Applying Important Performance Analysis for Jabodetabek Commuter Train Services

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Abstract- **People's mobility in the Greater Jakarta area requires effective and efficient transportation services. At present, many modes of transportation are competing to improve the quality of services to the users, which include the commuter trains that are managed by PT. Kereta Commuter Indonesia (PT. KCI). Research is needed to determine the level of services provided by PT. KCI. Here, the researcher analyzes the effectiveness of the services of the Jabodetabek commuter train of Bogor - Tanah Abang route, especially the services at Bogor and Manggarai stations as well as on the train. The research was carried out through a questionnaire survey that produced primary data. The secondary data was obtained from PT. KCI for further processing. The method used is the validity, reliability, Importance Performance Analysis, and Normality testing by using SPSS software. The results of the research shows that PT. KCI needs to increase the number of toilets at Bogor Station, to add the first-aid kits at Bogor and Manggarai Station, to increase the number of waiting chairs at Manggarai Station, to add stairs for platforms whose height are not the same as the train floor at Manggarai Station, and to improve the performance of security officers and the awareness of the users about the use of priority passengers seats.**

Keywords; *Effectiveness Analysis, Importance Performance Analysis (IPA), Electric Train, Reliability*

1. Introduction

Transportation plays a very important role in people's lives in Indonesia. As times change, transportation technology has developed quite rapidly that makes it beneficial to the public to get an efficient mass transportation mode.

The Special Capital Region of Jakarta, as the center of government, is the center of the activities of all sectors. The high population density and the value of land in Jakarta make the dependency of the community on the buffer zone of Bogor, Depok, Tangerang, and Bekasi (Bodetabek) are high towards the availability of good mass transportation mode. The Jakarta Special Capital Region Government tries to move the use of private vehicles to public vehicles to overcome traffic congestion in Jakarta.

The train is one of the mass transportation systems that are efficient and effective. It can carry passengers in relatively large numbers on its paths that are not affected by traffic jams. Also, the train uses non-fossil fuels that are environmentally friendly. The service factor must get primary attention to make the commuter line as the main transportation mode in the area of Jabodetabek. Service is the priority that is used as a benchmark to show competitiveness. KCI is required to provide excellent services to the community by improving its operational system. Customer satisfaction is the key to any service.

2. Literature Review

Transportation is the activity of moving goods (cargo) and passengers from one place to another. In transportation, there are two most important elements, which are the movement and changing the place of goods and passengers to other places. Transportation is said to be good if the travel time is fast enough without an accident, the frequency of service is sufficient, and the service condition is comfortable. Factors that affect transportation to achieve ideal conditions are the condition of the infrastructure and network systems, and the available facilities [1-5].

The mode of transportation is very influential in supporting fast, safe, and integrated traffic movements. The means of transportation are flexible that develop following the times and the needs of customers. The decision on the appropriateness of the type of transportation mode must be considered carefully to avoid traffic congestion, the waste of energy and space, and air pollution. Therefore, appropriate policies must be developed to minimize the above undesirable factors.

Rail transportation has some advantages compared to road transportation. It has a higher transport capacity, low energy use, and low air pollution. Rail-based urban transportation provides benefits for a city. The large transport capacity can move passengers from road transport to railway transportation. In the end, it reduces congestion, road accidents, road damage, and air pollution in urban areas. In the Jabodetabek area, commuter trains are operated by using Electric Rail Cars, which utilize electrical energy to drive their power. The commuter train serves routes from Bogor, Cikarang, Tangerang, and Rangkasbitung to the Jakarta city area. In August 2019,

the average number of passengers every day was 1.1 million, both for business, office, school, market, or other activities.

In providing services to users of commuter transport services, the minimum service standards are established through the Minister of Transportation decree. The minimum service standards must be met by the operators in delivering services to the customers. The minimum service standard is a reference for the operators of railway infrastructures that operate railway stations. It must be equipped with benchmarks, which are used as guidelines for service delivery, and references to assess service quality as the obligation and promise to the community, in the context of the quality, speed, ease, affordability, and measurability of services. There are two types of minimum service standards, at the station and on the train.

a. Minimum service standards at the station

In general, services at the station include the clear and easy-to-read station's information, the audio that can be heard clearly by the customers, passenger service facilities, the ticket counters, the waiting rooms, the boarding rooms, the worship place, the nursery rooms, the toilets, the elevators and escalators, disabled facilities, health, safety, and security facilities.

b. Minimum service standards on the train

In general services on the train include the availability of doors, windows, fixed seats with backrests, train lightings, air circulation regulators, luggage racks, standing passenger handrails, the station's information, facilities for disabled people, pregnant women, sick people, and the elderly, medical facilities, security, safety information and evacuation instructions in an emergency situation, train's name and train's serial number, information on train travel disruptions, and the accuracy of train schedules.

