How To Improve Service Performance of Commuterline in Jabodetabek: A Case Study of Depok to Jakarta Kota Route

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***Abstract*— DKI Jakarta as the capital of Indonesia is the region with the highest population density in Indonesia caused the spread of population to neighboring areas such as Bogor, Depok, Tangerang and Bekasi. Highly movement in the Greater Jakarta area resulting congestion problems, and one of the transportations that can carry large capacity with highly speed is Commuterline Jabodetabek. As the highly demand of people who use Commuterline Jabodetabek, KCJ Company needs to be accompanied by improved quality of service. The purpose of the study is to determine the service performance of Commuterline and its infrastructure and determine the direction of services performance improvement for Commuterline. Service performance is divided into two kinds: Commuterline as a moda and Station such as security, safety, regularity, comfort, convenience and equality aspects used Importance Performance Analysis (IPA). The results of service then becomes an input in the determination of alternative repair used Analytical Hierarchy Process (AHP). The results showed that there are eight aspects that must be corrected for commuterline such as information and health facilities, information and safety facilities, security guards, security facility, punctuality of travel, seating and space for standing passengers, information of travel disruption and facilities for passengers with disabilities. The highest priority to improve service performance is the use of sensors on the door of commuterline.**

Keywords—Commuterline; Jakarta-kota; Analytical-Hierarchy-Process; Service-performance

I. INTRODUCTION

According to Farida (2011), one service sector that has a vital role in supporting various daily activities is the transportation service sector. Transportation is an important tool and strategic developments in expediting the economy, strengthen unity and integrity as well as affecting all aspects of life. The importance of transportation is reflected in the increasing need of transportation services for the mobility of people and goods as a result of the increasing population development and the increasingly widespread settlement development especially in big cities such as Jakarta.

DKI Jakarta is the capital of the Unitary State of the Republic of Indonesia which became a barometer of development and economic growth of Indonesia. The region plays a vital role in various social, economic, cultural, and national political activities. This causes DKI Jakarta to be a growth pole for the surrounding area, such as Depok City, Bekasi City / Regency, Bogor City / Bogor Regency and Tangerang City / Regency. The availability of various activities in DKI Jakarta become an attraction for people in the surrounding area is doing various activities [1].

The data shows that the population of DKI Jakarta is 10.075.310 persons while the population of DKI Jakarta's day increases by 11.201.620 persons (BPS, 2015), thus there is an increase of population during the day which is the commuter from the area around DKI Jakarta. Continuous commuter movement in Jabodetabek area can cause transportation problems such as public transportation service that has not maximal is not comparable with the growth of private vehicles.

The existence of congestion problems is often associated with the use of public transportation as one solution to overcome them. Communities conducting daily activities outside their residence (commuters) need a mode of transportation that can shorten their travel time to the destination city. One mode that can accommodate the commuters reach the city center with a large capacity that is Jabodetabek commuter train with a capacity of 1500 people and 3 lb/km fuel consumption (Astuti, 2014).

The high population density in Jabodetabek area caused the need of train in Jabodetabek as commuter transportation has been increasing for the last 5 years. In 2011, the number of commuter passengers in Jabodetabek was approximately 121 million passengers, and it increased to 157.63 million passengers in 2013. Targeted in 2019 for commuterline in Jabodetabek can serve 1.2 million passengers per day (Annual Report of PT KAI, 2013). Along its development, commuterline in Jabodetabek must be able to provide good service in line with the increasing demand of people who use the services of these modes.

Commuterline in Jabodetabek as a type of transportation services that many people interested in, there are many weaknesses in terms of services include:

(a) The number of passengers who always exceed the capacity so far to create a sense of comfort; (B) The frequent occurrence of good things caused by disruption of facilities and technical problems so that the schedule of departure and arriving to be often not appropriate so that still can not provide timely service; (C) Frequent encounters of train accidents caused by human error or technical error so that they can not provide safe services (Wibowo, 2013).

The researcher conducted this research with the aim to evaluate the service performance of Commuterline in Jabodetabek especially for Depok to Jakarta Kota route, as well as to formulate the direction of service performance improvement of Commuterline in Jabodetabek.

II. METHODS

The type of research in "How to improve service performance of commuterline in Jabodetabek: A case study of Depok to Jakarta Kota route" is a quantitative research. Quantitative research is a process of finding knowledge using numerical data as a tool to find out what it wants to know (Thoifah, 2015: 155). The service performance of Commuterline in Jabodetabek and direction of service performance improvement according to the perception of experts in this research is explained descriptively and using data in the form of numbers (calculation and weight assessment) so that it becomes quantitative research.

