Analysis of Ro-Ro Ship Performance Management at the Merak-Bakauheni Crossing Port

Evada Rustina¹, Rafdy Kaukabun Nufus², Sri Sayekti Lestari³, Mochammad Sidiq Fathonni⁴, Sumarwanto⁵

¹,²,³,⁴,⁵Akademi Ketatalaksanaan Pelayaran Niaga Bahtera Yogyakarta

*Corresponding author: evadarustina@akpnbahtera.ac.id

Abstract

The Merak Crossing Port with the Merak – Bakauheni route connects the islands of Java and Sumatra which is the busiest crossing port in Indonesia. The purpose of this study is to analyze the management of Ro-Ro ship performance at the Merak-Bakauheni Crossing Port, including analyzing the calculation of ship trip targets, analyzing the total, average and standard deviation of ship trip targets, and analyzing the trip achievement of each ship. This research was conducted using quantitative methods with qualitative descriptive techniques. Researchers use several data collection techniques, namely literature studies, observations, documentation and interviews. Researchers use data analysis techniques, namely quantitative analysis, namely to calculate the target of a ship’s trip in one period of schedule, average and standard deviation. The calculation of the number of ship trips in one scheduled period is based on the number of ships that can operate in one scheduled period and the number of trip slots. Based on data processing and analysis, the results were obtained that the total one-period ship trip slots were 6,696 trips. The average trip grouping of piers I and II is 100 trips, the grouping of pier III is 102 trips, and the grouping of pier VI (executive) is 163 trips. While the standard deviation of the grouping of pier 1 is 0.68; the grouping of pier II is 0.72; the grouping of pier III is 0.91, and the grouping of pier VI (executive) is 4.61. From the realization of ship trips, it was found that the average ship at the Merak crossing port in March had not met the trip target that had been set. With a total of 39 ships or 67% of the total ships that lack trips and a total of 19 ships or 33% over-trip.

Keywords: Crossing Port, Management, Ro-Ro Ship
1. INTRODUCTION

Indonesia is an archipelagic country. Indonesia has land separated by oceans, and the area of the ocean is larger than that of land, namely 3/4 of the ocean and 1/4 of the land alone (Kurnia, 2016). The means of transportation for the river, lake, and crossing traffic is a ship (Arianto & Putri, 2019). The development of the transportation world in Indonesia from year to year is very rapid (Imansyah, 2018). The use of crossing transportation modes using crossing ships is in great demand among Indonesians who want to travel between islands (Rutz & Coull, 1996). This is due to several factors, including ticket prices that are cheaper than air transportation modes. To cross the sea to the opposite island it is easier to use a crossing boat that has been provided by the government or private companies. Ships that are commonly used for crossing routes between islands are ferry types or Ro-ro ships (Furuichi et al., 2017).

Merak Crossing Port (Banten) and Bakauheni (Lampung) are two nodes (ports) for the Merak – Bakauheni Crossing (Al Mahkya et al., 2020). Both are the main bridges connecting Java Island and Sumatra Island with a track distance of 15 mills and a travel time of 2 hours (Dick & Rimmer, 2003). The Merak Crossing Port has 7 piers ready for operation, the 7 Piers include Pier I, Pier II, Pier III, Pier IV, Pier V, Pier VII and Pier VI or Executive Pier (Kurniawan et al., 2015). Every crossing has a risk of accidents and damage. The risk of accidents in the transportation of passengers and vehicles at the crossing port must exist, because accidents and damage can threaten anyone, anytime, and anywhere. The risk of accidents can be detrimental to passengers, related companies, and even the country. Therefore, starting from ships, and ports, to existing facilities, they must meet the standards that have been set, to provide a sense of security, as well as fast and precise service (Giusti et al., 2019).

A crossing service through the sea route is said to be good and fast, inseparable from the performance of the crossing ship itself, the performance of the ship here is about the realization of a trip from a ship with a scheduled trip (Chernova & Volkov, 2010). Ship trips can affect various things for example the accuracy of the ship’s schedule, ship revenue, etc. So it is necessary to carry out supervision and evaluation of ship performance. Crossing Ports in Indonesia will continue as long as activities through sea transportation still exist (Leung, 2016).

