

The implementation of minimum service standards on ship operational performance: Empirical evidence from Indonesia

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ABSTRACT

Article history:

Received April 23, 2022

Received in revised format June 23, 2022

Accepted July 21 2022

Available online

July 22 2022

Keywords:

Shipworthiness

Seafarers Skills

Minimum Service Standards

Ship Operational Performance

Shipping Safety

The purpose of this study was to determine the effect of ship worthiness and seafarers' skills on improving ship operational performance through minimum service standards. Some early indications found in the field, such as the low performance of ship maintenance by procedures, and the obstacles in implementing the ship maintenance plan due to the inefficiency of the ship's operating schedule. This study uses Path Analysis with Path Coefficients Sub Structure 1 and Sub Structure 2. The test method used for the direct effect is the regression method while the indirect effect is the Sobel test. The number of samples is 80 respondents from national shipping companies, from various types of ships, namely, crew boats, patrol boats, utility boats, supply vessels, and anchor handling towing supply. The results of the study indicate that there is a positive and significant effect of seaworthiness and seafarers' skills on increasing ship operational performance, directly or indirectly through minimum service standards. The minimum service standard variable can mediate the indirect effect of the seafarers' skill and ship worthiness variables on the operational performance of the ship. To meet the growing customer satisfaction as the consequences of tight competition, it is necessary to improve the quality of the fleet where durability, cleanliness of the fleet, and safety facilities in the fleet are expected to provide a high guarantee for safety.

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1. Introduction

In today's highly competitive situation, every company is required to be able to develop and improve performance by innovating to produce superior products (Fenstad et al., 2016). The ability to provide quality goods and services is closely related to the needs and desires of customers. Companies that can understand the needs and desires of their customers well are expected to provide satisfaction for customers (Indrasari et al., 2022). However, to improve the operational performance of ships, there are still many obstacles encountered in the field, one of which is the incident ship accidents. A ship accident is an incident or event caused by external or internal factors of the ship, which can threaten and endanger the safety of the ship, and human life, property loss, and damage to the maritime environment. The National Transportation Safety Committee noted many accidents, and if accidents continue, they will directly have an impact on the decline in the operational performance of ships. Therefore, the application of seaworthiness is one way to provide sailing safety for a ship (Nabi et al., 2017). The provision of sailing safety is based on statutory regulations 17 of 2008 concerning shipping and is proven by a certificate after inspection and testing. However, in its implementation, many ships are found not proper to operate. These conditions are generally caused by several factors including lack of ship maintenance which is resulting in some components of the ship being non-standard and even damaged, the age of the ship being old (above 20 years), the

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implementation of the ship maintenance plan is hampered due to frequent conflicts with the operating schedule. ships and ship maintenance problems that are not by ship maintenance procedures are things that are ignored by management to streamline ship expenses so that the company can continue to be sustainable.

There are quite several problems related to Minimum Service Standards and Ship Operational Performance, including; (1) Lack of ship maintenance resulting in some components of the ship being non-standard and even damaged; (2) Some of the ships operating are old, over 20 years old; (3) The implementation of the ship's maintenance plan is constrained because it often clashes with the ship's operating schedule; (4) Vessel maintenance problems that are not by procedures are common to streamline ship expenses; (5) Seafarers knowingly overload ships than allowable standards; and (6) Some Seafarers are negligent in carrying out the applicable Standard Operating Procedures in navigating.

The available data shows that the accident rate continues to increase over three years, namely in 2015-2017. The highest number of accidents occurred in 2017 namely: first aid cases (2), near misses (5), and vessel damage to property (18) for a total of 25 accidents. The accident rate that tends to continue to rise has the potential to disrupt ship service activities so that it can have an impact on decreasing ship operational performance. Regarding maritime safety management, Prasetyo et al. (2018), and Thamrin (2015) signaled an improvement in management related to the work ethic of the officers on duty by coordinating with various parties. Wiweko et al. (2015) also explained that the high level of ship safety is related to efforts to prevent ship accidents. Results of research by Rahman et al. (2017) concluded that ship accidents were caused by three factors, namely natural factors, human factors, and other factors. Empirical evidence from research by Kuncowati and Mudiyanto (2017), Mudiyanto (2020), and Sumali et al. (2019) concluded that the ship's seaworthiness variable has a very strong relationship with several other variables such as shipping safety, compensation, and Seafarers satisfaction variables. The basic principle is that the safety of the ship is highly dependent on the condition of seaworthiness (Wiweko et al., 2015). Previous research by Pangihutan et al. (2016) suggested the importance of safety training for the achievement of Seafarers' skills which are very much needed because it can have a positive impact on Seafarers' operational performance to increase work effectiveness.

2. Literature Review

2.1. Shipworthiness

The term ship worthiness according to Trucco et al. (2008) refers to the condition of the ship that can meet the requirements of ship safety, the welfare of ship passengers, the legal status of the ship, for ships in certain waters and evidence by ship certificates. Another definition of a ship's ship worthiness is the ability of the ship to meet all safety regulations that are equipped with the necessary documents to operate the ship properly (Sumali et al., 2019). Likewise for the contract of carriage, where the ship must meet the standard of cargo worthiness.