A. Research Location

The scope of the area in this study is the route of Depok to Jakarta Kota (Figure 1). The selection of routes is due to the high movement of commuters in Depok to Jakarta Kota, which is 19.9 per cent of the total population (BPS, 2015) and Depok to Jakarta Kota route is an additional route that was originally part of the Bogor to Jakarta Kota route. The existence of the new route indicates that the increasing volume of passengers from Depok.

This research chose Depok to Jakarta Kota route as the study area with a view to know the service performance. In addition to Commuterline on the Depok to Jakarta Kota route, the scope of the region in this study also includes the station as the railway support infrastructure i.e Depok Station and Jakarta Kota Station as the departure station or the final destination.

B. Sample

The minimum sample used was 400 respondents using Slovin formula as follows:

$$n = \frac{N}{N.e^2+1} \qquad (1)$$

Notes:
N = minimum number of samples required
N = total population
e = level of accuracy (determined 5 per cent)

$$n = \frac{295.955}{295.955.(0{,}05)^2+1} = 399{,}46$$

The number of respondents for Depok and Jakarta Kota Station is proportionally divided according to the average number of passengers on both stations, 171 respondents in Depok Station and 229 respondents in Jakarta Kota Station, while for minimum sample for Commuterline service is 400 respondents. The sample for the selected stakeholders in this study can be seen in Table 1.

Table 1. The Selected Stakeholders as a Sample

No.	Institution	Reason
1.	PT. KAI Commuterline Jabodetabek (PT.KCJ)	Has competence in the field of railways and as the party that operates / executor of railway system in Jabodetabek directly.
2.	Ministry of Transportation Director General of Railways	Have competence and authority in planning in the field of transportation of the national railway section.
3.	Academic	Have competence in conducting research or evaluation on service performance of transportation.
4.	Commuterline Users Community (KRL Mania)	Has a role as a permanent user who has been traveling with a long period of time so as to know the service condition of Commuterline in Jabodetabek in the field and as a party to accommodate suggestions criticism from other passengers

In this study consist of several stages for problem solving that exist in the study area (Figure 2). Firstly, analyze the operational performance of railways consisting of Load Factor, Travel Time, Headway, waiting time and travel expenses. The primary survey at the peak hour, at 06.00 am to 08.00 am (weekday), at 08.00 am to 11.00 am (weekend) on the Depok to Jakarta Kota route and at 16.00 pm to 19.00 pm on the Jakarta Kota to Depok route (weekday and Weekend).

Finally, analyze the service performance by IPA to analyze the priority aspects of handling based on the respondent (user). Aspects assessed by the IPA are aspects of the Minimum Service Standard (SPM) of Regulation of the minister of transportation No.45 in 2015. Assessments are conducted for the JR Series 20R Series mode. Aspects included in quadrant I of Cartesian diagram is a priority that should be improved.

The results of service performance then produce output in the form of aspects / variables that do not meet the standards or required improvement. These aspects or variables will be the basis for formulating alternative improvement directives that will be assessed by relevant stakeholders resulting in a sequence of directives improvement of service performance for commuterline in Jabodetabek for Depok to Jakarta route.

C. Importance Performance Analysis

This analysis links between the importance of an attribute that belongs to a particular object to the reality (performance) perceived by the user. The first step for IPA analysis is weighting. The assessment of each aspect of service on the questionnaire was

performed using a Likert scale (Table 2) consisting of five levels, with the following assumptions.

Table 2. Likert Scale of Respondents's Satisfaction and Importance

Importance	Satisfaction	Score
Very unimportant	Very unsatisfy	1
unimportant	unsatisfy	2
Less important	Less satisfy	3
Important	satisfy	4
Very important	Very satisfy	5

Source: Farida, 2011

Then calculate the average level of importance and satisfaction level for each item of the attribute by the formula (Supranto, 2001):

$$Xi = \frac{\sum xi}{N} \quad (5)$$

$$Yi = \frac{\sum yi}{N} \quad (6)$$

Notes:
Xi = The average weight of the i-item satisfaction level
Yi = The average weight of the importance of item i
N = number of respondents / samples
The next step is to calculate the average of importance and level of satisfaction for the whole item by the formula (Supranto, 2001):

$$Tki = \frac{Xi}{Yi} x\ 100\% \quad (7)$$

Notes:
Tki = Degree of respondent's suitability
Xi = Scores of satisfaction assessment on service performance
Yi = Scores of interest rating on service performance

