Analysis of Handling Loading And Unloading Delays In Improving Operational Performance On Km Dharma Ferry VIII

I Dewa Gede Andika Kusuma Wibawa[1*], Haerani Asri[2], Sulastriani R[3]

[1,2,3]Program Diploma IV Pelayaran Politeknik Ilmu Pelayaran Makassar, Indonesia
[*] Corresponding author:
Email : andikalenovo@gmail.com

Abstract.
Delays in the loading and unloading process are one of the operational problems that can disrupt shipping schedules, increase operational costs, and reduce the quality of maritime transportation services. This study aims to analyze the factors causing delays in loading and unloading and their impact on the operational performance of KM Dharma Ferry VIII. The study used a qualitative approach with a case study method. The research population included all parties involved in loading and unloading activities and ship operations, while the sample was determined by purposive sampling consisting of the Captain, First Officer, Stevedoring Workers (TKBM), and port operational officers. The research instruments were in the form of interview guidelines, observation sheets, and documentation. Data analysis used the interactive model of Miles, Huberman, and Saldaña through data reduction, data presentation, and drawing and verifying conclusions with the help of NVivo 12 software. The results showed that delays in loading and unloading were caused by internal ship factors, land-side factors, and external factors such as vehicle density, passenger density, limited operational area, and weather conditions. These delays resulted in disruptions to shipping schedules, increased operational costs, and decreased service quality. The research conclusion shows that improving coordination between parties, optimizing vehicle arrangements, utilizing digital systems, and conducting regular operational evaluations are effective strategies for reducing loading and unloading delays and improving ship operational performance.
Keywords: *Cargo Handling, Maritime Logistics, Operational Performance, Port Operations and Schedule Reliability.*

I. INTRODUCTION

Indonesia is the largest archipelagic country in the world, with more than two-thirds of its territory covered by water. Therefore, the maritime sector plays a strategic role in maintaining national connectivity and supporting economic growth. These geographical characteristics make sea transportation the primary mode of distribution of goods and services between islands and support international trade activities. According to Yuen et al. [1], sea transportation is a key component in the global logistics system because it is capable of transporting large volumes of goods efficiently. In Indonesia, dependence on sea transportation is increasing because most areas can only be accessed through shipping networks. This condition makes ports an important node in the national supply chain, connecting production centers with consumption areas while supporting the smooth flow of domestic and international trade [2], [3].

The role of ports in Indonesia's logistics system is increasingly important because approximately 90% of Indonesia's foreign trade is conducted by sea. In addition to being the main gateway for exports and imports, ports also function as a means of distributing industrial raw materials, basic necessities, and various strategic commodities to remote areas and small islands. Ricardianto et al. [2] explain that the effectiveness of port operations directly contributes to national logistics performance and a country's economic competitiveness. Meanwhile, research by Gurning and Riadi [4] shows that the efficiency of ship and cargo services at ports is a crucial factor in reducing logistics costs and accelerating distribution flows. Therefore, optimizing port operational processes is an urgent need to support the sustainable development of Indonesia's maritime sector.

Despite their vital role, port operational activities in Indonesia still face various obstacles, one of which is delays in the loading and unloading process. This problem can be caused by limited loading and unloading facilities and equipment, less than optimal coordination between agencies, administrative obstacles, and unpredictable weather factors. Arisanti et al. [5] stated that low cargo handling efficiency can hamper terminal productivity and extend ship service times. In addition, Hidayatullah et al. [6] found that

loading and unloading delays are often triggered by a combination of technical, operational, and managerial factors that cause the ship service process to not run according to the set time targets. This condition results in increased ship waiting times, increased dwelling time, and the emergence of additional costs that must be borne by shipping companies and port service users.

The impact of loading and unloading delays is not only limited to activities at the port, but also affects the overall operational performance of ships. According to Zheng et al. [7], delays in ship services at a port can disrupt schedule reliability because they cause changes in departure and arrival times at the next port. As a result, shipping companies must bear increased operational costs, decreased fleet productivity, and reduced customer satisfaction levels. A similar phenomenon occurred in the operations of KM Dharma Ferry VIII when delays in the loading and unloading process caused the ship's departure to be delayed and impacted the service schedules of other ships using the same berthing facilities. In the long term, this condition can reduce the operational efficiency of shipping companies while reducing the effectiveness of logistics systems that depend on the timely distribution of goods [5], [7].