The importance of good ship performance at the crossing port which will provide information related to the performance of a ship to the trip schedule and the realization of ship trips, seeing that there are still many realise ship trips in one schedule period when compared to the target of ship trips at the Merak Crossing Port on the Merak-Bakauheni...
Crossing (Surnata & Andani, 2021). Realizing the great role of the Office of the Land Transportation Management Center for Region VIII of Banten Province, the researcher decided to conduct research at the Office of the Land Transportation Management Center for Region VIII of Banten Province and especially at the Office of the Merak Crossing Port Service Unit, the purpose of this study was to analyze the management of the performance of Ro-Ro ships at the Merak-Bakauheni Crossing Port including analyzing the calculation of ship trip targets, analyze the total, average and standard deviation of the ship’s trip targets, and analyze the trip achievement of each ship.

2. LITERATURE REVIEW

2.1 Ferry/RO-RO

The existing Ferry / RO-RO is designed to have two doors (double-ended), namely the front door and the rear door to facilitate the loading and unloading of transported vehicles (Marzano et al., 2020). This method also aims to make it easier for the ship to not need to maneuver when it is about to walk away from the port. When at the port of origin the Ferry leans back using the back door to transport vehicles, on the contrary when arriving at the destination port the Ferry ship uses the front door to dock. This makes it easier to get in and out of vehicles and the ship does not need to maneuver to dock (Shatat et al., 2020). So it will not take long at the port, and the process of getting on and off the vehicle runs quickly and smoothly.

2.1 Port

A port is an area consisting of land, and waters with certain boundaries as a place to carry out government activities and economic activities that are used as a place to lean ships, ship berthing, boarding or disembarking passengers and loading and unloading goods equipped with shipping safety facilities and supporting activities as well as a place for intra- and intermodal movement (Artanti et al., 2022; Astriawati et al., 2022). The Main Crossing Port is a port whose main function is to serve crossing transportation activities with interprovincial service coverage (Kunaka & Carruthers, 2014). Collector Crossing Port is a port whose main function is to serve crossing transportation activities with interprovincial service coverage. Feeder Crossing Port is a port whose main function is to serve crossing transportation activities with a range of services within the province (Putra et al., 2019). Ports can be divided into several types that depend on the angle of review, namely in terms of their implementation, their business functions in national and international trade, in terms of their usefulness and geographical location. Based on the Regulation of the Minister
of Transportation of the Republic of Indonesia Number PM 104 of 2017 concerning the Implementation of Crossing Transportation, it states that:

1. Article 23
   The placement of vessels on each Crosswalk shall be under the technical specifications of the crossing and the port facilities used to service the Crossing Transport.

2. Article 24
   (1) The placement of the number of ships at each Crosswalk must pay attention to the balance between the needs of service users and transportation service providers.
   (2) The addition of carrying capacity at each Crosswalk is carried out taking into account: The average load factor of ships on crosswalks reaches at least 65% (sixty-five per hundred) within 1 (one) year; The placed vessel cannot meet the amount of cargo present; The number of vessels operating is less than the number of vessels permitted to serve the relevant crossings; The capacity of port infrastructure and facilities used to serve the available crossing transport or crossing terminals; Level of pipeline serviceability; and/or The frequency of service of ships placed has not been optimal.
   (3) If the frequency of service of the ships placed is optimal and there is still a shortage of service, it can be done: a. an increase in the number of ships; or b. replacement of a vessel of a larger size
   (4) The addition of carrying capacity at each Crosswalk must pay attention to the average load factor of at least 50% (fifty per hundred) per year by not increasing the berthing time and sailing time of each ship.

