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ORIGINAL RESEARCH

Public Transport Passenger Satisfaction in Surabaya Using Ordinal Logistic Regression and Importance Performance Analysis

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Abstract

Public transportation has an important role in everyday life, namely reducing congestion and avoiding traffic accidents. However, in reality, public transportation tends to be abandoned by the people of Surabaya. The tendency of public transportation to be abandoned by the people of Surabaya City is due to reduced public satisfaction with the quality of public transportation services. This study aims to determine the factors that affect the satisfaction of passengers in public transport in the city of Surabaya using ordinary logistic regression and to identify what service quality needs to be improved and maintained in urban transportation using the Importance Performance Analysis method. The results of this study indicate that 70% of passengers in public transport in Surabaya are dissatisfied with the quality of the public transport service. Variables that affect passenger satisfaction are reliability (the ability of the public transportation to provide the promised service immediately), responsiveness (the ability of the driver to assist passengers and provide responsive and fast service), assurance (the knowledge and ability of the driver to maintain passenger trust), empathy (care driver to passenger needs), direct evidence (passenger attractiveness to the physical facilities of the public transportation) and transportation fares. The variable of service quality that becomes the main priority for improvement is the ability of the driver to provide the promised service immediately, the knowledge, ability, courtesy, and safety of the driver in carrying out their duties, as well as attractiveness to physical facilities.

KEYWORDS:

Importance Performance Analysis, Ordinal Logistic Regression, Public Transportation, Quality Service

1 | INTRODUCTION

Surabaya is the largest metropolitan city in East Java with a population of 2.87 million in 2020[1]. In addition to being the largest metropolitan city in East Java, the City of Surabaya also has traffic problems that need to be reviewed and addressed, one of which is congestion. The results of the Global Traffic Scorecard research in 2021 stated that the city of Surabaya was the first most congested city in Indonesia with the total amount of time wasted in traffic jams during the peak hour period reaching 62 hours a year. According to Kasatlantas, Surabaya City stated that the congestion that occurred in the city of Surabaya was due to the increasing activities of residents using motorized vehicles[2].

Based on these problems, public transportation is needed in the city of Surabaya to help reduce congestion. However, in reality, public transportation, especially minibuses in the city of Surabaya, tends to be abandoned by the community. This is evidenced by the number of public transport (bemo) passengers arriving and departing at Purabaya Terminal, Joyoboyo Terminal, Tambakoso Terminal and Bratang Terminal experiencing a significant decline in 2021. The number of passengers arriving at the four terminals reached 490,132 passengers and the number of departing passengers decreased by 530,559 passengers.

The tendency for public transportation (bemo) to be abandoned by the community is due to public dissatisfaction with the quality of public transport (bemo)ation services in the city of Surabaya.

This decrease in the number of passengers has a major impact on the public transport (bemo) driver, namely the reduced income of the driver. The problem faced by public transport (bemo) drivers today is how to maintain or increase the number of passengers so that public transport (bemo) drivers can maintain their lives.

This study aims to analyze the factors that influence the satisfaction of public transport (bemo) passengers in the city of Surabaya on the quality of transportation services using Ordinal Logistics Regression. This study also aims to find out what service quality needs to be improved in every public transportation in the city of Surabaya by using the Importance Performance Analysis method.

2 | METHOD

This study uses the Ordinal Logistics Regression method and Importance Performance Analysis. Ordinal Logistic Regression is used to find the effect of predictor variables on response variables where the response variable is polychotomous. The use of Ordinal Logistic Regression is used to find out the influence of variables that affect satisfaction.

Importance Performance Analysis (IPA) is used to measure the gap between the level of importance and the level of performance of public transport. The results of the IPA analysis will show service quality indicators that need to be evaluated or improved. In addition, the results of the IPA analysis also show that the service quality is quite good.

2.1 | Previous Study

This research based on several previous studies which can be seen in Table 1 .

2.2 | Customer Satisfaction

Customer satisfaction is a comparison between customer expectations of a service or product with the experience of the service or product perceived by the customer[8].

Customer satisfaction will be felt if the customer gets an experience that matches or exceeds customer expectations. Customer satisfaction arises when the quality of a service provided by a service provider equals or exceeds customer expectations. Disappointed customers will have a bad impact on the company because customers have the potential to spread their experiences so that the company's image decreases. This is bad for the company because it is very likely that prospective customers or existing customers will be affected so they are reluctant to use the service again[9].

TABLE 1 Previous Studies.