Based on these phenomena and problems, this study aims to identify the dominant factors causing loading and unloading delays and analyze their impact on the operational performance of KM Dharma Ferry VIII. This study has a high urgency because loading and unloading efficiency is one of the important indicators in increasing port productivity and maintaining the smoothness of the national supply chain. In contrast to previous studies that generally focus on container terminals or large-scale commercial ports [4], [5], this study offers novelty through a specific study of loading and unloading delays on the domestic ferry KM Dharma Ferry VIII. The results of the study are expected to provide theoretical contributions in the development of shipping operational management studies and become a basis for shipping companies and port managers in formulating strategies to improve operational efficiency and reliability of shipping schedules [2], [7].

II. METHODS

This research uses a qualitative approach with a case study method that aims to understand in depth the phenomenon of loading and unloading delays and their handling in improving operational performance on KM Dharma Ferry VIII. The qualitative approach was chosen because it allows researchers to gain a comprehensive understanding of the processes, experiences, interactions, and operational dynamics that occur naturally in the research context [8], [9]. The case study method was used because the research focuses on one particular object, thus allowing for a more in-depth exploration of the factors causing delays, the handling strategies implemented, and their impact on the ship's operational effectiveness. This approach is considered appropriate for uncovering complex and contextual shipping operational phenomena as explained in research related to operational performance and efficiency of maritime services [2], [5], [7].

The population in this study were all parties directly involved in the loading and unloading process and operations of KM Dharma Ferry VIII. The determination of informants was carried out using a purposive sampling technique by considering the level of involvement, experience, and knowledge of informants regarding the loading and unloading process. The main informants consisted of the Captain, First Officer, Stevedoring Workers (TKBM), port operational officers, and shipping company officials who have a role in operational decision making. The purposive sampling technique was chosen because it is able to produce in-depth and relevant data according to the objectives of qualitative research, namely to obtain information from individuals who understand the phenomenon being studied directly [8], [10].

The main instrument in this study was the researcher himself, supported by interview guidelines, observation sheets, and company operational documents. Data collection was conducted through in-depth interviews, direct observation of loading and unloading activities on the KM Dharma Ferry VIII, and documentation studies including the ship's logbook, operational reports, and standard operating procedures (SOPs). The combination of these three techniques was used to obtain complete data and increase the validity of the findings through triangulation of sources and methods. The use of various data sources also allows for more accurate identification of the factors causing loading and unloading delays and their impact on the ship's operational performance [5], [6], [9].

The research procedure began with problem identification and literature review related to port operations, loading and unloading delays, and ship operational performance. The next stage included the development of research instruments, the selection of informants, the collection of field data through observation, interviews, and documentation, and the transcription of interview results. The collected data were then organized and coded using NVivo 12 software to facilitate the identification of themes, patterns, and relationships between categories emerging from the field data. These stages were carried out systematically to produce valid, in-depth findings that align with the research objectives [9], [10].

Data analysis used the interactive model of Miles, Huberman, and Saldaña, which consists of data reduction, data presentation, and drawing and verifying conclusions [11]. In the data reduction stage, the results of interviews, observations, and documentation were selected, categorized, and focused on the main research themes, namely the factors causing loading and unloading delays, handling strategies, and their impact on ship operational performance. Next, the data was presented in the form of descriptive narratives and visualization of the results of NVivo coding to facilitate interpretation of the relationships between themes. The final stage was carried out through drawing conclusions and repeated verification by comparing the results of field findings with previous theories and research to obtain conclusions that were credible, consistent, and scientifically accountable [5], [7], [11].

III. RESULTS AND DISCUSSION

Observation Results

1. Ship departure schedule

In this study, KM Dharma Ferry VIII was scheduled to depart on July 31, 2025, at 9:00 PM WITA from Padang Bai Port to Lembar Port. However, based on observations and logbook data, the ship experienced a delay in departure due to the loading and unloading process taking longer than normal operating hours. This delay caused changes to the operational schedule and potentially had a ripple effect on other ships using the next sailing slot. In addition to impacting the sailing schedule, this condition also affected the operational efficiency of the port because it could increase ship waiting times and cause activity congestion in the dock area. Therefore, the smoothness of the loading and unloading process is an important factor that needs to be considered so that the ship's departure schedule can run according to the predetermined time.

Fig. 1. Ship Departure Schedule

Source: Port Data, 2025

2. Ship's Logbook Records

Based on the results of observations and the loading and unloading delay event scheme on KM Dharma Ferry VIII on Thursday, July 31, 2025 at Padangbai Port, it was found that the 25-minute delay from the scheduled departure time of 21:00 WITA was influenced by several factors that occurred during the operational process. The delay did not occur suddenly, but was influenced by various interrelated obstacles, both from internal ship factors, port operational factors, and external factors. This condition caused the loading and unloading process to take longer than the normal operating time that had been set. In addition, the delay also had an impact on the smoothness of the next sailing schedule due to changes in the ship's berthing and departure times. If conditions like this occur repeatedly, it can affect the effectiveness of port services and reduce the overall operational performance of the ship. Therefore, more effective coordination and handling are needed from all related parties so that the loading and unloading process can run according

to the established operational schedule.