2. 1. Importance of Performance Analysis

Importance Performance Analysis (IPA) is an analysis technique introduced by John A. Martilla and John C. James in 1977, which is used to identify the important performance factors an organization must show in meeting the satisfaction of their service users (consumers). In this method, it is necessary to measure the suitability level to find out how satisfied the customer is with the company's performance and how much the service provider understands the services the customer wants [6-10].

The analysis is intended to understand the service attributes that are important to the users. In principle, IPA combines dimensional measurements to the expectations and importance in two grids. Both dimensions were plotted into it. The importance value is plotted on the vertical axis while the expected value on a diagonal axis, by using the mean value contained in the importance and expectation dimension at the intersection of the center lines. The four-quadrant diagram shows the level of importance of the service attributes. IPA is used to get the importance of service attributes to customers. The level of importance is described in the importance diagram that is divided into four quadrants (Figure 1) with a description as follows:

a. Quadrant A, the area that contains the attributes that are considered important by customers but not as expected (levels of customer satisfaction are still very low). In this area, the management performs improvements continuously to increase performance in this quadrant.
b. Quadrant B, the area that contains the attributes that are considered important by the customers, and have a high level of satisfaction.
c. Quadrant C, the area that contains attributes that are considered less important by the customer, and have a less special performance.

Quadrant D, the area that contains the attributes that are considered less important by the customer, and assumed excessive.

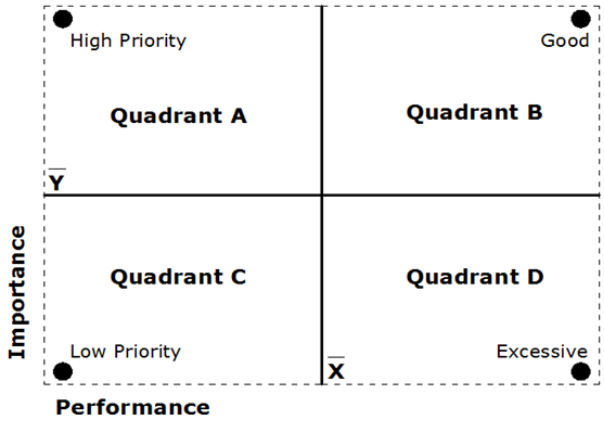

Figure 1. Importance of Classification Diagram

3. Research Methodology

3.1. Population and Sample

The method used to determine the number of respondents in this study is Roscoe's method (1975). Guidelines for determining the number of samples as follows:

1) Sample size between 30 to 500 elements;
2) If the sample is broken down again into subsamples (male/female, primary / high school, etc.), the minimum number of subsamples must be 30;
3) In multivariate studies (including multivariate regression analysis) the sample size must be several times larger (10 times) than the number of variables to be analyzed;

4) For simple experimental research, with strict control, the sample size is between 10 to 20 elements.

3.2. Validity Test

Validity is intended to explain the extent to which the data contained in a questionnaire measures what you want to be measured. Validity Test is done by using the Pearson method or Product Moment Correlation Method, by correlating the score of the items on the questionnaire with the total score. A questionnaire is said to be valid if the questions on a questionnaire can measure what is actually and should be measured [11-15].

3.3. Reliability Test

Reliability is the extent to which a measure is error-free or reliable and trustworthy. Reliable instruments can be used safely in different times and conditions or remain consistent if it is used in two or more measurements to measure the same symptoms, while temporary and situational factors do not affect [12].

This research methodology uses quantitative research. The data used in this study is a combination of the qualitative and quantitative data obtained through surveys using a questionnaire. The instrument used in this questionnaire refers to the results of research conducted by [1] by using the Servqual method.

3.4. Location of Research

For the research to be carried out evenly, several points are determined to be represented entirely. The observation point is determined based on the area that is considered appropriate but is still on the route of Bogor Station to Tanah Abang. The research locations were at two stations, at Bogor and Manggarai Stations. At the stations, the primary data was collected with the help of a questionnaire. The questionnaires were distributed to passengers of Bogor - Tanah Abang route stations.