Source	Result
Wattimena et al (2017)	This study uses the SEM-PLS method. The results of the study explain that service quality affects Go-Ride customer satisfaction.[2]
Paputungan et al (2017)	This study uses the SEM-PLS method. The results of the study explain that service quality has an effect on customer satisfaction. Service quality is measured based on 5 dimensions, namely reliability, responsiveness, empathy, tangible and assurance[3].
Hasbi (2021)	The people of Surabaya feel dissatisfied by 61.02% of public transportation (bemo) in Surabaya. This study uses the Customer Satisfaction Index method where only the percentage of satisfaction is obtained without knowing the factors that influence satisfaction[4].
Steffany (2021)	This study uses the SEM-PLS method. The results of the study showed that the tariff and service quality had an influence on the satisfaction of Grab-Car transportation users[5].
Pentury (2016)	This study uses the SEM-PLS method. The results of the study explain that the variables that affect customer satisfaction are reliability and responsiveness[6].
Proposed Study	This study uses Ordinal Logistics Regression to find out what variables affect passenger satisfaction. The results of the factors that influence passenger satisfaction are reliability, responsiveness, empathy, assurance, tangibles and transportation fares. In addition, this study also uses the Importance Performance Analysis method which is used to find out what indicators need to be improved[7]

2.3 | Public Transportation

Public transportation is any vehicle used to transport people or goods from one place to another for a fee[10]. In the city of Surabaya itself, there are 2 types of land public transportation that are still used, including city buses, trains and minibuses. This research uses public transport (bemo) as the object of research.

Public transport (bemo) is a motorized transportation equipped with seating for a maximum of eight people, excluding the driver's seat which is bound in a fixed and regular transportation route. Public transportation, which is the subject of research as shown in Figure 1 .

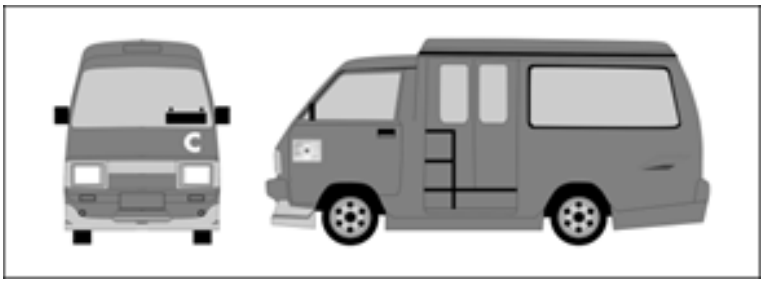

FIGURE 1 Public Transportation.

2.4 | Service Quality

Service quality is the company's ability to meet customer needs. Service quality is measured in five dimensions including reliability, responsiveness, assurance, empathy and tangibles [11].

Reliability relates to the ability of a company or organization to deliver the promised service promptly. Responsiveness relates to the ability of service providers to provide responsive and fast services. The guarantee includes the driver's ability to maintain customer trust. Empathy is concerned with providing care, attention, understanding of customer needs and appropriate operating hours. Physical evidence relates to the attractiveness of physical facilities such as equipment and materials used [12].

2.5 | Ordinal Logistic Regression

Ordinal logistic regression is a statistical method used to analyze the effect of predictor variables on the response variable, where the response variable has an ordinal scale with more than two categories. The model used in ordinal logistic regression is the logit model obtained from the cumulative probability of less than or equal to the r-th response category on p predictor variables [13]. The ordinal logistic regression model is generally expressed in Equation 1.

$$\text{Logit}\left(P(Y \le r \mid x)\right) = \ln\left(\frac{P(Y \le r \mid \mathbf{x})}{P(Y > r \mid \mathbf{x})}\right) = (\alpha_r + \sum_{i=1}^{p} \beta_i x_i) \tag{1}$$

Where r = 1,2, …. R is the response category. This study uses ordinal logistic regression because the response variables used are categorical and have levels.

1. Model Parameter Estimation. The model parameters in ordinal logistic regression were estimated using the Maximum Likelihood Estimation (MLE) method. MLE is obtained by differentiating L(β) with respect to and equating to zero. MLE was used to estimate the variance and covariance of the estimated obtained from the second derivative of the ln-Likelihood function [13]. The likelihood function for a sample with n observations is as Equation 2.

$$\ell(\boldsymbol{\beta}) = \prod_{i=1}^{n} \left[\pi_1(\mathbf{x}_i)^{y_1} \pi_2(\mathbf{x}_i)^{y_2} \pi_3(\mathbf{x}_i)^{y_3}\right] \tag{2}$$

2. Simultaneous Testing of Parameter Significance. Parameter significance testing was conducted to determine whether the predictor variables contained in the model had a significant effect on the response variable. Simultaneous testing is carried out to check the significance of the coefficient simultaneously [14].

   $H_0 : \beta_0 = \beta_1 = \beta_2 = \cdots = \beta_i$
   H_1 : There is one $\beta_i \neq 0 \quad \text{for} \quad i = 1, 2, \ldots, p$
   H_0 : Predictor variables have no significant effect on the model.
   H_1 : There is at least one predictor variable that has a significant effect on the model. The test statistic used is the Likelihood Ratio Test as shown in Equation (3). With a significance level of
   $\alpha, H_0 is rejected if the value G^2 > \chi^2_{(df;\alpha)}, \quad$ where $\chi^2_{(db;\alpha)}$
   indicates the value of a random variable in the chi-square distribution table at degrees db or p-value $< \alpha$

$$G^2 = -2 \ln\left[\frac{n}{\sum_{i=1}^{n} \hat{\pi}_i^{y_i} (1 - \hat{\pi}_i)^{(1-y_i)}}\right] \tag{3}$$

3. Partial Testing of Parameter Significance. Partial testing was conducted to determine the effect of each predictor variable on the response variable [15].