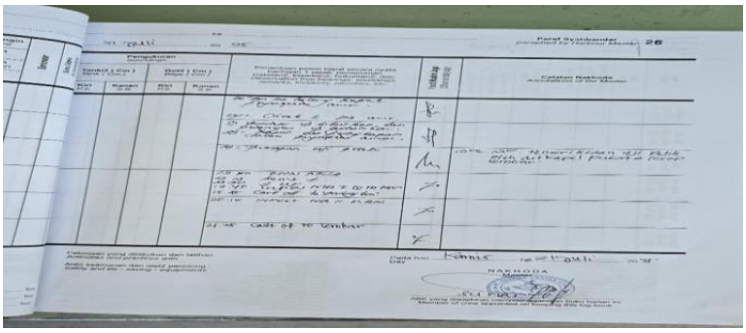

Fig. 2. LogbookKM Dharma Ferry VIII July 31 2025
Source: Author's Documentation, 2025

Interview Results

The data collected by the author is the result of interviews conducted with several parties directly involved in the loading and unloading process on the KM Dharma Ferry VIII. In this study, the author selected four informants who were considered to have a direct relationship with the research object. The first informant was the Captain as the main informant because he had responsibility for the overall operational activities of the ship. The second informant was the Chief Officer who played a role in organizing and supervising the implementation of the loading and unloading process on board the ship. The third informant was the Stevedoring Workers (TKBM) as the party directly involved in the implementation of loading and unloading activities in the field. The fourth informant was the port operational officer who was responsible for the operational arrangements and smooth activities in the port area. The following are excerpts from interviews with each informant:

1. What are the procedures for loading and unloading on KM Dharma Ferry VIII?

a. The author conducted an interview with the Captain (S) and the following are excerpts and results of the interview.

"The loading and unloading process begins with the ship docking, followed by coordination between the ship's crew and ground personnel. After the ramp doors are opened, vehicles are unloaded in an orderly manner along designated routes. Once the unloading process is complete, the loading of vehicles and passengers continues."

b. The author conducted an interview with the Chief Office (WS) and the following are excerpts and results of the interview.

"After the ship has docked and the ropes have been installed, we usually direct the sailors to open the ramp door, then the pedestrian passengers are directed to leave the ship, then after the pedestrian passengers have left, the motor vehicles and trucks are also directed to leave one by one."

c. The author conducted an interview with TKBM (AW) and the following are excerpts and results of the interview.

"After the ramp door was opened, we helped regulate the flow of vehicles out."

d. The author conducted an interview with the Operational Officer (KW) and the following are excerpts and results of the interview.

"The port authorities are preparing operational facilities such as docks, vehicle storage areas, and regulating traffic flow to ensure the loading and unloading process can proceed in an orderly and smooth manner."

2. How is communication carried out before the loading and unloading process begins?

a. The author conducted an interview with the Captain (S) and the following are excerpts and results of the interview.

"Usually coordination is carried out via radio communication and short briefings between the ship's mate, ship's crew, and port officials so that all parties understand their respective duties."

b. The author conducted an interview with the Chief Office (WS) and the following are excerpts and results of the interview.

"Before the loading and unloading process began, we coordinated via radio and walkie-talkies to assign tasks

to each ship's crew and the stevedoring personnel (TKBM). This communication ensured that each personnel understood their respective responsibilities, ensuring the loading and unloading process could proceed safely, orderly, and efficiently."

c. The author conducted an interview with TKBM (AW) and the following are excerpts and results of the interview.

"Communication is usually done via HT radio and direct instructions from the field coordinator. In addition, tasks are assigned to each personnel so that each member knows their position and responsibilities during the loading and unloading process."

d. The author conducted an interview with the Port Operations Officer (KW) and the following are excerpts and results of the interview.

"Communication is established with the ship's management before the ship docks. We typically use radio communication or HT to convey information regarding port area readiness, vehicle conditions, and coordination with field personnel to ensure the loading and unloading process runs smoothly.

3. What obstacles were experienced during the loading and unloading process on KM Dharma Ferry VIII?

a. The author conducted an interview with the captain (S) and the following are excerpts and results of the interview.

"Frequent obstacles are usually traffic congestion and queues in the port area. When there are too many vehicles, the process of entering and leaving ships is slower because the port area is quite congested, especially during peak times like weekends or the holiday season.

b. The author conducted an interview with the chief officer (WS) and the following are excerpts and results of the interview.

