improvement priority is must-be quality (M), followed by one-dimensional quality (O), and then attractive quality (A). In Quadrant IV, where the customer satisfaction coefficient is high but the customer dissatisfaction coefficient is low, the improvement priority is adjusted to attractive quality (A), followed by one-dimensional quality (O), and then must-be quality (M). The overall ranking for service quality improvement for LRT Jabodebek is presented in the following table 9.

Table 9. Ranking for Service Quality Improvement of LRT Jabodebek

Quadrant	Items	Improvement ranking
Quadrant I	E3 : LRT Jabodebek employees always prioritize the interests of passengers	1
	E1 : Every LRT Jabodebek employee is always vigilant even if no problems occur	2
	A3 : LRT Jabodebek employees have been trained and become proficient	3
	T6 : LRT trains are driven well	4
	T5 : LRT trains and stations have good temperature and ventilation systems	5
	A2 : LRT Jabodebek employees serve politely	6
	E2 : LRT Jabodebek ride provides comfort for all passengers including children, elderly, people with disabilities and pregnant women.	7
	T2 : LRT train stations are well lit	8
	A4 : LRT Jabodebek staff make passengers feel comfortable during the trip.	9
	T3 : LRT trains are well lit	10
	T1 : LRT train stations are clean	11
	T4 : Condition of the LRT train is clean	12
	E4 : LRT Jabodebek officials make it easy to plan a trip	13

Quadrant II	A1 : Traveling on the LRT Jabodebek train keeps you safe despite unusual situations	14
	R3 : LRT Jabodebek departs and arrives on time	15
	R1 : LRT Jabodebek service reaches its destination	16
	RS1: LRT Jabodebek employees are prompt in helping	17
	RS3: LRT Jabodebek staff always on standby to help	18
Quadrant III	RS4: LRT Jabodebek employees can provide timely and efficient services	19
	RS2: LRT Jabodebek employees are responsive in providing services if there are complaints	20
	R2 : LRT Jabodebek train schedule is adequate	21

The 21 variables in this study have been ranked according to their quadrant order, starting from Quadrant I, followed by Quadrants II, IV, and III. However, the variables are only distributed across three quadrants: Quadrants I, II, and III. This ranking follows the method used by Chen et al. [4], where the prioritization in Quadrants I, II, and III is based on must-be quality (M) values, followed by one-dimensional quality (O) values, and finally attractive quality (A) values.

Table 10. Satisfaction with LRT Jabodebek service quality items

Item	Improvement Ranking	Kano Classification	Satisfaction
T6 : LRT trains are driven well	4	O	4.28
T4 : Clean condition of LRT train	12	O	4.27
E2 : LRT Jabodebek ride provides comfort for all passengers including children, elderly, people with disabilities and pregnant women.	7	O	4.22
T1 : LRT train stations are clean	11	O	4.22
T5 : LRT trains and stations have good temperature and ventilation systems	5	O	4.22
T2 : LRT train stations are well lit	8	O	4.18
T3 : LRT trains are well lit	10	O	4.18

A4 : LRT Jabodebek employees make passengers feel comfortable during the trip	9	O	4.17
A2 : LRT Jabodebek employees serve politely	6	O	4.16
E3 : LRT Jabodebek employees always prioritize the interests of passengers	1	O	4.15
E4 : LRT Jabodebek officials make it easy to plan a trip	13	O	4.14
A3 : LRT Jabodebek employees have been trained and become proficient	3	O	4.13
A1 : Traveling on the LRT Jabodebek train keeps you safe despite unusual situations	14	O	4.09
E1: All LRT Jabodebek employees consistently maintain a high level of vigilance, even in the absence of any issues.	2	O	4.08
RS3 : LRT Jabodebek staff always on standby to help	18	I	3.99
RS1 : LRT Jabodebek employees are prompt in helping	17	I	3.93
RS2 : LRT Jabodebek employees are responsive in providing services if there are complaints	20	I	3.92
R3 : LRT Jabodebek departs and arrives on time	15	O	3.69
R2 : LRT Jabodebek train schedule is adequate	21	R	3.61
R1 : LRT Jabodebek service reaches its destination	16	R	3.56
RS4 : LRT Jabodebek employees can provide timely and efficient services	19	R	3.48