   $H_0 : \beta_i = 0 \quad \text{for} \quad i = 1, 2, \ldots, p$ (number of parameters)
   $H_1 : \beta_i \neq 0 \quad \text{for} \quad i = 1, 2, \ldots, p$ (number of parameters)
   H_0 : The predictor variable category has no significant effect on the response variable.

H_1 : The predictor variable category has a significant effect on the response variable.

The test statistic used is the Wald value as shown in Equation (4). With a significance level of α, H_0 is rejected if the value $W > \chi^2(a;1)$, where $\chi^2(a;1)$ indicates the value of a random variable in the chi-square distribution table at degrees of freedom db, or if the P-value $< \alpha$.

$$\hat{\beta}_i \quad W = \frac{\hat{\beta}}{SE\hat{\beta}_i)} \tag{4}$$

$SE(\hat{\beta}_i) = \sqrt{\text{var}(\hat{\beta}_i)}$

4. Model Interpretation. Parameter coefficients in ordinal logistic regression were interpreted using the odds ratio value[9]. If the odds value is equal to one, it means that the probability of success is equal to the probability of failure, but if the odds value is less than one, it means that the probability of success is less than the probability of failure and vice versa.

$$\frac{\exp(\beta_0 + \beta_1 + \beta_1 x)}{\exp(\beta_0 + \beta_1 x)} = e^{\beta_1} \tag{5}$$

2.6 | Importance Performance Analysis

Importance Performance Analysis (IPA) is a method for measuring the gap between the level of importance and the level of performance perceived by customers for a company or organization. The results of the IPA analysis are visually described using a Cartesian diagram. The diagram is divided into 4 quadrants, where the quadrant shows the conditions for each service variable[15].

FIGURE 2 IPA Cartesian Diagram

Figure 2 shows there are four quadrants. Quadrant 1 shows the service elements that have the highest customer expectations, but customer satisfaction has been obtained. Quadrant II shows the service elements that are expected to be very high by customers, but in fact satisfaction with these elements has not met customer expectations. Quadrant III shows the level of reality and low customer expectations. Quadrant IV shows a higher level of reality than the level of low customer expectations.

2.7 | Data

Data collection in this study used the face-to-face interview (F2F) method. The respondents are (1) passenger who are currently using public transportation or have used public transportation in the city of Surabaya at least 3 times a week for the last 3 months,

and (2) respondents are of productive age, namely 15-64 years. Sampling in this study used simple random sampling (SRS) with an error limit of 10% and a significance level of 4%. The number of respondents who became the sample in this study was 97 respondents spread across the city of Surabaya.

2.8 | Research Variable

The variables in this study consisted of passenger demographic variables consisting of type of work, age, last education, gender of passengers and the level of monthly income of passengers. These demographic variables are only used to describe the characteristics of passengers. Meanwhile, passenger satisfaction variables are presented in Table 2 .

TABLE 2 Research Variable

Variable	Description	Category
Y	Satisfaction of public transport passengers	1. Dissatisfied 2. Quite Satisfied 3. Satisfied
x_1	Reliability	1. Very Dissatisfied 2. Dissatisfied 3. Quite Satisfied 4. Satisfied 5. Very Satisfied
x_2	Responsiveness	Same as x_1
x_3	Assurance	Same as x_1
x_4	Empathy	Same as x_1
x_5	Tangibles	Same as x_1
x_6	Transportation rates	Continuous

The operational definition and explanation of the relationship between predictor variables and response variables in this study are as follows. (a) Satisfaction of Public Transport Passenger (Y) Passenger satisfaction is the result felt by passengers when driving a public transport (bemo). There are three categories of customer satisfaction used, namely dissatisfied, quite satisfied and satisfied.

1. Reliability (x_1)
   Reliability is a dimension related to the ability of public transportation to provide services that are promised to be accurate and satisfactory immediately.
   Reliability is measured by several questions including passenger satisfaction with the friendliness and courtesy of the driver in serving passengers (X1,1), the driver's ability to carry out work (X1,2), security at the public transport (bemo) (X1,3), accuracy of the schedule for departure and arrival of the public transport (bemo). (X1,4), ease of obtaining information on price rates (X1,5).

2. Responsiveness (x_2)
   Responsiveness relates to the willingness and ability of public transport (bemo) drivers to help passengers and provide responsive and fast service.
   Responsiveness is measured by several questions including passenger satisfaction with fast and precise driver service (X2,1), driver concern for passenger needs (X2,2), driver alertness in responding to passenger questions (X2,3) and driver alertness in responding to complaints. passengers (X2,4).