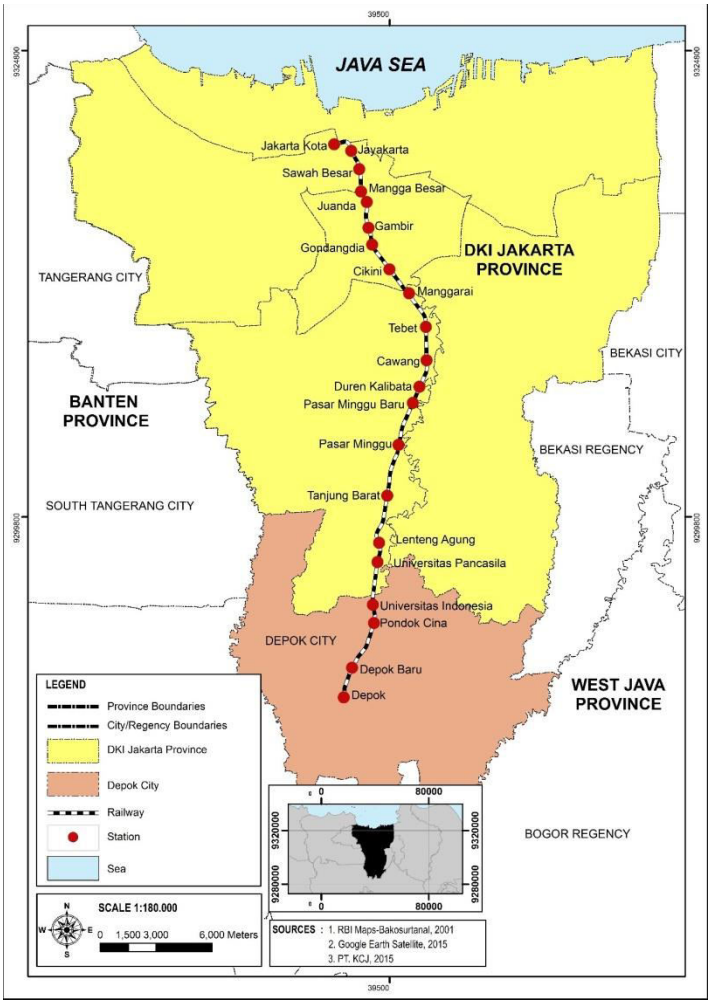

Figure 1. Research location

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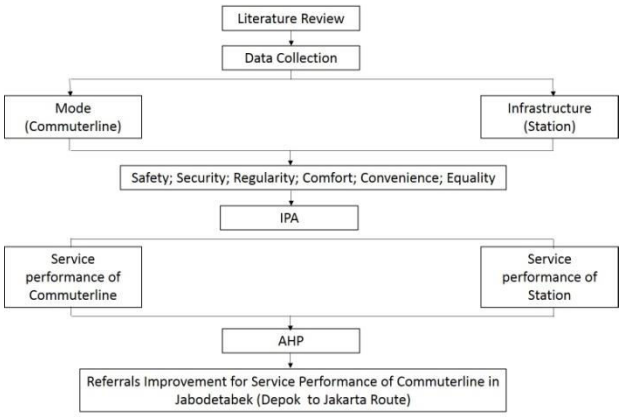

Figure 2. Research framework.

After getting the average value of importance and satisfaction level, then the next step is to make Cartesian Diagram with the help of SPSS software.

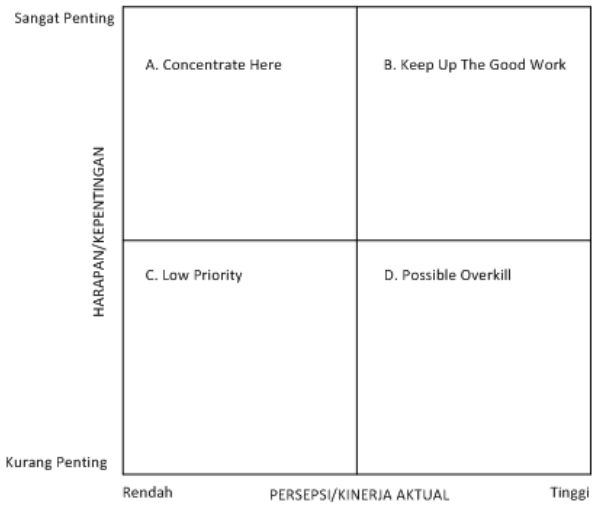

Figure 3. Cartesian diagram of IPA

According to Nurhadi (2011), the interpretation of Cartesian diagram is as follows.