"The problems encountered are usually caused by the high number of vehicles arriving simultaneously. This results in long queues at the port, disrupting the smooth flow of vehicles during loading and unloading.

c. The author conducted an interview with TKBM (AW) and the following are quotes and the results of the interview.

"The parking area is often full, making it difficult for vehicles to move. When conditions are busy, vehicles disembarking the ship must queue because the port area is quite congested, slowing down the loading and unloading process."

d. The author conducted an interview with the port operational officer (KW) and the following are excerpts and the results of the interview.

"This has happened several times during peak passenger periods, particularly on weekends or during the holiday season. During these times, the number of vehicles increases, resulting in more congestion in the port area, and sometimes delays in loading and unloading."

4. What factors most often cause delays in loading and unloading?

a. The author conducted an interview with the captain (S) and the following are excerpts and results of the interview.

"This problem typically occurs during strong winds. In such conditions, mooring lines must be secured to prevent the ship's position from shifting or shifting. This ensures safe loading and unloading and prevents disruption to vehicles entering and leaving the ship.

b. The author conducted an interview with the chief officer (WS) and the following are excerpts and results of the interview.

"The most common factors causing delays are wind and passenger density. If the wind is strong, the docking process needs to be adjusted to ensure the ship remains safe. Furthermore, when there are a lot of passengers and vehicles, queues at the port become congested, resulting in longer loading and unloading times."

c. The author conducted an interview with TKBM (AW) and the following are quotes and the results of the interview.

"Traffic congestion and port congestion are the most common causes of delays. When traffic is high, the port area becomes congested, making it difficult for vehicles to move and delaying the loading and unloading process."

d. The author conducted an interview with the port operational officer (KW) and the following are excerpts and the results of the interview.

"Delays typically occur due to overcrowding at ports and unfavorable weather. When a large number of ships arrive, queues often form, and if the weather is unfavorable, loading and unloading processes must be carried out more carefully.

5. How do loading and unloading delays impact ship sailing schedules?

a. The author conducted an interview with the captain (S) and the following are excerpts and results of the interview.

"Delays can disrupt subsequent shipping schedules, creating a ripple effect. If one ship is late, subsequent departures may also be delayed. This can impact other ships, increase port activity, and reduce operational efficiency.

b. The author conducted an interview with the chief officer (WS) and the following are excerpts and results of the interview.

"The departure schedule is delayed, and the crew must adjust to the next task. Typically, the crew needs to rearrange planned tasks to ensure operational activities continue and prevent further delays."

c. The author conducted an interview with TKBM (AW) and the following are quotes and the results of the interview.

"The next ship was also delayed. If one ship is delayed, other ships waiting to dock are usually affected as well, as operational schedules are delayed."

d. The author conducted an interview with the port operational officer (KW) and the following are excerpts and the results of the interview.

"Other ships scheduled for later departures are also affected. If one ship is delayed, ships scheduled after it must also wait, as dock use is delayed and port operations are disrupted."

6. What steps are taken when there is a delay in the loading and unloading process?

a. The author conducted an interview with the captain (S) and the following are excerpts and results of the interview.

"We are improving coordination, expediting vehicle arrangements, and maintaining intensive communication with port authorities. If delays occur, we strive to find solutions quickly on the ground so that loading and unloading processes can return to normal and avoid disrupting the next schedule."

b. The author conducted an interview with the chief officer (WS) and the following are excerpts and results of the interview.

"We conduct field evaluations and re-arrange traffic flow. If delays occur, we assess the situation directly on the ground and re-arrange traffic lanes to ensure smoother traffic flow and expedite loading and unloading."

c. The author conducted an interview with TKBM (AW) and the following are quotes and the results of the interview.

"The steps taken include optimizing vehicle traffic management on ramps and parking areas to prevent congestion. Furthermore, officers are also expediting vehicle service processes to reduce wait times."

d. The author conducted an interview with the port operational officer (KW) and the following are excerpts and the results of the interview.

"The steps taken include improving coordination between field officers and reorganizing vehicle movement routes so that the service process can be more effective."

Based on the results of the interview data coding process using the NVivo12 application, several main categories and sub-categories were obtained which became the main focus of the problems in this study.