3. Assurance (x_3)
   Assurance includes knowledge, ability, courtesy, driver safety and how the driver's ability to maintain trust, so that

passengers are free from doubt and risk.
This dimension is measured by several questions including passenger satisfaction with the driver's vigilance when driving the public transport (bemo) (X3,1), the orderliness of the driver in driving the public transport (bemo) (X3,2), the skill of the driver in carrying out his duties (X3,3), and the suitability of the route or path of the public transport (bemo) (X3,4).

4. Empathy (x_4)
Empathy is shown by providing care, attention, understanding of passenger needs and appropriate operating hours.
Empathy is measured by several questions including passenger satisfaction with the information provided by good and easy to understand language (X4,1), the driver's patience in providing services (X4,2), the availability of easy

access to information (X4,3) and prompt driver service during working hours (X4,4).

5. Tangibles (x_5)
Tangibles are related to the attractiveness of physical facilities such as the equipment and materials used by the public transport (bemo) as well as the appearance of the public transport (bemo) and the public transport (bemo) driver.
Direct Evidence is measured by several questions including passenger satisfaction with cleanliness in the public transport (bemo) (X5,1), the design and arrangement of the exterior and interior of the public transport (bemo) that is attractive, clean and comfortable (X5,2) and (X5,3), availability of lights (X5,4), comfortable seats (X5,5), air circulation and the passenger bell in the public transport (bemo) (X5,6) and (X5,7).

6. Transportation rates (x_6)
Transportation fare is the price paid by passengers to use the public transport (bemo). The variable of transportation fare is measured by several questions including passenger satisfaction with the affordability of the tariff set by the driver (X6,1) and the suitability of the tariff with the quality of service received by the passenger (X6,2).

2.9 | Research Methodology

The analysis steps in this study were as follows:

1. Test the validity and reliability of the variable data that is thought to have an effect on passenger satisfaction with the quality of public transport (bemo).
2. Describe the characteristics of public transport (bemo) passengers in Surabaya.
3. Conduct an independence test using Likelihood test.
4. Identify variables that are thought to affect the satisfaction of public transport (bemo) passengers by using Ordinal Logistic Regression with the following stages
   (a) Perform parameter estimation
   (b) Performing the significance test simultaneously
   (c) Performing a partial significance test
   (d) Interpret model.
5. Analyzing the gap between reality and expectations that affect the satisfaction of public transport (bemo) passengers in Surabaya using Importance Performance Analysis
6. Interpret the results of the analysis
7. Draw conclusions and suggestions.

3 | RESULTS AND DISCUSSION

3.1 | Passengers Characteristics

The characteristics of public transport (bemo) passengers in Surabaya are shown in Figure 3 .

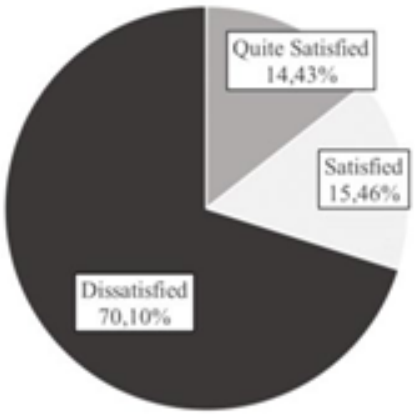

FIGURE 3 Passengers Satisfaction

Figure 3 explains that there are 70.10% of public transport passengers (bemo) who are not satisfied with the quality of public transport services (bemo). There are 15.46% of public transport passengers (bemo) who are satisfied with the quality of public transport services (bemo) while the remaining 14.43% are quite satisfied.

3.2 | Result of Independence Test

The independence test is used to determine the relationship between the predictor variables and the response variable (passenger satisfaction). Hypothesis:
H0: There is no relationship between passenger satisfaction and the variables that are thought to influence it.
H1: There is a relationship between passenger satisfaction and the variables that are thought to influence it.
With a significance level (α) sebesar 0, 100, H_0 is rejected if the value of $G^2 > \chi^2(\alpha, db)$ atau $p\text{-}value < \alpha$. The test results are shown in Table 3 .

TABLE 3 Independence Test Result

Variabel	df	G^2	$\chi^2(\alpha, df)$	P-value
x_1	4	79,303	7,779	0,000
x_2	4	26,822	7,779	0,000
x_3	4	68,841	7,779	0,000
x_4	4	56,430	7,779	0,000
x_5	4	61,117	7,779	0,000
x_6	4	13,648	7,779	0,009

Tabel 3 menunjukkan bahwa hasil uji kemandirian menunjukkan adanya hubungan antara kepuasan penumpang dan seluruh variabel prediktor, yaitu reliabilitas (X_1), daya tanggap (X_2), jaminan (X_3), empati (X_4), bukti fisik (X_5), dan tarif transportasi (X_6). Hal ini dibuktikan dengan nilai G^2 yang lebih besar dari $\chi^2(\alpha, db)$ dan $p\text{-}value$ yang lebih kecil dari 0,100, yang juga memperkuat hipotesis.

