THE TRAVEL TIME PERFOMANCE ANALYSIS OF THE COMMUTER LINE TRAIN (KRL) (CASE STUDY: THE COMMUTER LINE TRAIN BLUE LINE CORRIDOR, BEKASI - JAKARTA KOTA)

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ABSTRACT

On the commuter line trains (the KRL), the Bekasi-Jakarta City Blue Line corridor has a buildup of passengers so that it can reduce travel time. Based on the regulation of the Minister of Transportation No. 63 of 2019 on Minimum Service Standards for Transportation of People by Train, the maximum delay tolerance for urban trains is 15 minutes from the total scheduled travel time. The method used is the depiction of working charts and calculations of statistical analysis with standard deviation in SPSS application version 26. The difference in the comparison of scheduled travel times with those in the field is determined by using Microsoft Excel for Windows version 2015. The performance of Blue Line routes (the KRL) was reviewed based on travel time using the SPSS (Statistical Package for the Social Sciences) analysis tool version 26. The standard deviation results using the SPSS KA 1341 analysis tool have a higher deviation standard result of 10.82, which means that the train has a higher travel time delay than the train of PT Kereta Commuter Indonesia (KCI), which experienced an average delay of 4 minutes. The cause of the delay consists of several factors, including the queue of passengers who want to get into the train and the fact that traffic on the blue line KRL route is congested. Because it has to alternate with intercity trains, and the KRL must wait.

1. PRELIMINARY

The train is a reliable, quick, comparatively safe, and flexible mode of transportation. These benefits encourage community use of railroads for transportation. In an effort to lessen pollution brought on by the vast number of motorized vehicles, the train serves as a supporting infrastructure.

An effective and efficient rail-based mode of land transportation is the electric rail train. This is demonstrated by its superior human carrying capacity when compared to other forms of ground transportation in the Greater Jakarta region. The route to Bekasi was the one that saw the most delays.

The KRL ought to have expanded its fleet along this corridor to prevent further

passenger buildup. Additionally, Bekasi has a significant number of passengers, necessitating the addition of a second fleet. The commuter line trains (the KRL) must wait whenever an out-of-town train is passing because the Bekasi line is the only one that runs outside of the city.

The established KRL schedule is also impacted by this. The maximum tolerance for delays for urban trains is 15 minutes of the total scheduled journey time, as per Minister of Transportation Regulation No. 63 of 2019 concerning Minimum Service Standards for the Transport of People by Train.

In this instance, PT KAI and PT KCI have taken several steps to enhance services for both the KRL infrastructure and facilities. These include regular facility additions, increases in the KRL trip frequencies, and station facility repairs. The punctuality of the KRL trips has not, however, been able to increase as a result.

The company must pay closer attention to this in order to find the best answer to these issues and boost performance even further. The KRL services nevertheless have several flaws despite their strategic role as a popular sort of transportation service, including the number of passengers always exceeds the capacity, making it impossible to feel comfortable. Moreover, due to frequent roadblocks (both those brought on by infrastructure disturbances and those resulting from technical issues) the departure and arrival schedules are frequently erratic, making it impossible to deliver timely services.

In general, service quality is viewed as the outcome of the total service system that consumers receive, and in practice, service quality is concentrated on efforts to meet customer requirements and wishes as well as the resolve to deliver services in accordance with customer expectations. Service quality is the expected degree of excellence and the management of that level of perfection to satisfy client needs. Since service quality is crucial, it is required to undertake a study on its factor analysis to understand and pinpoint the variables that

affect it, particularly in terms of trip time, for the area of Jakarta, Bogor, Depok, Tangerang and Bekasi (Jabodetabek) Commuter Line's transportation services. Therefore, this analysis will discuss the evaluation of the KRL performance on the blue line route from the perspective of travel time.

2. IDENTIFICATION OF PROBLEMS

The main problem that can be identified in this study is whether the increasing number of passengers is one of the challenges in slowing down the KRL travel time on the Blue Line.

Therefore, this study will analyze whether the KRL's travel time on the blue line route has been running effectively.