3.5. Data Collection Techniques

This study uses the data collection technique of the quota sampling method where respondents are the passengers of the Commuter Line Route of Bogor - Tanah Abang. The quota sampling method is a data collection technique by taking samples freely from populations that have certain characteristics to the desired amount (quota). The data used in the form of primary data, which is a questionnaire distributed to respondents.

4. Data Analysis

4.1. Validity and Reliability Test

a. Validity test: To find a clue about the extent to which a measuring instrument measures what you want to measure by calculating the correlation between each question with a total score by using the Pearson Product Moment formula as follows:

$$r = \frac{N\,(\sum XY) - (\sum X \sum Y)}{\sqrt{\{(N\sum X^2 - (\sum X)^2\} - \{(N\sum Y^2 - (\sum Y)^2\}}}$$

Table 1. The distribution of the value of the R table with a significance of 5% and 1%

N	The Level of Significance	
	5%	1%
100	0.195	0.256

b. Reliability test: This study uses the Alpha Cronbach technique. This technique is used to measure the reliability of each question whose score is a range between several values (for example 0-10, 0-7) or in the form of a scale (e.g. 1-3, 1-5). The Cronbach's Alpha formula used is shown in the following formula

$$\propto = \left[\frac{k}{k-1}\right]\left[1 - \frac{\Sigma\sigma_b^2}{\sigma_t^2}\right]$$

A variable is declared reliable if it gives an alpha Cronbach value of α> 0,600.

4.2. Importance Performance Analysis Test

This test is used to measure the extent of the customer's interest and the level of the company's implementation.

4.3. Normality Test

This test is used to assess whether the distribution of data or questionnaires are normally distributed or not. The normality test with SPSS is carried out through the Kolmogorov-Smirnov test that requires the significance value of > 0.05. The significance value of the interests and satisfaction factors in the Shapiro-Wilk test requires the significance value of > 0.053.8.

5. Data Analysis and Discussion

5.1. Respondent's Data

Based on the analysis of respondents' data, the Commuter Line at Bogor and Manggarai Stations are more desirable by women, with the age between 20 to 30-year-old, who work as private employees. The frequency of using the Commuter Line is between 10-14 times in one week.

5.2. Statistical Data Analysis

Analysis of the data used in this research is a descriptive statistical analysis of the SPSS program. Descriptive statistics are related to the collection and ranking of the data. Descriptive statistics describe the sample's characters used in this study.

a. Bogor Station

Table 2. Descriptive Statistical Analysis Results at Bogor Station

ATRIBUTES	N	IMPORTANCE		SATISFY	
		Mean	Std Dev	Mean	Std Dev
Tangibles					
Worship space available	100	4.74	0.543	3.98	0.974
Toilet Available	100	4.74	0.485	0.83	1.074
Reliablity					
Information facilities	100	4.56	0.608	3.90	0.847
Ticket services	100	4.53	0.758	3.91	0.975
Responsiveness					
Security Personnel Responsive	100	4.72	0.533	3.93	0.977
Train position Personnel Responsive	100	4.58	0.654	3.95	0.880
Assurance					
Train Schedule Inform	100	4.74	0.604	4.09	0.877
First Aid Facilities	100	4.62	0.632	3.82	1.029
Emphaty					
Ease of passengers to train	100	4.52	0.703	3.90	0.971
Waiting Room Facilities	100	4.45	0.687	3.91	1.120
Mean	100	4.62	0.62	3.91	0.97

From table 2, the average rating of the company's performance is 3.91 on a scale of 5.00. It means that the assessment of company performance is in the "Satisfied" category according to the Likert scale. The average level of importance of 4.62 means that the importance of the assessment of the services of KRL is in the "Very Important" category.

b. Services Onboard

Table 3. Descriptive Statistical Analysis Results Service onboard

ATRIBUTES	N	IMPORTANCE		SATISFY	
		Mean	Std Dev	Mean	Std Dev
Tangibles					
Facilities on the train	100	4.59	0.570	4.42	0.638
Air circulation in the train	100	4.74	0.592	4.16	0.838
Reliablity					
Train punctuability	100	4.39	0.665	3.94	0.851
Train Driver skill	100	4.49	0.577	4.21	0.524
Responsiveness					
Train information	100	4.48	0.643	4.23	0.664
Train Security Personell	100	4.43	0.655	4.12	0.686
Assurance					
Health Facility in the train	100	4.21	0.756	3.81	0.873
Security Facilities	100	4.50	0.644	4.19	0.734
Emphaty					
Ease of handicap passenger	100	4.46	0.688	4.03	0.810
Train clenliness	100	4.60	0.569	4.47	0.643
Mean	100	4.47	0.64	4.16	0.74

From table 3, the average rating of company performance is 4.16 on a scale of 5.00. It means that the assessment of the company's performance is included in the "Satisfied" category, according to the Likert scale. The average level of importance of 4.47 means that the importance of the assessment of Commuter Line services is in the "Very Important" category.