1. Quadrant I: Concentrate here, indicates that the related variables have a relatively high level of importance but the reality is not in accordance with user expectations, so these variables that must be improved performance.
2. Quadrant II: Keep up the good work, shows that the variables that have a relatively high level of importance with a relatively high level of satisfaction as well, so it is considered as a supporting factor for user satisfaction so it must be maintained.
3. Quadrant III: Low priority, shows that the variables related to service performance have decreased, because both the level of importance and the quality of service is lower than the average value.
4. Quadrant IV: Possible overkill, indicating that the related variables have a relatively low level of importance and are perceived by the user to be exaggerated with a relatively high degree of satisfaction.

D. Analytical Hierarchy Process

Stages of problem solving by AHP method according to Marimin (2004) are as follows:

a. Formulation of problems and hierarchical structure

The hierarchy concept in this study consists of three levels, where the first level is the objective, the second level is the criterion / variable and the third level is the alternative formula / direction determined by the priority.

b. Weighing criteria by forming pairwise comparison matrices

The determination of quantitative scale according to Saaty (1993) is used to assess the comparative importance of an element to other elements can be seen in Table 3.

Table 3.
Priority Rating Scale

Scale	Information
1	Both elements are equally important
3	One element is slightly more important than the other
5	One element is more important than the other
7	One element, obviously more absolutely than any other element
9	One element is absolutely essential from other elements
2,4,6,8	If unsure of the value of the adjacent

Source: Saaty, 1993

c. Consistency Test of Hierarchy

The consistency index of the norded matrix can be obtained by the formula:

$$CI = \frac{\lambda\ maksimum - n}{n-1} \quad (8)$$

Notes:
CI = Consistency index of hierarchy
λ Maximum = The greatest eigenvalue of the order matrix n

The limit of inconsistencies set by Saaty, measured by Consistency Ratio (CR), is the comparison of the consistency index with the value of the random generator (RI) that is labeled in Table 4. Thus, the consistency ratio can be formulated as follows:

$$CR = \frac{CI}{RI} \quad (9)$$

Notes:
CR = *Consistency Ratio*
CI = *Consistency Index*
RI = *Random Consistency Index*

Table 4.
Random Generator Value (RI)

n	1	2	3	4	5	6	7	8	9	10
RI	0	0	0,58	0,9	1,12	1,24	1,32	1,41	1,45	1,49

Sourc: Saaty (1993)

d. Calculates the criteria weight
e. Calculates the alternative weight

III. RESULTS AND DISCUSSIONS

A. Service Performance of Commuterline in Jabodetabek (Depok to Jakarta Kota Route)

Based on the result of calculation according to the passenger's perception of service in commuterline in Jabodetabek for Depok to Jakarta Kota route, Cartesian Diagram produced is shown in Figure 4. Based on the calculation, there are 8 service aspects in the commuterline in Jabodetabek that enter into quadrant 1 (A) on Cartesian diagram presented in Table 5.

Table 5. IPA diagram of service performance of commuterline (Quadrant-1)

Quadrant	No.	Satisfaction (x)	Importance (y)
1	1	2,59	4,50
	2	2,3	4,20
	3	2,3	4,10
	4	2,59	4,46
	7	2,36	4,51
	8	2,89	4,64
	14	2,52	4,57
	15	2,54	4,56
2	6,9	4,07	4,50
	11	4,50	4,64
	12	3,81	4,51
	13	3,73	4,61
3	5	2,11	3,71
	10	2,62	4,22
Average		**3,009**	**4,479**

Source: Analysis, 2016

B. Solution to Improve Service Performance for Commuterline in Jabodetabek (Depok to Jakarta Kota Route)

Referrals to improved service performance.