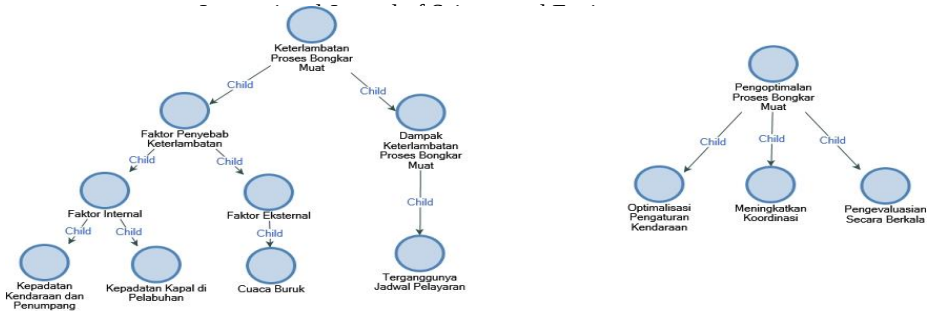

Fig 3. Project Map Resulting from Interview Data

Source: NVivo12 Application (2026)

The analysis using the NVivo 12 application yielded a project map showing the relationship between the causes, impacts, and mitigation efforts for delays in the loading and unloading process. The main theme identified was delays in the loading and unloading process, which were influenced by two groups of factors: internal and external. Internal factors included vehicle and passenger congestion and ship congestion at the port, while the external factor identified was bad weather. These conditions contributed to delays in loading and unloading activities. Furthermore, the analysis showed that delays in the loading and unloading process disrupted shipping schedules. Disruptions to shipping schedules can impact port operational efficiency and overall transportation services.

To address these issues, several measures have been identified, including optimizing vehicle management, improving coordination between relevant parties, and conducting regular evaluations. These three measures are expected to reduce bottlenecks in the loading and unloading process, thereby improving port operations and ensuring shipping schedules run according to plan.

IV. DISCUSSION

Based on the results of the analysis, as well as observations of the delay in the loading and unloading process at KM Dharma Ferry VIII on Thursday, July 31, 2025 at Padangbai Port, it was found that the delay of 25 minutes from the departure schedule at 21:00 WITA was caused by three main interrelated factors, namely factors from the ship side, factors from the land side, and external factors.

Field observations indicate that these three factors are not independent factors but rather interact with each other in the ship's operational processes. The delays are the result of several obstacles that arose during the preparation for departure, ranging from onboard service processes and operational coordination in the port area to conditions beyond operational control that also affected the smooth sailing schedule. This discussion will examine each of these factors in depth to understand the root causes and formulate appropriate recommendations for improvement.

Internal factors

Internal factors originating from the ship were one of the contributors to delays in the loading and unloading process on the KM Dharma Ferry VIII. Based on the compiled event scheme, several obstacles were identified originating from the ship's management and operations itself. The first obstacle occurred during the loading and unloading preparation stage from 8:20 PM to 8:30 PM, where initial communication between the ship's crew and the stevedoring workers (TKBM) on land was not synchronized. This lack of synchronization resulted in the preparation process being delayed by up to 10 minutes as each party awaited instructions or confirmation from the other. In ship operational management, effective coordination between the captain, ship's officers, and deck crew is crucial to the smooth loading and unloading process, considering that standard procedures require synergy between the on-board and on-shore teams to manage the movement of vehicles in and out safely and efficiently.

Fig. 4. Ship Crew Waiting for TKBM Coordination
Source: Author's Documentation, 2025

External factors

External factors or factors beyond the direct control of the ship or port management also contributed to the delays that occurred. Based on the situation analysis, the main external factor was the high volume of vehicles and passengers on Thursday, July 31, 2025, which was the end of the month with high public mobility to or from Lombok Island via Padangbai Port as stated by TKBM (AW) during the interview who said that the buildup of vehicles and passenger density caused the unloading process to be delayed ". This condition is seasonal, where on certain days such as weekends, national holidays, or school holidays, the volume of vehicles and passengers can increase significantly to exceed the normal capacity of port services.

The increase in the number of vehicles and passengers has led to congestion in queues, inspections, vehicle management, and the loading and unloading of ships, which have taken longer than normal. Consequently, operational processes have become less efficient, as officers must implement additional arrangements to maintain order, security, and the smooth flow of vehicles and passengers.

In addition, weather conditions are also an external factor that affects the smooth operation of ships. Weather factors such as strong winds and strong ocean currents can hinder the ship's berthing process, requiring additional time, as stated by the chief officer (WS) during an interview who said that "if the wind and current are strong, the berthing process requires a little extra time." When weather conditions are less favorable, ships require maneuver adjustments when approaching the dock to ensure the ship's position remains safe and stable. Adjustments to mooring lines also need to be carried out more carefully, while ground officers must ensure the position of the movable bridge (MB) is in accordance with the ship's position so that the loading and unloading process can take place safely. This causes the berthing and loading and unloading process to take longer than under normal conditions.