3.3 | Ordinal Logistic Regression

Ordinal logistic regression analysis was used to determine the effect of predictor variables on response variables. The following are the results of the ordinal logistic regression analysis of the satisfaction of public transport passengers (bemo) in the city of Surabaya.

1. Parameter Estimation Model The estimation result of β of all predictor variables that are thought to affect the satisfaction of public transport passengers (bemo) in Surabaya are shown in Table 4 .

TABLE 4 Hasil Estimasi Parameter.

Variabel	β
Konstanta (1)	-24,434
Konstanta (2)	-16,677
X_1 (1)	-4,740
X_1 (2)	-4,962
X_2 (1)	-6,781
X_2 (2)	-1,806
X_3 (1)	-11,521
X_3 (2)	-3,067
X_4 (1)	-1,529
X_4 (2)	-6,084
X_5 (1)	-26,028
X_5 (2)	-4,045
X_6 (1)	-3,461
X_6 (2)	-3,871

Table 4 shows the results of the initial β parameter estimation. Then the initial model obtained is as follows:

$$\begin{aligned}\hat{g}_1(x)\& &= -24{,}434 - 4{,}740X_1^{(1)} - 4{,}962X_1^{(2)} - 6{,}781X_2^{(1)} - 1{,}806X_2^{(2)}\\ \& &\quad - 11{,}521X_3^{(1)} - 3{,}067X_3^{(2)} - 1{,}529X_4^{(1)} - 6{,}084X_4^{(2)}\\ \& &\quad - 26{,}028X_5^{(1)} - 4{,}045X_5^{(2)} - 3{,}461X_6^{(1)} - 3{,}871X_6^{(2)}\end{aligned}$$

$$\begin{aligned}\hat{g}_2(x)\& &= -16{,}677 - 4{,}740X_1^{(1)} - 4{,}962X_1^{(2)} - 6{,}781X_2^{(1)} - 1{,}806X_2^{(2)}\\ \& &\quad - 11{,}521X_3^{(1)} - 3{,}067X_3^{(2)} - 1{,}529X_4^{(1)} - 6{,}084X_4^{(2)}\\ \& &\quad - 26{,}028X_5^{(1)} - 4{,}045X_5^{(2)} - 3{,}461X_6^{(1)} - 3{,}871X_6^{(2)}\end{aligned}$$

After estimating the initial parameters of β, the analysis continued by testing the significance of the parameters simultaneously.

2. Simultaneous Testing of Parameter Significance Simultaneous testing of parameter significance was carried out to determine the effect of predictor variables simultaneously on passenger satisfaction of public transport (bemo).

Hipotesis:

$$H_0 : \beta_1 = \beta_2 = \beta_3 = \cdots = \beta_6 = 0$$
$$H_1 : \text{At least there is one } \beta_k \neq 0,$$
$$\text{with} k = 1, 2, 3, \ldots, 6$$

With a significance level of $\alpha = 0{,}100$, H_0 dis rejected if the value of :

$$G^2 > \chi^2(\alpha, \text{db}) \quad \text{or} \quad p\text{-value} < \alpha$$

The test results are shown in Table 5 .

TABLE 5 Hasil Uji Simultan Parameter

Model	df	G^2	$\chi^2(\alpha, df)$	P-value
Model	12	155,287	18,549	0,000

Tabel 5 menunjukkan bahwa nilai G^2 sebesar 155,287 lebih besar dari $\chi^2(\alpha, \text{db})$ sebesar 18,549, yang berarti bahwa minimal terdapat satu variabel prediktor yang berpengaruh signifikan terhadap kepuasan penumpang angkutan umum *public transport* (bemo). Hal ini didukung oleh nilai *p-value* yaitu 0,000 yang lebih kecil dari α sebesar 0,100. Dengan demikian, pengujian dapat dilanjutkan pada tahap pengujian secara parsial, yang bertujuan untuk mengidentifikasi variabel prediktor mana yang berpengaruh signifikan terhadap kepuasan penumpang angkutan umum *public transport* (bemo).

3. Partial Test of Parameter Significance Testing the significance of the parameters partially is done to find out which variables affect the satisfaction of passengers on public transport (bemo).

Hipotesis:

$$H_0 : \beta_i = 0, \quad i = 1, 2, 3, 4, 5, 6(numbers of parameters)$$
$$H_1 : \beta_i \neq 0, \quad i = 1, 2, 3, 4, 5, 6(numbers of parameters)$$

DWith a significance level $\alpha = 0{,}100$, H_0 is rejected if the value of $W > \chi^2(\alpha, \text{db})$ where $\chi^2(\alpha, \text{db})$ indicates the value of the random variable in the table chi-square distribution or Pvalue . The test results are shown in Table 6 .

Table 6 shows that the ability of public transport (bemo) to provide services that are promised immediately (reliability), the ability of the driver to provide responsive and fast service (responsiveness), the ability and knowledge of the driver in maintaining passenger confidence so that passengers can be free from doubts and risks. (assurance), the driver's patience and concern for the needs of passengers (empathy), physical public transport facilities (bemo) (tangibles) and transportation fares affect passenger satisfaction.