Traffic management of crossings at the port is carried out within the area of the port work environment which includes: Vehicle traffic and its cargo, People traffic (Supartini et al., 2022). The traffic management of crossings at the port includes normal conditions and congested conditions. Under normal conditions, establish a scheduling plan that includes: Ship departure schedule, Arrival schedule, Berthing schedule, Anker schedule, and docking schedule. According to River Freight Management and Crossings travel time is the time it takes to sail between ports depending on the distance between ports and the speed at which ships travel. The characteristics of the needs of crossing transportation services from time to time vary greatly and are influenced by various factors, including normal conditions, vacation conditions and special conditions. The ship’s trip capability is the number of trips that the ship runs in a given unit of time. The ship’s trip capability is affected by sailing time
and ship turnaround time. In carrying out the performance of crossing transportation there are several analytical steps such as the level of use of the dock by ships, determining the number of docks, the number of cargoes of both passenger and vehicle loads, the level of use of loading and unloading equipment and the amount of time the dock is empty (Rustina et al., 2022).

3. RESEARCH METHOD

This research was conducted using quantitative methods with qualitative descriptive techniques, because the researcher describes the calculation of ship trips in one scheduled period and calculates the average and standard deviation on the trip target and describes the state of the subject or object of research, which includes the presentation of comparative data about ship trips at the Merak crossing port in tables, diagrams, and describes events, problems, and solutions that occur in the field (Rustina, 2021). The population data in this study includes data on ships located at the Merak Crossing Port on the Merak-Bakauheni crossing and ship grouping data at each Merak Crossing Port Pier on the Merak-Bakauheni Crossing Cross which includes Pier I, Pier II, Pier III, Pier IV, Pier V, Pier VI (Executive) and Pier VII. The sample data in this study is the number of ships and docks operating on one scheduled period, namely the scheduled period in March 2019.

Researchers use several data collection techniques, namely literature studies, observations, documentation and interviews. Literature Study is a data collection technique by studying books or references that exist and are related to the problem under study (Fattah et al., 2022). Observations in this study, researchers saw and made direct observations about the performance of ships at the Merak crossing port at the Office of the Land Transportation Management Center for Region VIII of Banten Province with the Merak-Bakauheni Crossing Track. Documentation Techniques in this study, researchers carry out documentation activities or take photos to complete the research results, the tool used is a 16 Mega Pixel handphone camera (Purjiyono et al., 2019). Meanwhile, the interview technique according to Sidiq in Subekti et al., (2022) explains that interviews are used as a data collection technique if researchers want to conduct preliminary studies to find problems that must be studied, and also know things from respondents that are more in-depth and the number of respondents is small. interviews are differentiated into structured interviews and unstructured interviews. Interviews in this study include in-depth interviews and phased interviews. In-depth interviews were conducted in the context of participation observations. Researchers are intensively involved with the research setting, especially in their involvement with the life of informants.
Researchers collect operational data on the performance of ships contained in the Merak crossing port, data obtained from a daily journal on the target and realization of a ship’s trip at the Merak Crossing Port, and then it will be presented in tabular form. So that it can be known the performance of ships at the Merak Crossing Port at the Merak-Bakauheni Crossing, the results of which can be used as an evaluation of the performance of ships at the Merak Crossing Port. The researcher also presented data on the causes of the non-realization of trips to scheduled ship targets that occurred at the Merak Crossing Port related to shipping performance at the Merak Crossing Port and their solutions. Researchers use data analysis techniques, namely quantitative analysis, namely to calculate the target of a ship’s trip in one period of schedule, its average and standard deviation, and Descriptive qualitative analysis is a way of describing problems based on the data owned, namely by arranging the data in such a way that it can be easily understood about the characteristics of the data, explained and useful for further purposes. So in this case there is an activity or process of data collection, and data processing is based on its purpose. Average trip value using the formula:

\[ \bar{x} = \frac{\sum n}{n} \]  

with \( \bar{x} \) = average value, \( n \) number of ship trips

Standard deviation is a statistical value that is used to determine how the data is distributed in the sample, as well as how close individual data points are to the mean or average of the sample values. A standard deviation of a data set equal to zero indicates that all values with that set are the same. A larger deviation indicates that individual data points are far from the average value. To find out how to calculate the standard deviation, two formulas must be known, namely the variance formula and the standard deviation formula. Here is the formula that can be used:

\[ s = \sqrt{\frac{\sum_{i=1}^{n}(x_i-\bar{x})^2}{n-1}} \]  