Based on the results of IPA analysis, it is known that there are 8 aspects that must be prioritized handling on the trip. The following directions are later weighted for known sequence directions for improving service performance on commuterline trips (Figure 9).

a. Improving the quality of human resources
Increasing the quality of human resources in this case is the officers who are in the train conducted through the skills of the officers so that officers have the ability to work and responsive to any problems that arise. Officers are expected not only to maintain order during the trip but also to provide information and services.

b. The use of sensors at the entrance
Direction of sensor use at the entrance aims to avoid the occurrence of accidents (pinched) while limiting the capacity of commuterline. With such sensors, it is expected that the maximum number of passengers can be adjusted to the available commuterline capacity so that there is no density inside the KRL for the convenience, safety and security of users.

c. Emergency button supply
Figure 5 shows the emergency buttons that are directed to be provided in the train as a form of anticipation of events that are considered dangerous. Procurement aims to summon officers within the commuterline to obtain service / assistance due to crime as well as other matters that threaten the safety of passengers.

Figure 5. Emergency button facility of MRT in Singapore
Source: sgtrans.com (2014)

d. Optimizing the delivery of audio and display information via SIP
The SIP screen is available on each carriage, currently only used as a promotional / advertising medium (Figure 6). To increase the value and benefits for commuterline passengers, the SIP screen will be directed to provide information about commuterline such as travel disturbance information in the form of reasons for delays and time estimates, information on safety facilities in the form of simulation instructions, etc.

Figure 6. Screen information on commuterline in Jabodetabek
Source: primary survei (2016)

e. The addition and maintenance of the facilities on trip
Based on the results of IPA analysis, there is need for improvement, addition and maintenance of facilities in trains such as health facilities (P3K) and CCTV. The addition is done to the first aid facility which in the existing condition there is no facilities P3K, while the treatment is done at all facilities in the KRL trip. In accordance with the applicable SPM, while the maintenance is done regularly to ensure all facilities in transit in good condition.

f. Improvement of disabled facilities
Repairs carried out on passengers with special needs facility, which change shape into a priority seat folding chair in order to facilitate passengers who use wheelchairs (Figure 7) and the addition of difable path to facilitate persons with disabilities blind walk to the entrance / exit.

Figure 7. Facility for disabilities
Source: australia-mrt.com (2013)

In determining the priority alternative, then paired comparison of each of the criteria and alternatives. Table 8 shows the comparison of service performance criteria on commuterline for Depok to Jakarta Kota route.

The highest criterion value based on the evaluation criteria by stakeholders in order are aspects of safety, regularity, safety, comfort, convenience and equality. Table 9 shows the results of alternative calculation of service performance improvement on commuterline in Jabodetabek trip. The calculation of the weight of the alternative is the same as the calculation of the weight of the criteria that has been done before.

The highest criteria value based on the evaluation criteria by stakeholders in sequence is the alternative use of door sensors, improving the quality of human resources, improvement and addition of facilities according to SPM, optimizing the delivery of information through audio and SIP screens, the use of emergency buttons and repair facilities for persons with disabilities.

Table 8. Assessment criteria of service performance for commuterline in Jabodetabek (Depok to Jakarta Kota Route)

No	*Stakeholders*	Criteria 1	Criteria 2	Criteria 3	Criteria 4	Criteria 5	Criteria 6
1	Commuterline Mania (Coordinator)	0.436062191	0.271356308	0.056966297	0.109271262	0.067604595	0.058739347
2	Commuterline Mania (Secretary)	0.440138104	0.06413938	0.271902839	0.093915102	0.098526433	0.031378142
3	Academics (UI)	0.490355948	0.191535886	0.191617988	0.055824773	0.046565514	0.024099892
4	Academics (Trisakti)	0.514887696	0.10567228	0.164935462	0.128385109	0.046999329	0.039120125
5	KCJ Services	0.526184452	0.138844949	0.115035425	0.109735072	0.10498366	0.03912689
6	KCJ Public Relations	0.433251634	0.170343137	0.114787582	0.088316993	0.117772109	0.088316993
7	Transportation Ministries	0.353316327	0.12457483	0.201105442	0.117772109	0.117772109	0.085459184
8	Transportation Ministries (Public Relations)	0.453294997	0.104647095	0.2499104	0.117772109	0.064140477	0.033776605
	Geomean	0.452869452	0.134736734	0.154512845	0.099857849	0.077938668	0.045170849

Source: Analysis, 2016

Table 9. Assessment criteria of service performance for commuterline in Jabodetabek (Depok to Jakarta Kota Route)