TABLE 6 Hasil Uji Parsial Parameter

Variabel	B	W	df	$\chi^2(\alpha, df)$	P-value
Konstanta (1)	-24,434	7,133	1	2,705	0,008
Konstanta (2)	-16,670	6,911	1	2,705	0,009
X_1 (1)	-4,740	5,040	1	2,705	0,025
X_1 (2)	-4,962	6,640	1	2,705	0,010
X_2 (1)	-6,781	3,612	1	2,705	0,057
X_2 (2)	-1,806	0,810	1	2,705	0,368
X_3 (1)	-11,521	8,005	1	2,705	0,005
X_3 (2)	-3,067	3,732	1	2,705	0,053
X_4 (1)	-1,529	0,593	1	2,705	0,441
X_4 (2)	-6,084	4,869	1	2,705	0,027
X_5 (1)	-26,028	0,000	1	2,705	0,986
X_5 (2)	-4,045	4,614	1	2,705	0,032
X_6 (1)	-3,461	2,557	1	2,705	0,110
X_6 (2)	-3,871	3,348	1	2,705	0,067

The logit model that is formed based on the satisfaction variable that has been significant to the satisfaction of public transport (bemo) passengers in the city of Surabaya will be written as follows.

$$Logit\left(P(Y \leq 1 \mid x_i)\right) \& = -24{,}434 - 4{,}740\, X_1^{(1)} - 4{,}962\, X_1^{(2)} - 6{,}781\, X_2^{(1)} - 11{,}521\, X_3^{(1)}$$
$$\& \quad - 3{,}067\, X_3^{(2)} - 6{,}084\, X_4^{(2)} - 4{,}045\, X_5^{(2)} - 3{,}871\, X_6^{(2)}$$

$$Logit\left(P(Y \leq 2 \mid x_i)\right) \& = -16{,}677 - 4{,}740\, X_1^{(1)} - 4{,}962\, X_1^{(2)} - 6{,}781\, X_2^{(1)} - 11{,}521\, X_3^{(1)}$$
$$\& \quad - 3{,}067\, X_3^{(2)} - 6{,}084\, X_4^{(2)} - 4{,}045\, X_5^{(2)} - 3{,}871\, X_6^{(2)}$$

4. Model Interpretation The odds ratio value is used to facilitate the interpretation of the model from the significant predictor variables. The results of the odds ratio value are shown in Table 7

TABLE 7 Hasil Odds Ratio.

Variabel	B	Exp(β)	1 / Exp(β)
X_1 (1)	-4,740	0,0087	114,434
X_1 (2)	-4,962	0,0069	142,879
X_2 (1)	-6,781	0,0011	880,949
X_3 (1)	-11,521	0,9919	1,008
X_3 (2)	-3,067	0,0465	21,477
X_4 (2)	-6,084	0,0022	438,780
X_5 (2)	-4,045	0,0175	57,111
X_6 (2)	-3,871	0,0208	47,990

Table 7 shows that passengers who are satisfied with the ability of public transport (bemo) in providing the promised service immediately and accurately have a risk of 0.0087 times compared to those who are dissatisfied or in other words, passengers who are dissatisfied with the ability of public transport (bemo) in providing services that are promised immediately and accurately (variable reliability) have a risk of 114 times compared to those who are satisfied. Meanwhile, passengers who are quite satisfied with the ability of public transport (bemo) to provide services that are promised immediately and accurately have a risk of 0.0069 times compared to those who are dissatisfied or in other words, passengers who are dissatisfied with the ability of public transport (bemo) in providing services. Promised immediately and accurately (reliability variable) has a risk of 143 times compared to those who are quite satisfied. Passengers who are satisfied with the driver's ability to provide responsive and fast service have a risk of 0.0011 times compared to those who are dissatisfied or in other words, passengers who are dissatisfied with the driver's ability to provide responsive and fast service (responsiveness variable) have a risk of 881 times compared to satisfied.

Passengers who are satisfied with the driver's ability to maintain trust have a risk of 0.9919 times compared to those who are dissatisfied or in other words, passengers who are dissatisfied with the driver's ability to maintain trust (assurance variable) have a risk of 1.008 times compared to those who are satisfied.

Meanwhile, passengers who are quite satisfied with the driver's ability to maintain trust have a risk of 0.0465 times compared to those who are dissatisfied or in other

words, passengers who are not satisfied with the driver's ability to maintain passenger trust (assurance variable) have a risk of 21 times compared to those who are quite satisfied.

Passengers who are quite satisfied with the driver's concern for the needs of passengers have a risk of 0.0022 times compared to those who are dissatisfied or in other words, passengers who are not satisfied with the driver's concern for the needs of passengers (the empathy variable) have a risk of 439 times compared to those who are quite satisfied.