5.3. The Analysis of the Determination of Service Improvement's Priority

To translate the results of data analysis into an evaluation, improvement, or maintain the level of service performance, the data analysis results are grouped into 4 quadrants following the Cartesian's Important Performance Analysis diagram.

Services at Bogor Station

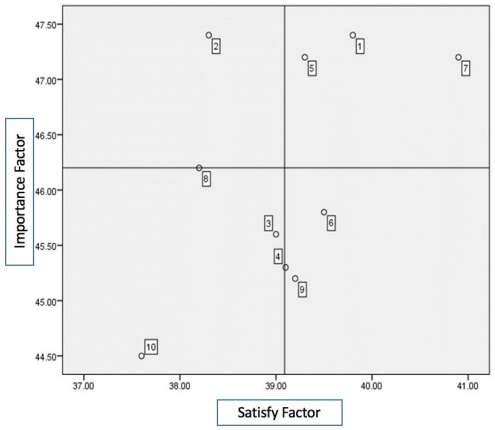

Figure 2. Diagram of the Result of the Analysis of Bogor Station

5.4. Services Onboard

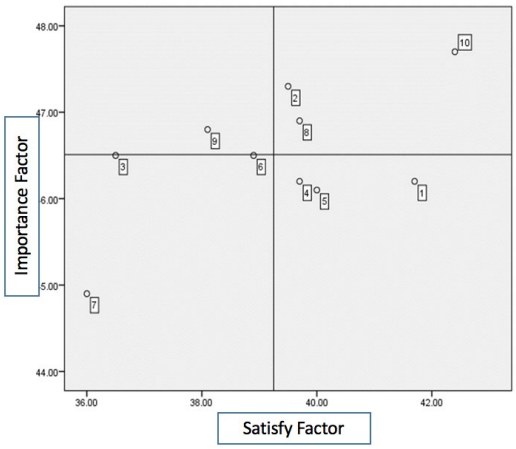

Figure 3. Diagram of the Result of the Analysis of Traveling by Train

From the results of the analysis of the services at the station and on the train, the type of service that is in quadrant I need a quality upgrade, the type of service that is in quadrant II need a quality maintenance, two types of services that are in quadrant III need further quality review, and three types of services that are in quadrant IV need to be reduced [16-18].

6. Conclusion

Based on the analysis of Jabodetabek commuter train services, the following conclusions can be made:

a. Descriptive statistical analysis results at Bogor Station, Manggarai Station and on the train show the average level of the importance's value of 4.46. It means that the importance of the company's services falls into the "Important" category. The average satisfaction of the performance appraisal shows a value of 3.9, which means that the company's performance assessment is included in the "Satisfied" category.

b. The results of the analysis by using the Importance Performance Analysis (IPA) method indicate a low level of user satisfaction to the services deemed to be important by users. From the results of the analysis, it can be concluded that the Bogor-Tanah Abang Route is not effective in terms of providing services to passengers.

c. The results of the analysis using the IPA (Importance Performance Analysis) method show that there are five attributes of the Bogor-Tanah Abang services that must be prioritized for improvement, which are:

   1) Toilet availability.
   2) Waiting Room (adequate seating)
   3) Availability of First-Aid Tools for Accidents (First Aid Box, wheelchairs, stretchers)
   4) Passenger stairs for getting on/off the train (platform height is not the same as train floor height)
   5) Ease of getting seats for priority passengers.

   The above five services should be prioritized for improvement. According to the passengers, four services are considered important. However, the implementation is not in line with the user's expectations, so the manager needs to improve the quality and performance of the service.

d. From the results of the study, there are some suggestions to improve Jabodetabek commuter transport services:
   1) Increase the number of toilets at Bogor Station;
   2) Add more first-aid kits at Bogor and Manggarai Station;
   3) Increase the number of seats at Manggarai Station;
   4) Optimize the use of additional stairs for platforms whose height are not the same as the train's floor at Manggarai Station;
   5) It is necessary to improve the performance of the security officers and the awareness of the passengers about the importance of priority passenger seats.