Description:  
\( s \) : Standard deviation  
\( n \) : Sample Size  
\( x_i \) : Value of \( x \) i-th  
\( \bar{x} \) : Average
4. **RESULT AND DISCUSSION**

Merak Crossing Port (Banten) and Bakauheni (Lampung) are two nodes (ports) for the Merak – Bakauheni Crossing. Both are the main bridges connecting Java Island and Sumatra Island. To realize effective and efficient transportation, it must be directed to improving services by bringing together interests or expectations both from the provider side and from the side of the crossing transportation service user. The crossing ships serving the Merak - Bakauheni track are inter-provincial crossings with a track distance of 15 miles and a travel time of 2 hours. This trajectory can be seen in Figure 1 below.

![Merak - Bakauheni Track Map](image)

Figure 1. Merak – Bakauheni Track Map

Merak Crossing Port is a crossing port in Cilegon City, Banten while Bakauheni Crossing Port is located in Bakauheni District, South Lampung Regency which is located at the southern end of the Cross Sumatra Highway. By KM. number 53 of 2002 concerning the National Port Order, this Crossing Port is included in class I crossing port and is the most populous crosswalk in Indonesia even in the Asian region which has various facilities in the land and water areas. The following can be seen in the Existing Area of Merak Port in Figure 2 below.
The type of ship used to cross from the Merak Crossing Port to the Bakauheni Crossing Port is the Ro-Ro (Roll on – Roll off) ship. A Ro-Ro (Roll on – Roll off) ship is a ship that can load vehicles that walk into the ship. The ship is equipped with ramp doors connected by a movable bridge or floating pier to the pier. Ro-Ro ships in addition to being used for truck transportation are also used to transport passenger cars, motorcycles and pedestrians. The Merak Crossing Port has 68 ships available at the Merak – Bakauheni crossing. In the March schedule period, 28 ships were operating daily. Ships operating on the Merak - Bakauheni track already have a schedule of operations and ship formations that rest on each pier in Merak Port. Of the 68 ships in operation, most of the ships are over 30 years old, namely 27 ships, the ships between the ages of 21 years and 30 years are 22 ships, while the ships under 10 years old are 19 ships. This shows that the ships on the Merak-Bakauheni Crosswalk are mostly quite old. Here’s Table 1 showing the age of the ship in the Merak-Bakauheni Cross.

<table>
<thead>
<tr>
<th>Age of the ship</th>
<th>SUM (Ship)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 10 Year</td>
<td>19 Ship</td>
<td>27.94%</td>
</tr>
<tr>
<td>11 - 20 Year</td>
<td>0 Ship</td>
<td>0.00%</td>
</tr>
<tr>
<td>21 - 30 Year</td>
<td>22 Ship</td>
<td>32.35%</td>
</tr>
<tr>
<td>&gt; 30 Year</td>
<td>27 Ship</td>
<td>39.71%</td>
</tr>
</tbody>
</table>

Table 1. Age of the ship in the Merak-Bakauheni Cross.
In percentage terms, regarding the age condition of ships across Merak-Bakauheni, 27.94% are under 10 years old, 0% are between 11 years old and 20 years old, 32.35% are between 21 years old and 30 years old and 39.71% are over 30 years old. From the aspect of ship size located at the Merak-Bakauheni Crossing, most ships are ships with sizes between 5,000 GT to 10,000 GT, which is 42 ships, and only 6 ships are above 10,000 GT. The rest are ships with a size below 5,000 GT, which is 20 ships. The percentage of ship size can be seen in Figure 3 below.