Passengers who are quite satisfied with physical facilities on public transport (bemo) have a 0.0175 times risk compared to those who are dissatisfied or in other words passengers who are not satisfied with physical facilities on public transport (bemo) (tangible variable) had 57 times the risk compared to those who were quite satisfied.

Passengers who are quite satisfied with transportation fares have a risk of 0.0208 times compared to those who are dissatisfied or in other words, passengers who are dissatisfied with transportation fares (transportation rate variables) have a risk of 48 times compared to those who are quite satisfied.

3.4 | Result of Importance Performance Analysis

Importance performance analysis (IPA) is used to analyze indicators of the quality of public transport services that must be improved, maintained, low priority or excessive. There are 29 indicators grouped into 6 variables. IPA results are shown in Figure 4 .

Figure 4 shows that in quadrant I there are 9 indicators, namely safety when in public transport (bemo) (attribute number 3), accuracy of departure and arrival schedules of public transport (bemo) (4), driver vigilance and orderliness when driving public transport (bemo). bemo) (10), cleanliness in public transport (bemo) (18), attractive, clean and comfortable exterior and interior design and arrangement of public transport (bemo) (19 and 20), availability of comfortable seats (22) and air circulation in public transport (bemo) (23). This is a service that is a top priority for evaluation or improvement because the expectations or expectations of passengers are higher than the reality received by passengers.

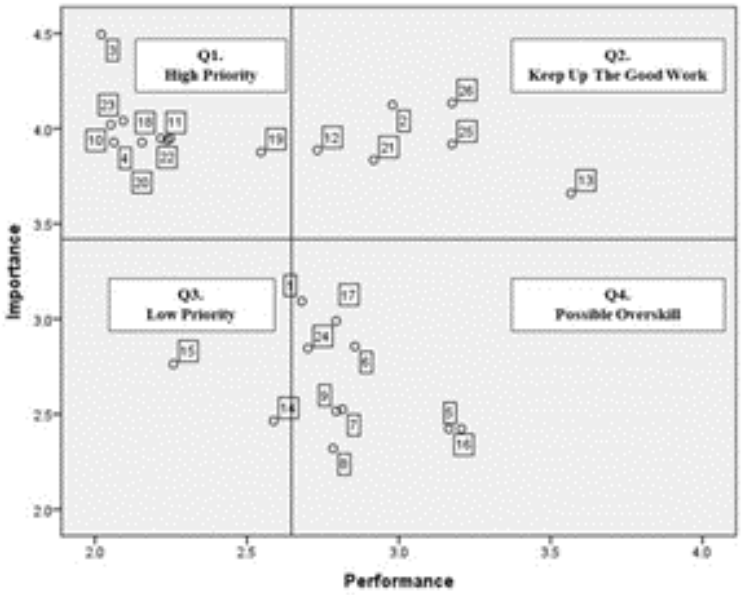

FIGURE 4 Result of IPA Diagram

Quadrant II contains 6 indicators, namely the ability and skills of the driver in carrying out work (2 and 12), the suitability of the route or path of public transport (bemo) (13), the availability of lights in public transport (bemo) (21), the affordability of the stipulated tariff (25) and the suitability of tariffs with the quality of service received (26). The six indicators are indicators that are considered to be by the reality received by passengers. These indicators must be maintained because these indicators are considered superior by public transport passengers (bemo) in the city of Surabaya.

Quadrant III contains 2 indicators, namely the provision of information in good language and easily understood by the driver (14) and the driver's patience in providing services (15). These two indicators are indicators of low priority nature, which means they are not too important for public transport passengers in the city of Surabaya and fact the performance of these indicators is not too special.

In quadrant IV there are 9 indicators, namely the friendliness and courtesy of the driver in serving passengers (1), ease of obtaining information on price rates (5), fast and precise driver service (6), concern for the driver to the needs of passengers (7), alertness and the dexterity of the driver in responding to passenger questions and passenger complaints (8 and 9), the

availability of easy access to information (16), the prompt service of the driver during working hours (17) and the availability of the passenger bell in public transport (bemo) (24).

These nine indicators are services that are considered less important but the service felt by passengers is satisfactory. This is considered good, but it is very wasteful in providing space and costs, so it needs to be reviewed.

4 | CONCLUSION

The conclusion obtained in this study is that the majority of public transport passengers (bemo) in the city of Surabaya are dissatisfied with the quality of public transport services (bemo) (70.10%). The satisfaction of public transport passengers (bemo) is influenced by the variables of reliability, responsiveness, assurance, empathy, direct evidence and transportation fares. These six variables have a great opportunity for passengers to feel satisfied with the quality of public transport services (bemo). Indicators that must be improved from the quality of public transport (bemo) services are safety when in public transport (bemo) and the accuracy of the departure and arrival schedule for public transport (bemo) driver vigilance and driver order in driving public transport (bemo). cleanliness in public transport (bemo), exterior and interior design and arrangement of public transport (bemo) as well as the availability of seats and air circulation in public transport (bemo). Thus, it is hoped that these variables will be repaired immediately to increase passenger satisfaction.