REFERENCES

[1] Parasuraman, V. A. Zeithaml, and L. L. Berry, *"SERVQUAL: A Multiple-Item scale for measuring consumer perceptions of service quality,"* Journal of Retailing, Vol. 64, No. 1, pp. 5-6, 1988.

[2] Parasuraman, V.A. Zeithaml, and L.L. Berry, *"A conceptual model of service quality and its implications for future research,"* Journal of Marketing, Vol. 49, No. 4, pp. 41-50, 1985.

[3] G. Arabatzis and E. Grigoroudis, *"Visitors' satisfaction, perceptions and gap analysis: The case of Dadia-Lefkimi-Souflion National Park,"* Forest Policy and Economics, Vol. 12, pp. 163-172, 2010.

[4] J. S. Chou, T. C. Kuo, and N. C. Ou, *"Deploying effective service strategy in the operations stage of high-speed rail,"* Transportation Research E, Vol. 47, pp. 507-519, 2011.

[5] A. Coghlan, *"Facilitating reef tourism management through an innovative importance-performance analysis method,"* Tourism Management, Vol. 33, pp. 767-775, 2012.

[6] A. L. P. Freitas, *"Assessing the quality of intercity road transportation of passengers: an exploratory study in Brazil,"* Transportation Research Part A, Vol. 49, pp. 379-392, 2013.

[7] L. A. Graf, M. Hemmasi, and W. Nielsen, *"Importance-Satisfaction Analysis: A diagnostic tool for organizational change,"* Leadership & Organization Development Journal, Vol. 13, No. 6, pp. 8-12, 1992.

[8] H. Y. Hu, Y. C. Lee, T. M. Yen, and C. H. Tsai, *"Using BPNN and DEMATEL to modify importance-performance analysis model - A study of computer industry,"* Expert System with Application, Vol. 36, pp. 9969-9979, 2009.

[9] R. Lewis, *"Importance-performance analysis,"* Australasian Journal of Engineering Education, Vol. 02.

[10] C. C. Lo, C. H. Wang, P. Y. Chien, and C. W. Hung, *"An empirical study of commercialization performance on nano products,"* Technovation, Vol. 32, pp. 168-178, 2012. Martilla, J. A. and Carvey, D. W. *"Four subtle sins in marketing research,"* Journal of Marketing, Vol. 39, No. 1, pp. 8-15, 1975.

[11] R. Vijayakumaran, *"Agency Costs, Ownership, and Internal Governance Mechanisms: Evidence from Chinese Listed Companies,"* Asian Economic and Financial Review, Vol. 9, No. 1, pp. 133-154, 2019.

[12] K. Matzler, F. Bailom, and H. H. Hinterhuber, *"The asymmetric relationship between attribute-level performance and overall customer satisfaction: a*

reconsideration of the importance-performance analysis," Industrial Marketing Management, Vol. 33, pp. 271-277, 2004.

[13] T.N. Widodo, *"The development model of exploitability knowledge based on entrepreneurial learning to innovative performance and sustainable competitive advantage,"* International Journal of Innovation, Creativity and Change, Vol. 4, No. 2, pp. 123-133, 2018.

[14] A. Sorensson and Y. V. Friedrichs, *"An importance-performance analysis of sustainable tourism: A comparison between international and national tourists,"* Journal of Destination Marketing and Management, Vol. 2, pp. 14-21, 2013.

[15] J. Tonge and S. A. Moore, *"Importance-satisfaction analysis for marine-park hinterlands: A Western Australian case study,"* Tourism Management, Vol. 28, pp. 768776, 2007.

[16] R. Wang and M. L. Tseng, *"Evaluation of international student satisfaction using fuzzy importance-performance analysis,"* Procedia: Social and Behavioural Sciences, Vol. 25, pp. 438-446, 2011.

[17] N. Yahya and M. C. Bell, *"Assessment of service quality and satisfaction from passengers' perspective to inform bus operator decision making,"* UTSG 42nd Annual Conference. University of Plymouth, January 5-7, 2010, 2010.

[18] A. Zeithaml, A. Valarie, Parasuraman, and L.B. Leonard, *Delivering quality service: Balancing customer perceptions and expectations.* New York: The Free Press, Division Of Macmillan Inc, 2000.