Alternative	Stakeholders								Geomean
	Commuterline Mania 1	Commuterline Mania 2	Academics UI	Academics Trisakti	KCJ 1	KCJ 2	T.Ministries 1	T. Ministries 2	
Alternative 1	0.1659	0.1383	0.3207	0.2219	0.2217	0.2967	0.1785	0.2022	0.2107
Alternative 2	0.2536	0.1374	0.2118	0.2430	0.2597	0.2118	0.2118	0.2194	0.2151
Alternative 3	0.0514	0.0984	0.0827	0.1389	0.0842	0.1066	0.1349	0.1050	0.0515
Alternative 4	0.0221	0.1417	0.0538	0.0563	0.0745	0.0538	0.0673	0.1085	0.0639
Alternative 5	0.2177	0.2163	0.1310	0.1274	0.1048	0.1311	0.1286	0.1147	0.1414
Alternative 6	0.2219	0.1926	0.1163	0.1503	0.1874	0.1163	0.1954	0.1562	0.1630

Source: Analysis, 2016

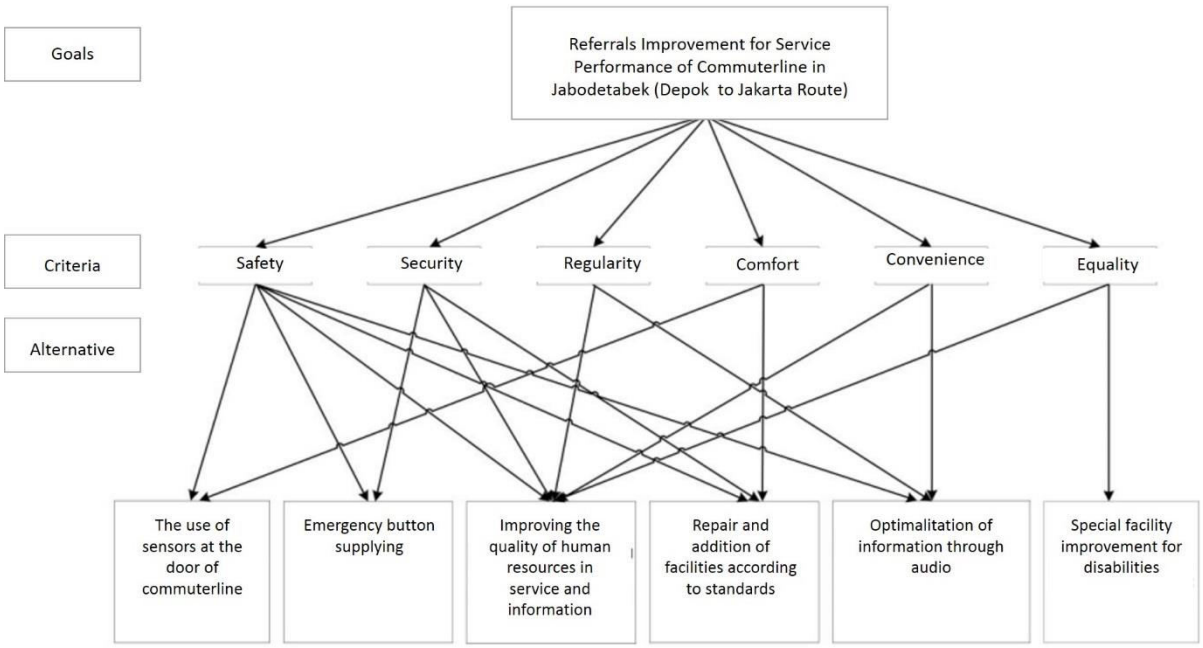

Figure 5. Hierarchy of service performance improvement for commuterline in Jabodetabek (Depok to Jakarta Route)

IV. CONCLUSION

The result of service performance analysis of commuterline by using IPA also shows that there are 8 aspects of service which prioritized handling because it has high importance level but low satisfaction level. After obtaining the results of service performance, the determination of alternative directions to improve service performance of commuterline in Jabodetabek for Depok to Jakarta Kota route. Based on the results of analysis with AHP method, it is known that the sequence of landing improvements in service performance in commuterline in sequence is an alternative to the use of sensors on the door, improving the quality of human resources, improving and adding facilities according to SPM, optimizing the delivery of information through audio and SIP screens, the use of emergency buttons and facility improvements For persons with disabilities.

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