![Figure 3. Percentage of Ship Size in Lintas Merak-Bakauheni](image)

This shows that most of the ships that cross the Merak-Bakauheni track are medium-sized ships or between 5,000 GT to 10,000 GT which has a percentage of 62%. 29% of ships are under 5,000 GT and Only 9% of ships are over 10,000 GT. From the aspect of ship ownership, most of the ships located at the Merak - Bakauheni Crosswalk are owned and operated by private companies, namely 60 Ships or as much as 88% of all ships and only 8 ships or 12% are owned by PT. Bakauheni. ASDP Indonesia Ferry (Persero), which is a State-Owned Enterprise company. The number of dock pairs in the March schedule period is 6 (six) pairs of piers with the following pair pattern: a. Pier I of Merak Port is paired with Pier I of Bakauheni Port; b. Pier II of Merak Port is paired with Pier II of Bakauheni Port; c. Pier III of Merak Port is paired with Pier III of Bakauheni Port; d. Pier V of Merak Port is paired with Pier V of Bakauheni Port; e. Pier VI (Executive) of Merak Port is paired with Pier VII (Executive) of Bakauheni Port; f. Pier VII of Merak Port is paired with Pier VI of Bakauheni Port; Grouping ship is a grouping of ships against the port dock as a place for ships to dock. Grouping ship based on ship specification, which includes: Ship length, Ramp door width,

Each scheduled period at the Merak-Bakuheni Cross Crossing Port has a different service pattern. The Service Pattern on the March schedule at the Port of Cross-Merak-Bakauheni crossing is as follows:

a. Piers I and II each have as many as 6 ships per pier, with the following service patterns: Schedule cycle time for 6 hours (time for 1 round trip (1 PP)); Sailing Time for 120 minutes (Sailing Time, Inbound Motion Time and Exit Travel Time); Time at the Pier (Port time) for 60 minutes (Unloading and Loading, Passenger and Vehicle Cargo Service Time, Ticket claim time and Manifest Printing, and Clearance Ship handling time); The closing time of Rumpdoor is set at least 25 minutes before departure time, which is then used for tapping smart cards (tickets) for printing ship cargo lists (manifests) and issuing SPB, especially at the Merak Crossing Port; Load Service Time for 13 minutes (time to direct passenger and vehicle loads).

b. Piers III and VII each as many as 5 ships per pier, with the following service patterns: Schedule cycle time for 6 hours (time for 1 round trip (1 PP)); Sailing Time for 108 minutes (Sailing Time, Inbound Motion Time and Exit Motion Time (Sailing Time), Time at the Pier (Port time) for 72 minutes (Unloading and Loading, Passenger and Vehicle Load Service Time, Ticket claim time and Manifest Printing, and Clearance Ship handling time); The closing time of Rumpdoor is set at least 25 minutes before departure time,
which is then used for tapping smart cards (tickets) for printing ship cargo lists (manifests) and issuing SPB, especially at the Merak Crossing Port; Load Service Time for 13 minutes (time to direct passenger and vehicle loads).

c. Pier V as many as 3 ships per pier to avoid flotation, with the following service pattern: Schedule cycle time for 6 hours (time for 1 round trip (1 PP)); Sailing Time for 90 minutes (Sailing Time, Inbound Motion Time and Exit Motion Time (Sailing Time), Time at the Pier (Port time) for 90 minutes (Unloading and Loading, Passenger and Vehicle Cargo Service Time, Ticket claim time and Manifest Printing, and Clearance Ship handling time); The closing time of Rumpdoor is set at least 25 minutes before departure time, which is then used for tapping smart cards (tickets) for printing ship cargo lists (manifests) and issuing SPB, especially at the Merak Crossing Port; Load Service Time for 13 minutes (time to direct passenger and vehicle loads).

d. Pier VI (Executive) as many as 3 ships per pier, with the following service patterns: Schedule cycle time for 6 hours (time for 1 round trip (1 PP)); Sailing Time for 90 minutes (Sailing Time, Inbound Motion Time and Exit Motion Time (Sailing Time), Time at the Pier (Port time) for 90 minutes (Unloading and Loading, Passenger and Vehicle Cargo Service Time, Ticket claim time and Manifest Printing, and Clearance Ship handling time); The closing time of Rumpdoor is set at least 25 minutes before departure time, which is then used for tapping smart cards (tickets) for printing ship cargo lists (manifests) and issuing SPB, especially at the Merak Crossing Port; Load Service Time for 13 minutes (time to direct passenger and vehicle loads).