The analysis of satisfaction with the service quality items of LRT Jabodebek is presented in Table 10. As shown in this table, ten items that most require improvement are elements of one-dimensional quality (O). This means that improving these elements can increase satisfaction, but if their quality declines, satisfaction will also decrease. Scores below 4 indicate potential areas for improvement, predominantly involving indifferent quality (I) variables. Indifferent quality (I) elements are those that do not influence passenger satisfaction regardless of whether they are fulfilled or not. In the context of LRT Jabodebek services, these attributes may not significantly impact overall passenger satisfaction, but they are still important to address to enhance overall service standards. Addressing these aspects, even if they do not directly boost satisfaction, can prevent potential declines in the perceived quality of service among passengers. The reverse quality (R) variables in this study indicate elements that require attention to improve passenger

satisfaction. These aspects are critical for passengers and must always be met to avoid dissatisfaction. Reverse quality (R) refers to quality elements that cause dissatisfaction when met and satisfaction when unmet. In this context, if the train schedules are adequate, services reach their destinations, and staff provide timely and efficient service, passengers are likely not to feel satisfied because these elements might be expected as the minimum standard.

5 Conclusion

Service quality is a framework used to measure the quality of service, as exemplified by LRT Jabodebek in this study. Service quality can be assessed through five aspects: responsiveness, assurance, tangibles, empathy, and reliability. Each element of satisfaction has unique attributes, resulting in different impacts on satisfaction levels. Understanding these satisfaction elements alone is not sufficient; it is necessary to comprehend how each service element specifically affects satisfaction levels.

In the Kano model classification, the calculation of Kano quality attributes in this study identified attributes in the categories of one-dimensional quality (O), reverse quality (R), and indifferent quality (I). These findings indicate that the proportion of one-dimensional quality (O) attributes dominates the service quality of LRT Jabodebek. Therefore, improving the performance of attributes in the one-dimensional quality (O) category is essential for enhancing overall user satisfaction.

From the satisfaction analysis of LRT Jabodebek's service quality items, several key findings can be identified. Ten items with the highest improvement rankings primarily fall under one-dimensional quality (O), indicating that enhancements in these attributes can boost user satisfaction, while declines can reduce it. This highlights the importance of focusing on fundamental quality aspects to enhance the overall user experience. High-scoring O items emphasize the significance of aspects such as safety, cleanliness, comfort, and punctuality in LRT Jabodebek services.

However, some items with scores below 4 indicate potential areas for improvement, particularly regarding service timeliness and staff responsiveness to user complaints. Additionally, elements of reverse quality (R) and indifferent quality (I) underscore the need for further attention in enhancing user satisfaction, especially concerning adequate scheduling, service coverage, and readiness to assist.

6 Implication/Limitation and Suggestions

6.1 Managerial Implication

This research on understanding service quality provides valuable insights into the quality attributes that influence customer satisfaction when using LRT Jabodebek services. Such understanding can help management identify areas needing improvement and focus on aspects that contribute to overall customer satisfaction. Applying the Kano model in evaluating service quality can be a valuable tool for LRT Jabodebek management and other transportation service providers. It helps identify service attributes considered important by customers, guiding resource allocation

and efforts to enhance aspects that directly affect customer satisfaction. The research emphasizes the need for continuous efforts to improve service quality based on passenger feedback. This implies that management should be responsive to customer feedback and initiate changes that lead to increased customer satisfaction, higher ridership, and a positive public perception of the LRT Jabodebek system.

6.2 Limitation

The methodology is based on the application of the Kano model, which may have limitations in capturing all aspects of service quality and customer satisfaction. The study duration was limited to a specific time frame (April 2024 to May 2024), which might not fully encompass variations in service quality over different periods. Although the sample size was sufficiently large, it may not comprehensively represent the entire population of LRT Jabodebek users, potentially limiting the generalizability of the findings. Additionally, the scope of the study may not cover all potential factors influencing service quality and customer satisfaction, such as external economic factors, broader transportation infrastructure, or cultural aspects.

6.3 Suggestions

There are several options worth exploring to broaden the scope and enhance understanding of influential service quality factors in the future. Firstly, conducting a longitudinal study would assess the effectiveness of recommendations derived from the current research in improving service quality on LRT Jabodebek over time. Secondly, examining the impact of implementing the Kano model on customer satisfaction and overall perceptions of LRT Jabodebek services among the public could provide valuable insights. Thirdly, investigating the feasibility and potential challenges in sustaining improvements in service quality, based on passenger feedback and evolving needs, would focus on enhancing user satisfaction, increasing ridership, and fostering positive public perception of LRT Jabodebek. Fourthly, comparing the application of the Kano model in service quality management across different transportation systems would offer comparative insights. Lastly, analyzing the correlation between service quality, customer satisfaction, and ridership would provide understanding into how quality enhancements directly affect the utilization of LRT Jabodebek. These approaches could collectively contribute to a comprehensive understanding and improvement of service quality in public transportation systems.

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