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CREDIT

References

1. Zaldy Purwa dCB Hera Widyastuti. Surabaya menjadi kota Metropolitan Terbesar di Jawa Timur. Jurnal Transportasi 2021;https://www.mendeley.com/search/?page=1&query=Surabaya%20menjadi%20kota%20Metropolitan%20Terbesar%20di%20Jawa%20Timur&sortBy=relevance.

2. Wattimena A, Talakua M, Temartenan V. Pemodelan Tingkat Kepuasan Masyarakat Terhadap Proses Pelayanan Pembuatan SIM di Satlantas Polres Ambon Menggunakan Regresi Logistik Ordinal. Jurnal Ilmu Matematika dan Terapan 2017;11:85–94. file:///C:/Users/DRPM-ITS/Downloads/349-Article%20Text-1518-1-10-20180430.pdf.

3. Paputungan NW, Langi YA, Prang JD. Analisis Regresi Logistik Ordinal Pada Tingkat Kepuasan Pengguna Jasa Terhadap Pelayanan di Bandara Internasional Sam Ratulangi Manado. Jurnal Universitas Sam Ratulangi 2016;5:72–79. file:///C:/Users/DRPM-ITS/Downloads/jm_dc,+02_Ninda+W.+Paputungan_72-79.pdf.

4. Hasbi MM. Tinjauan Kinerja pelayanan Angkutan umum Jlanan Arteri Primer Kota Palopo. Jurnal Peradaban Sains, Rekayasa dan Teknologi 2021;p. 113–124. file:///C:/Users/DRPM-ITS/Downloads/pengelola,+ARTIKEL+3.pdf.

5. Steffany Revina Wulandari aS. Pengaruh Tarif Dan Kualitas Pelayanan Terhadap Kepuasan Yang Berdampak Kepada Loyalitas Masyarakat Kota Medan Menggunakan Transportasi Grab-Car. Jurnal Management and Bisnis 2021;3:67–78. file:///C:/Users/DRPM-ITS/Downloads/Pengaruh_Kualitas_Pelayanan_Harga_dan_Citra_Merek_.pdf.

6. Pentury TA, Wattimena SN. Analisis Regresi Logistik Ordinal untuk Menganalisis Tingkat Kepuasan Nasabah Terhadap Kualitas Pelayanan PT. Bank 9 Jambi (Persero) Tbk. Cabang Muara Bulian. Jurnal Ilmu Matematika dan Terapan 2020;p. 55–60. file:///C:/Users/DRPM-ITS/Downloads/299-Article%20Text-1282-1-10-20180205.pdf.

7. Jasfar F. Teori dan aplikasi sembilan kunci keberhasilan bisnis jasa: sumber daya manusia, inovasi, dan kepuasan pelanggan. Salemba Empat 2012;p. 1–176. https://digilib.umsu.ac.id/index.php?p=show_detail&id=13454.

8. Angraini N. Mengukur Kepuasan Pelanggan. Jakarta: January; 2023. file:///C:/Users/DRPM-ITS/Downloads/43447-108217-2-PB-3.pdf.

9. de RozariYudi Hari Wibowo A. Penerapan Metode Importance Performance Analysis (IPA) Untuk Menganalisis Kinerja Suroboyo Bus Sebagai Moda Transportasi Umum Berdasarkan Tingkat Kepuasan Pengguna. Jurnal Ilmiah Matematika 2015;4:1–15. file:///C:/Users/DRPM-ITS/Downloads/mathunesa,+34.Bagas+Saputra_16030214032+(239-253).pdf.

10. Vieira AL. Delivering Quality Service, vol. 6. New York: September; 2005. https://www.tandfonline.com/doi/abs/10.1300/J162v06n01_03.

11. Hosmer DW, Lemeshow S. Applied Logistic Regression, vol. 47. New York City: John Wiley & Sons, Inc.; 2000. https://www.jstor.org/stable/2532419?origin=crossref.

12. Withers SD. Categorical Data Analysis, vol. 1. New York: July; 2009. https://www.sciencedirect.com/science/article/abs/pii/B9780080449104004090?via%3Dihub.

13. de Rozari A, Wibowo YH. Faktor-faktor Yang Menyebabkan Kemacetan Lalu Lintas di Jalan Utama Kota Surabaya. JPAP (Jurnal Penelitian Administrasi Publik) 2015;1:42–57. https://core.ac.uk/download/pdf/293642484.pdf.

14. T SE. Pembelajaran Biologi Terkait Materi Bakteri Probiotik dalam Pencernaan Manusia Menggunakan Model Bersiklus. Bandung: November; 2021. file:///C:/Users/DRPM-ITS/Downloads/5075-Article%20Text-15631-1-10-20211116.pdf.

15. Richard FG. Mengukur Kepuasan Pelanggan. Ilmu Administrasi Bisnis Fakultas Ilmu Sosial dan Hukum (JADBISFISH) 2023;2:1–14. file:///C:/Users/DRPM-ITS/Downloads/43447-108217-2-PB.pdf.

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