Delays caused by the accumulation of obstacles at each stage of the loading and unloading process not only impact the operational aspects of the ship but also have financial consequences for the company and affect the level of customer satisfaction and comfort. The operational impact can be seen in the disruption of the next sailing schedule due to the chain of delays. From a financial perspective, delays can increase operational costs, such as the use of additional fuel, labor costs, and potential losses due to disrupted service efficiency. Meanwhile, from the customer's perspective, delays can cause inconvenience, reduce satisfaction levels, and potentially affect service users' trust in the company's service quality. Therefore, a thorough discussion of these three impacts is necessary to understand the extent of the influence of delays on overall operational performance and to provide a basis for developing future improvement measures.

Land-based factors

Land-based factors significantly contributed to the delay in the loading and unloading process at KM Dharma Ferry VIII, particularly those related to port management and on-shore service flow. Based on the event scheme, the biggest obstacles actually occurred in the land area, starting from the vehicle disembarkation process (at 20:30–20:55) which was slow due to queues at the ramp and full parking area, causing the unloading process to be delayed for up to 25 minutes. This condition indicates that the parking area capacity at Padangbai Port is not yet able to accommodate the high volume of vehicles, especially during periods with increased levels of community mobility, so that vehicles leaving the ship are stuck in long queues in the parking area and slow down subsequent vehicles from disembarking.

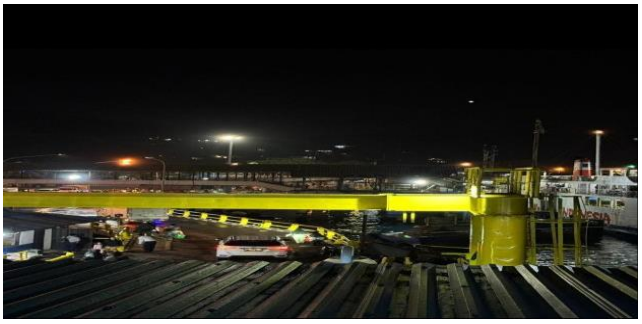

Fig 5. Congestion area on the ramp and full parking area

Source: Documentation at Padangbai Port. 2025

This situation was exacerbated by the slow ticket check-in process at the counter and the long queue of pedestrian passengers when the ship was ready to receive passengers. Based on field data, the passenger boarding process experienced a delay of up to 10 minutes (20:55–21:05) because some passengers were still in the check-in queue and only went to the ship after the vehicle loading process was completed. In addition, limited coordination between field officers, vehicle lane arrangements, and passenger flow distribution were also factors that affected the effectiveness of services in the port area as stated by the captain (S) during the interview "improving coordination in managing outgoing vehicles". The imbalance between service capacity and the number of service users during peak hours caused a buildup of vehicles and passengers which directly impacted the ship's operational time.

In the context of port management, the smooth flow of vehicles and passengers on land is a primary prerequisite for achieving efficient loading and unloading times. Port operational systems that are not optimally integrated with ship operations can increase waiting times and cause chain delays in subsequent stages. Therefore, better system integration between ports and ships is needed, both through improved operational coordination, optimized queue management, and the use of digital systems for vehicle and passenger management, so that loading and unloading processes can be more effective and departure delays can be minimized.

Delays in the loading and unloading process significantly impact the overall operational performance of a ship. The loading and unloading process is a crucial stage in ferry operations because it directly impacts the accuracy of the ship's departure and arrival schedules. Delays in this process can have an impact not only on one operational stage but can also impact the entire ongoing shipping chain. Delays in the loading and unloading process also have the potential to cause a chain effect, as stated by a port operations officer during an interview, "other ships with subsequent schedules will experience delays," which disrupts the operational schedules of subsequent ships.

The following are some of the impacts caused by delays in the loading and unloading process:

1. Impact on operations

Delays in the loading and unloading process on the KM Dharma Ferry VIII have had a cascading impact on the ship's and port's operations. The most significant operational impact is the disruption to subsequent sailing schedules, as ships delayed in their departure from Padangbai Port will have their arrivals at Lembar Port postponed. This cycle has the potential to cause backlogs at the end of the day and disrupt the continuity of subsequent sailing operations. Given that ferry operations are run according to a strictly defined schedule, a delay on one trip can trigger a chain effect on subsequent trips.

Besides affecting shipping schedules, delays can also impact port operations. Shifts in ship berthing times can lead to changes in dock allocations, adjustments to staff service schedules, and potentially increase vehicle and passenger congestion at the port. If these conditions occur repeatedly, the effectiveness of the port service system can decrease and hinder overall operational smoothness.

2. Impact on finances

The financial impact of loading and unloading delays on the KM Dharma Ferry VIII is an unavoidable consequence and imposes an economic burden on the ship operator. Although the delay is only about 25 minutes, the accumulated additional costs can be quite significant when calculated in a long-term operational context. This is because each delay, even of a relatively short duration, requires the continued use of operational resources and incurs additional expenses for the company.