On the other hand, this study also has some limitations that must be considered. Those limitations are as follows:

1) The Blue Line route is the KRL that is being examined.
2) The stations reviewed are Bekasi as the KRL departure time and Jakarta Kota as the KRL arrival time.
3) The KRL journey time between Bekasi station and Jakarta Kota is the main topic of this investigation.
4) On Monday, Wednesday, and Saturday, data collecting takes place from 6.00 to 9.00 WIB. For the purposes of this study, working days are Monday through Wednesday, and weekends are Saturday.
5) On Tuesday, Friday, and Saturday, data collecting takes place from 7:30 to 9:00 WIB. Tuesday through Friday are used as working days for this study's purposes, whereas Saturday is used to symbolize a holiday during the Covid-19 pandemic.
6) The process involves using the SPSS version 26 application to display work graphs and calculate statistical analysis using the standard deviation. calculating the discrepancy between the field journey time and the planned travel time using the 2015 version of Microsoft Excel for Windows. utilizing SPSS (Statistical Package for the Social

Sciences) analysis tool version 26 to determine the performance of the KRL Blue Line route in terms of journey time.

7) This study compares PT KCI data with industry standards.

3. THE STUDY'S HYPHOTHESIS

The goal of this study, as previously said, is to determine whether the KRL travel time for the blue line route was completed on schedule.

The map shows that the KRL's blue line starts the journey from Jakarta Kota Station and ends at Bekasi Station.
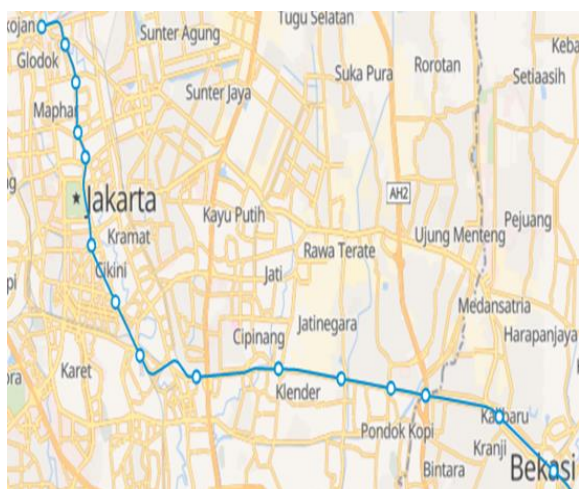

Figure 1. Map of the Stations of the Jakarta Kota Route -Bekasi
(Source: Trafic Application)

Bekasi as the KRL departure time and Jakarta Kota as the KRL arrival time were the stations examined.

Based on the case study that will be carried out, the hypothesis that will be taken is to avoid a backlog of people, travel will be scheduled once every 20 minutes.

4. LITERATURE REVIEW

Meaning of Train

A train is a railroad facility with the ability to move, either operating independently or in conjunction with other railroad facilities and moving or about to move along a railroad built for train travel.

Railroads

Railroads are what they are called. The train is a unique means of transportation because of the utilization of this railroad. Additionally, this prevents direct contact between trains and other ground transportation methods. The track width of the Indonesian railway system's rail road is 1067 mm.

Train station

A station is a location from which a train departs or stops to accommodate commodities loading and unloading, people boarding and alighting, and/or railway operations. Emplacement is the term used to describe the group of railroad tracks at a station.

Elapsed time

The length of the road segment L (km) is used to calculate the average amount of time it takes a vehicle to drive a segment of that length. This time includes delays and stops (MKJI 1997).

Punctuality

The occurrence of delays, however, is attributed to timeliness related to facilities, infrastructure, and scheduling stops, according to Higgins et al. in Nyström (2005).

Ease of Service

The term "service" then refers to a guarantee of service that enables someone to get service, both in terms of passengers and commodities. For the passengers, assurance that they will receive the level of service they desire or that they will be able to buy the tickets they need for subsequent or return excursions. Similar to how easy it is to get room for delivery vehicles, which reflects how easy it is to get service.

Travel Itinerary (Timetable)

The maximum speed restriction is calculated using the travel schedule and the constrained capabilities of the railway

infrastructure and amenities, such as the number of facilities, traffic capacity, track capability, and the maximum allowable train axle weight. Given these constraints, timetable planning must be done correctly with qualified staff and comprehensive auxiliary data. In order to achieve timeliness in accordance with the established timetable, we have taken the effects of delays into account while planning the train journey time.

Deviation

Whether there will be a delay in the train's travel duration depends on the capabilities and accessibility of the rail system as well as the travel schedule. Delays can occur when there are variations from the anticipated schedule (Nyström, 2008).