Target trip is the number of trips/trips of a ship in one scheduled period. The calculation of the number of trips per ship in one scheduled period is based on the number of ships that can operate in that scheduled period and the number of trip slots in that period. In each period the schedule has a changing trip per ship target. The calculation of the number of trip ships, is still influenced again by schedule adjustments, and empty trip ship slots, so the number of trip targets based on formula calculations will be different from the final trip target set, but it will not be much different. Total trips are the number of ship trips according to the schedule that has been set. Total trips are a reference for shipping companies to run their ships. For example ship Bahuga Pratama is a ship grouping pier I and has a total of 100 trips, ship Menggala is a ship grouping pier II and has a total trip of 101 trips, ship SMS Sagita is a ship grouping pier III and has a total trip of 104 trips, and ship Port link is a ship grouping pier VI (Executive) and has a total of 163 trips. The average trip target in the March schedule period at the Merak-Bakauheni Crossings is 100 trips for ship Grouping Pier I and Pier II, as
many as 102 Trip ship Grouping Pier III and As many as 160 Trips for Grouping Pier VI (Executive). The average trip per ship at grouping pier 1 is:

\[ \bar{x} = \frac{\sum n}{n} = \frac{1612}{16} = 100.75 \text{ trip} \]

The average trip per ship at grouping pier II is:

\[ \bar{x} = \frac{\sum n}{n} = \frac{1505}{15} = 100.33 \text{ trip} \]

The average trip per ship at grouping pier III is:

\[ \bar{x} = \frac{\sum n}{n} = \frac{2783}{27} = 103.07 \text{ trip} \]

The average trip pership at grouping pier VI (executive) is

\[ \bar{x} = \frac{\sum n}{n} = \frac{481}{3} = 160.33 \text{ trip} \]

Standard deviation grouping Pier 1 with the number of 16 ships, The average trip is 100.75 and the number of each trip: 100, 100, 101, 101, 101, 101, 101, 101, 101, 101, 102, 102, 100, 100, 100, 100, 100. Then the standard deviation result is

\[ s = \sqrt{\frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n-1}} = \sqrt{\frac{7}{15}} = \sqrt{0.467} = 0.68 \]

So it is known that the standard deviation of grouping Pier I is = 0.68. Standard deviation Grouping pier 2 is:

\[ s = \sqrt{\frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n-1}} = \sqrt{\frac{7.33}{14}} = \sqrt{0.52} = 0.72 \]

So it is known that the standard deviation of grouping Pier II is = 0.68. Standard deviation Grouping pier 3 is:

\[ s = \sqrt{\frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n-1}} = \sqrt{\frac{21.85}{26}} = \sqrt{0.84} = 0.91 \]

So it is known that the standard deviation of the Grouping of Pier III is = 0.91. Standard deviation Grouping pier 4 (executive) is:
So it is known that the standard deviation of grouping pier VI (executive) is = 4.61. The realization of the trip ship at the Merak Cross Merak-Bakauheni Crossing. Merak Crossing Port with the Merak-Bakauheni Pass which are two port nodes connecting Java Island and Sumatra Island. To realize effective and efficient transportation, it must be directed to improving services both from the provider side and from the user side of the crossing transportation service. The fulfilment of the trip ship target or the fulfilment of trip ship realization by service providers is something that must be considered. To see the ship performance of a port, it is necessary to calculate the realization of a trip ship.

The calculation of the realization of this research trip was carried out manually, namely by recapturing the daily journal of each guard team. In fulfilling the trip ship’s target, it is influenced by various things, the main thing is about the weather and the readiness of the ship itself in fulfilling the trip ship target. From the results of the recap of the realization of the trip ship at the Merak Lintas Merak-Bakauhen Crossing Port, it was found that the average ship operating at the Merak-Bakuheni crossing has not met or has not reached the trip target that has been set. From these results, it is necessary to evaluate and improve the performance of the ship so that the fulfilment of the trip target for each ship and the creation of effectiveness and efficiency at the Merak Cross Crossing Port of the Merak-Bakauheni Crossing. The fulfilment rate of the trip ship based on the schedule at the Merak-Bakauheni Crossing can be described in the following Table 2.