Ship operational costs continue even when the ship is stationary or still at the dock. During the loading and unloading process, several ship support systems must remain operational, such as auxiliary engines used to supply the ship's electricity needs. The operation of these auxiliary engines requires continuous fuel consumption to support lighting, communications, ventilation, passenger air conditioning, and other operational equipment. Furthermore, the use of electricity and the ship's operational needs during the waiting period also add to the company's costs.

In addition to technical operational costs, delays can also increase labor costs. Operational activities that last longer than normal can result in additional working hours for ship and port personnel. Repeated delays can potentially increase overtime costs and reduce the efficiency of human resource use. Furthermore, repeated delays can accelerate the wear and tear of ship operational equipment, leading to higher maintenance requirements.

3. Impact on passengers

Delays in loading and unloading not only impact a company's operations and finances, but also directly impact the customer experience as a passenger ship user, as well as their perception of service quality and punctuality. In the ferry transportation industry, customers are a crucial component in determining the continuity of a company's services, making customer satisfaction a critical indicator of operational success.

Furthermore, delays can also impact customer perceptions of a company's overall service quality. Passengers tend to judge service quality based on the timeliness and smoothness of operations they directly experience. Repeated delays can potentially erode customer trust in the company and influence future decisions about using the service.

This situation indicates that customer service is not yet fully optimal, particularly in terms of punctuality and operational smoothness. Therefore, efforts are needed to improve service quality by optimizing loading and unloading processes, enhancing operational coordination, and more effectively managing vehicle and passenger flow to continuously improve customer satisfaction.

Delays that occur certainly require a comprehensive management strategy. Strategies for handling loading and unloading delays can be classified into two main categories: preventive measures, which are taken before the delay occurs, and corrective actions, which are taken during the delay to minimize its negative impact. This discussion will outline both strategies in depth based on field findings and references to best practices in the shipping industry.

Preventive measures

Preventive measures are anticipatory steps designed to prevent delays before the loading and unloading process begins. Based on an analysis of the factors causing delays on the KM Dharma Ferry VIII, several preventive measures can be implemented to improve future operational performance.

1. More efficient and structured schedule planning

WrongOne cause of the delay was the lack of synchronization in the initial coordination between the ship's crew and the stevedoring workforce (TKBM), which resulted in preparations being delayed by up to 15 minutes. To anticipate this, a more structured and realistic loading and unloading schedule is needed so that the ship and equipment can be used optimally without long waiting times. This planning must include clear timing for each stage of the process, from preparation, vehicle unloading, vehicle loading, to boarding passengers. In practice, a systematic approach based on planning and control (P&C) that prioritizes detailed planning and integrated supervision has proven effective in optimizing the loading and unloading process and reducing potential disruptions in the field. The implementation of a mature planning system on KM Dharma Ferry VIII will help all parties involved have the same understanding of the timeline and their respective responsibilities.

2. Integration of digital systems and information technology

The lack of integration of information systems between the ship, port management and service users also contributes to this. delay, especiallySlow passenger check-in and long queues at the counters are a major challenge. To address this issue effectively, a digital system integration that connects all stakeholders is needed. Implementing a Terminal Booking System (TBS), as implemented at various major Indonesian

ports, can be an effective solution, requiring every vehicle to book an online schedule before entering the port area. This system regulates arrival time slots and terminal capacity, allowing for measurable vehicle flow management and avoiding congestion at gates or port access roads. With an online reservation system, vehicle queues at the dock, which can delay the loading process for up to 30 minutes, can be minimized. Furthermore, digitizing the documentation and verification system on board is also necessary to expedite the final check process before departure, significantly reducing the 15-minute final preparation time.

3. Optimizing the Use of Tools and Labor

The delay in the loading and unloading process on the KM Dharma Ferry VIII was also caused by the suboptimal use of available resources. Preventive measures that can be taken are to ensure the availability of a sufficient fleet of transport vehicles and loading and unloading equipment and ready to use according to schedule, including ensuring the availability of adequate labor. In the context of a Ro-Ro ship like the KM Dharma Ferry VIII, optimal preparation of the cargo hold (car deck) is crucial for the smooth loading and unloading process. Suboptimal preparation, such as a floor that is not completely dry or lashing equipment that is not suitable for use, can hinder vehicle movement and slow down the process. Therefore, it is necessary to conduct routine inspections of the condition of the car deck and its equipment before the ship docks, as well as ensuring that the deck crew is in sufficient numbers and ready to work during the loading and unloading process. Technological transformation by implementing a planning and control-based terminal operating system can also help optimize the use of equipment and labor more efficiently.