Standard Deviation

The variation between sample values and the average is known as the standard deviation. The spread or deviation of two or more data groups is compared using the standard deviation. You can use the following formula to determine the standard deviation value:

$$S = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \overline{x})^2}{n - 1}}$$

Information:
  S = Standard deviation
  X_1 = Average total of the sample
  $\overline{x}$ = Average number of sample averages
  n = Number of samples

The spread or deviation of two or more data groups is compared using the standard deviation. The sample and population values are aggregated or clustered around the average value if the standard deviation is low. This indicates that because the value is nearly identical to the average value, it can be assumed that the sample or population as a whole shares some characteristics. On the other hand, if the departure is significant, the spread from the mean is also significant. This demonstrates that extreme values—both

high and low—exist. Additionally, a high standard deviation suggests the presence of extreme values on both the high and low ends. A high standard deviation also suggests that population members differ significantly from one another. As a result, as compared to a low standard deviation, a large standard deviation is typically viewed as undesirable.

5.   DATA COLLECTION

The process of gathering, measuring, and evaluating different kinds of information using defined methodologies is known as data collection. The primary goal of data collecting is to gather as much trustworthy data and information as possible, which will subsequently be examined to help make an important decision.

The data collection method in this study was a field survey by selecting the day when peak hours occurred for KRL passengers.
 a.   Survey Location
      Stasiun KRL departs at Bekasi Station and arrives at Jakarta Kota Station at the designated times.
      1)   Monday, February 24, 2020, is a working day. At 06.00 - 09.00 WIB
      2)   Wednesday, February 26, 2020, is a working day. At 06.00 - 09.00 WIB
      3)   Saturday, February 29, 2020, a holiday. At 06.00 - 09.00 WIB
 b.   Survey Time During Covid-19
      1)   Working day Friday, July 24 2020. At 07.30 – 09.00 WIB
      2)   Holiday Saturday, July 25 2020. At 07.30 – 09.00 WIB
      3)   Working day Tuesday, July 28 2020. At 07.30 – 09.00 WIB
 c.   Primary Data Collection
      1)   Departure data for Bekasi Station and Arrival Station for Jakarta Kota
      2)   Duration of the travel from Jakarta Kota Station to Bekasi Station
 d.   Secondary Data Collection
      The departure data for Bekasi Station and Jakarta Kota Arrival Station have been made by PT KCI
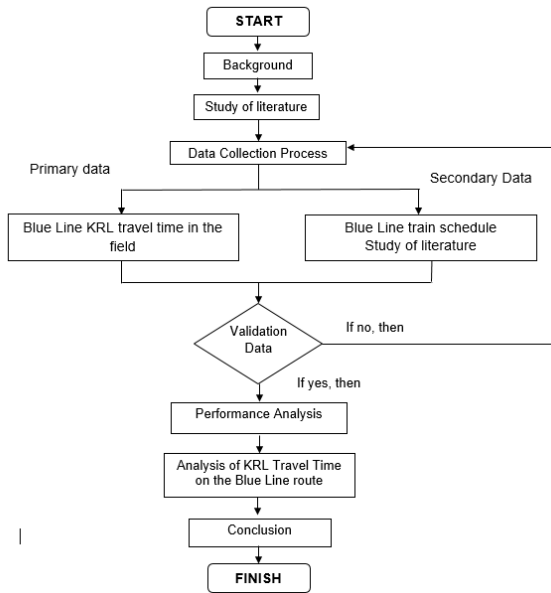
6. RESEARCH METHODOLOGY

Figure 2. Research Flow Chart
(Source: Analysis Results, 2020)

Field Data

The following information is gathered from a field evaluation of the journey time between the Bekasi Departure Station and the Jakarta Kota Arrival Station:

Table 1. Recapitulation of Travel Time (in minute)

Numb. Of Train	Research time recapitulation			Scheduled time
	Workdays I	Workdays II	Holiday	
KA 1327	66	76	58	55
KA 1331	53	67	66	54
KA 1333	65	69	57	57
KA 1335	47	65	50	60
KA 1339	60	57	52	55
KA 1341	74	59	53	61
KA 1343	63	60	52	56
KA 1345	62	60	53	62
KA 1347	52	58	58	58
KA 1349	58	62	43	60
KA 1351	60	56	62	61
KA 1353	68	55	55	55

(Source: Analysis Result,2020)

Table 2. Recapitulation of Travel Time in Conditions of the Covid-19 Pandemic (in minutes)