<table>
<thead>
<tr>
<th>NO</th>
<th>Trip</th>
<th>Amount of Excess Ship</th>
<th>Number of Ship Shortages</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0 – 10</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>2</td>
<td>11 – 20</td>
<td>0</td>
<td>16</td>
</tr>
<tr>
<td>3</td>
<td>21 – 30</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>&gt;30</td>
<td>0</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>Amount</td>
<td>1</td>
<td>57</td>
</tr>
</tbody>
</table>

The average fulfilment of trips based on ship schedules at the Port of Peyeberangan Merak in Lintas Peyeberangan Merak-Bakauheni has not been fulfilled. With the number of ships that have a shortage of trips above 30 trips, it is as many as 17 ships or 29% of the total.
ship. Meanwhile, the fulfilment rate of trip ship based on the overall trip at the Merak-Bakauheni Crossing can be described in table 3 below.

<table>
<thead>
<tr>
<th>NO</th>
<th>Trip</th>
<th>Amount of Excess Ship</th>
<th>Number of Ship Shortages</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0 – 10</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>11 – 20</td>
<td>7</td>
<td>11</td>
</tr>
<tr>
<td>3</td>
<td>21 – 30</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>&gt;30</td>
<td>19</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>Amount</td>
<td>1</td>
<td>12</td>
</tr>
</tbody>
</table>

The average trip fulfilment based on the overall trip ship at Peyeberangan Merak Port in Lintas Peyeberangan Merak-Bakauheni has not been fulfilled. With the number of ships that have a shortage of trips above 31 trips is as many as 14 ships, the shortage between 21-30 trips is 4 ships, the shortage between 11-20 trips is 11 ships, and the shortage of trips under 10 trips is 10 ships. With a total ship that lacks trips as many as 39 ships or 67% and the total ships that have excess trips of as many as 19 ships or 33%.

5. CONCLUSION

Merak Crossing Port with Merak-Bakauheni Track which is a two-port node connecting Java Island and Sumatra Island and is the port with the busiest track in Indonesia. To realize effective and efficient transportation, it must be directed to improving services both from the provider side and from the user side of the crossing transportation service. The conclusion of this study is (1) In the calculation of the number of trips per ship in one scheduled period, it is based on the number of ships that can operate in that scheduled period and the number of trip slots in that period. In each period the schedule has a changing trip per ship target. The calculation of the number of trip ships is still influenced again by schedule adjustments and empty trip ship slots. In determining trip ships, there are various things such as grouping ships, and service patterns at each pier. (2) a. Total trips are the number of ship trips according to the schedule that has been set. Total trips are a reference for shipping companies to run their ships; b. The average trip target in the March schedule period at the Merak-Bakauheni Crossings is 100 Trips for ship Grouping Pier I and Pier II, as many as 102 Trip ship Grouping Pier III and As many as 160 Trips for Grouping Pier VI (Executive); c. Standard deviation is a statistical value that is used to determine how the data is distributed in the sample, as well as how close individual data points are to the mean or
average of the sample values. The standard deviation of the pier 1 grouping is = 0.68, Dermag 2 grouping is = 0.72, Dermag 3 grouping is = 0.91, and the pier 6 grouping (executive) is = 4.61. (3) In fulfilling the trip ship target, it is influenced by various things, the main thing is the weather and the readiness of the ship itself in fulfilling the trip ship target. From the results of the recapitulation of the realization of trip ships at the Merak Lintas Merak-Bakauhen Crossing Port, it was found that the average ship operating at the Merak-Bakuheni crossing has not met or has not reached the trip target that has been set. With a total ship that lacks trips as many as 39 ships or 67% and the total ships that have excess trips of as many as 19 ships or 33%.

REFERENCES
critical success factors, enabling technologies, and open research issues.