4. Improving Human Resource Competence Through Routine Training

The lack of coordination between the ship's crew and the TKBM indicates the need to improve human resource competency through regular training. Preventive measures include conducting regular training for the ship's crew and TKBM on fast, safe, and standardized loading and unloading procedures. Prior to each loading and unloading process, a safety meeting involving all parties involved should be held to ensure everyone is aware of potential hazards and can take swift action if problems arise. This training should also include simulations of emergency situations and high congestion, so that when actual conditions arise, all personnel are prepared and trained to respond quickly and appropriately. By improving human resource competency, the initial coordination time, which currently takes 15 minutes, can be shortened and the loading and unloading process can run more smoothly.

V. CONCLUSION

The results of the study indicate that loading and unloading delays on KM Dharma Ferry VIII were influenced by three main factors, namely internal ship factors, factors from the land side, and external factors. Internal factors include less than optimal coordination between the ship's crew and the Stevedoring Workers (TKBM) during the operational preparation stage. Land-side factors include vehicle density, limited parking areas, passenger queues, and slow service processes at the port. Meanwhile, external factors come from the high volume of vehicles and passengers and unfavorable weather conditions. The 25-minute loading and unloading delay was proven to have an impact on the operational performance of the ship in the form of disruption to the sailing schedule, increased operational burden, and decreased service effectiveness to service users. The research findings also show that improving coordination between parties, optimizing vehicle arrangements, periodic operational evaluations, and implementing preventive measures are effective steps to reduce the risk of loading and unloading delays.

This study still has limitations because it was conducted on a single research object, namely KM Dharma Ferry VIII, with a limited observation period so that the results cannot be generalized to all ferry vessels or ports in Indonesia. In addition, this study used a qualitative approach so it did not quantitatively measure the magnitude of the influence of each factor on loading and unloading delays. Therefore, further research is recommended to use a mixed or quantitative approach with a wider coverage of locations and involving operational and financial variables in more detail. Practically, the results of this study can be used as evaluation material for shipping companies and port managers in improving operational coordination, improving vehicle and passenger queue management systems, optimizing the use of digital technology, and

improving human resource competencies to support smooth loading and unloading and improve ship operational performance in a sustainable manner.

REFERENCE

[1] K. F. Yuen, X. Wang, Y. D. Wong, and Q. Zhou, "Port performance factors and their interactions: A systems thinking approach," ***The Asian Journal of Shipping and Logistics***, vol. 38, no. 2, pp. 107–123, 2022, doi:10.1016/j.ajsl.2022.04.001.

[2] P. Ricardianto, Y. Fonataba, S. Marzuki, et al., "Determinants of logistics effectiveness on port operational performance: Empirical evidence from Indonesia," Uncertain Supply Chain Management, vol. 11, no. 2, pp. 799–810, 2023, doi:10.5267/j.uscm.2022.12.010.

[3] Ramadhani, A. Q. (2022). Analisis penyelesaian kapal tanker iran yang melanggar hukum laut internasional dengan memasuki wilayah indonesia. Researchgate.Net, January.

[4] R. H. Gurning and A. Riadi, "Dwelling time analysis using dynamic system model in the implementation of National Logistics Ecosystem at Port Jakarta International Container Terminal," Omni-Akuatika, vol. 18, no. S1, 2022, doi:10.20884/1.oa.2022.18.S1.973.

[5] D. Arisanti, J. Prastyorini, and S. F. Bachtiar, "Enhancing efficiency in container handling operations: A multivariate analysis," Academia Open, vol. 8, 2023, doi:10.21070/acopen.8.2023.7813.

[6] M. F. Hidayatullah, M. Z. Arifin, and L. I. Sari, "Faktor terjadinya keterlambatan waktu bongkar muat kontainer MV. Oriental Jade di Pelabuhan Manokwari," ***Indonesian Journal of Nautical Study***, vol. 1, no. 2, 2024, doi:10.46484/ijns.v1i2.745.

[7] J. Zheng, C. Mao, and Q. Zhang, "Hybrid dynamic modeling and receding horizon speed optimization for liner shipping operations from schedule reliability and energy efficiency perspectives," Frontiers in Marine Science, vol. 10, 2023, doi:10.3389/fmars.2023.1095283.

[8] J. W. Creswell and J. D. Creswell, Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 6th ed. Thousand Oaks, CA, USA: Sage Publications, 2023.

[9] Emzir, Metodologi Penelitian Kualitatif: Analisis Data. Jakarta, Indonesia: Rajawali Pers, 2023.

[10] Sugiyono, Metode Penelitian Kualitatif. Bandung, Indonesia: Alfabeta, 2024.

[11] M. B. Miles, A. M. Huberman, and J. Saldaña, Qualitative Data Analysis: ***A Methods Sourcebook***, 4th ed. Thousand Oaks, CA, USA: Sage Publications, 2022.