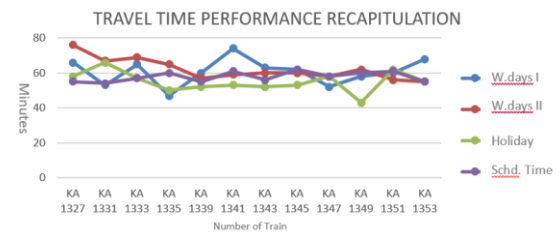| Numb. Of Train	Research time recapitulation			Scheduled time
	Workdays I	Workdays II	Holiday	
KA 1339	55	55	55	55
KA 1341	63	61	61	61
KA 1343	55	60	56	56
KA 1345	64	62	63	62
KA 1347	58	58	58	58
KA 1349	58	61	59	60
KA 1351	61	61	61	61
KA 1353	55	55	55	55

(Source: Analysis result, 2020)

Figure 3. Graph of KRL Travel Time Recapitulation
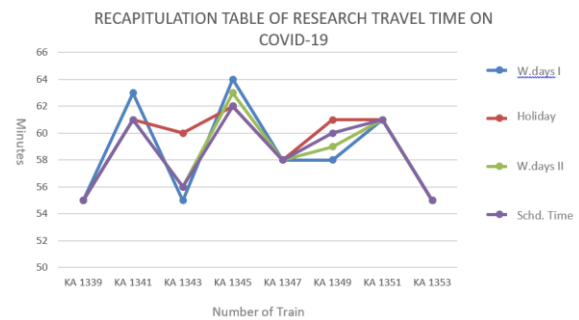(Source: Analysis Result, 2020)

Figure 4. Graph of Research Travel Time in the Conditions of the Covid-19 Pandemic
(Source: Analysis Result, 2020)

Calculation

The scheduled trip time and travel time throughout the study must be known for the fundamental computation to determine the standard deviation.

The outcome of calculating the standard deviation is as follows:

Table 3. Standard Deviation Summary

Numb. Of Train	Standart Deviation
KA 1327	9,018
KA 1331	7,810
KA 1333	6,11
KA 1335	9,644
KA 1339	4,041
KA 1341	10,817
KA 1343	5,686
KA 1345	4,726
KA 1347	3,464
KA 1349	10,017
KA 1351	3,055
KA 1353	7,506

(Source: Analysis Result, 2020)

The recapitulation table's findings show that there is still a delay in terms of travel time as the standard variation of research time on the Blue Line KRL route is greater than the standard deviation of time projected by PT KCI.

Table 4. Summary of Standard Deviations in the Conditions of the Covid-19 Pandemic

Numb. Of Train	Standart Deviation
KA 1339	0
KA 1341	1,155
KA 1343	2,646
KA 1345	1
KA 1347	0
KA 1349	1,528
KA 1351	0
KA 1481	0
KA 1353	0

(Source: Analysis Result, 2020)

The recapitulation table's findings show that there is still a delay in terms of travel time as the standard variation of research time on the Blue Line KRL route is greater than the standard deviation of time projected by PT KCI.

6. CONCLUSION

The following conclusions are reached from the examination of KRL's Bekasi Station departure and Jakarta Kota Station arrival data:

a. The results of the Standard Deviation using the SPSS analysis tool KA 1341 have a higher standard deviation of 10.82, which means that this train has a higher travel time delay than other trains that pass between 06.00 - 9.00.

b. The results of the travel time graph showing the scheduled time that has been made by PT KCI experience an average delay of 4 minutes.

c. The causes of the delay consisted of several factors including the queue of passengers wanting to get on the train, traffic on the Blue Line KRL route was congested because they had to alternate with intercity trains so the KRL had to wait.

d. The actual travel time made by PT KCI on the Bekasi - Jakarta Kota KRL Blue Line route, the fastest travel time on the first working day is 54 minutes and the longest travel time is 1 hour 8 minutes. Research travel time on the Bekasi - Jakarta Kota Blue Line KRL route, the fastest travel time on the first working day is 53 minutes and the longest travel time is 1 hour 14 minutes

e. The actual travel time made by PT KCI on the Bekasi - Jakarta City KRL Blue Line route, the fastest travel time on the second working day is 54 minutes and the longest travel time is 1 hour 16 minutes. The research travel time on the Bekasi - Jakarta Kota Blue Line KRL route, the fastest travel time on the second working day is 55 minutes and

the longest travel time is 1 hour 16 minutes.

f. The actual travel time made by PT KCI on the Bekasi - Jakarta City KRL Blue Line route, the fastest travel time on the first holiday is 54 minutes and the longest travel time is 1 hour 6 minutes. The research travel time on the Bekasi - Jakarta Kota Blue Line KRL route, the fastest travel time on the first holiday is 43 minutes and the longest travel time is 1 hour 6 minutes.

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