Regarding ship worthiness, the International Safety Management Code with ISPS is currently considered good as an implementing rule (Kassem, 2006). He added that the carrier's obligation to make the ship seaworthy must be extended to cover the entire voyage, not only limited to the beginning of the voyage. In a study in Makassar, Eastern Indonesia, Bokau (2020) explained that the seaworthiness conditions for traditional ships related to seaworthiness conditions were in the very good category. In other studies, the ship worthiness variable has a significant effect, especially on the needs of ships that need to be improved, namely Seafarers' safety equipment (Kuncowati & Mudiyanto, 2017). Several dimensions or factors that affect the ship worthiness of ships according to Trucco et al. (2008) include (1) Ship safety, (2) Ship's crew, (3) Management of ship operations and ship prevention, (4) Cargo loading and (5) Ship legal status.

Based on these sources, ship worthiness is a form of protection related to efforts to prevent shipping accidents and the ability to overcome all the dangers that may be experienced while sailing with the fulfillment of the ship worthiness requirements, which are measured through eight dimensions, namely; (1) ship safety, (2) prevention of pollution from ships, (3) manning of ships, (4) ship loading and unloading lines, (5) Seafarers welfare and passenger health, (6) legal status of ships, (7) safety management and prevention of pollution from ships, and (8) ship safety management.

2.2. Seafarers Work Skill

The design of human resources development in shipping is prepared to maintain competent, disciplined, and responsible human resources, besides meeting international standards in shipping and sea transportation. HR development is closely related to the Shipping Law of the Republic of Indonesia of 2008 (Sara, 2021). Work skills are needed to support performance. According to Robbins and Coulter (2018), work skill is the individual's capacity to perform various tasks in a job. Seafarers' skill, according to Lu and Tseng (2012), and Supomo et al. (2020) consists of Nautical and Technical Competencies, based on regulations not only applicable to ship seafarers, but also to ship owners, and shipping companies. Maritime Labor Convention (MLC) 2006, according to Hastuti et al. (2018) MLC can be considered as a "ticket" for seafarers in claiming their rights as workers. The 2006 MLC was adopted by the ILO to create a single instrument containing all international labor principles and standards applicable in the shipping industry.

In general, ship accidents according to Ilham et al. (2020), apart from the lack of application of shipping safety, is also due to the lack of supervision from related parties, as well as the low competence of seafarers. Prasetyo et al. (2018) added that if Seafarers were trained properly, their skills and quality could be improved, then the shipwreck rate could be suppressed. Some previous research on Seafarers' proficiency by Engelbrecht et al. (2017), and Ricardianto et al. (2020) includes several variables such as performance, work effectiveness, and efficiency to achieve organizational goals. Nguyen et al. (2014) also explained that shipping companies that have competent and motivated seafarers will be able to increase work productivity. In addition, the poor working and living conditions on board are a major factor to be considered in upgrading the proficiency of seafarers. Seafarers must be aware of the effectiveness of safety when they work on board so that they will be familiar with working according to operational standards (Wiweko et al., 2015). Training is one way to get workers that match the needs and desires of the company (Čulin & Bielić, 2021; Medina, 2021; Saluy et al., 2021; Pangihutan et al., 2016). In general, based on Baum-Talmor's (2018) studies, training costs are borne by seafarers and their families. Finally, the importance of supporting career support systems for seafarers and the need for future maritime interests (Baum-Talmor & Kitada, 2022).

Based on these several sources, it is synthesized that seafarers' skills are all the skills and skills possessed by a seafarer to carry out his professional duties in carrying out various jobs on board to produce a satisfactory performance for the company obtained through education, training, and experience, which is measured through six the variable dimensions are (1) expertise, (2) skills, (3) education, (4) training, (5) experience, and (6) responsibility.

2.3. *Minimum Service Standard*

According to the 2005 Indonesian Government Regulation, Minimum Service Standards are provisions on the type and quality of basic services which are mandatory regional affairs that every citizen has the right to obtain at a minimum. In shipping companies, minimum service standards have not been fully implemented, evidenced by the delays in ship departure and arrival times, the ship accommodations that are not met properly, and the lack of responsiveness of Seafarers in providing services needed by customers. With the enactment of government regulations that require companies to implement Minimum Service Standards and a Public Transportation Safety Management System, it is hoped that public interest in using this mode of transportation will increase along with improving consumer perceptions (Anjasmara et al., 2021; Ricardianto et al., 2021a). In addition, the Government has required companies to implement the Minimum Service Standards so that the Company is committed to providing Passenger Transportation services. The minimum requirements for seafarers working on ships, according to the 2006 MLC, are limitations, health conditions, competencies, skills, and training and recruitment (Hastuti et al., 2018). One of the requirements of the Minimum Service Standards, based on the STCW'2010 Curriculum is the ability to communicate in English. Factors supporting the success of English Language Teaching communication in the Maritime context include a) maritime substance, b) language skills, and c) linguistic characteristics (Dirgeyasa, 2018).

Based on these several sources, it is synthesized that the Minimum Service Standard is a provision regarding the type and quality of basic services that are applied to ensure the minimum quality of public service to be enjoyed by the community or customers, and at the same time will encourage equity in public services and avoid service gaps (Simanjuntak et al., 2022). This variable is measured through ten indicators, namely: (1) physical appearance, (2) reliability, (3) responsiveness, (4) competence, (5) politeness, (6) credibility, (7) security, (8) access, (9) communication, and (10) understanding.

2.4. *Operational Performance*

Employee performance is the basis of company performance which is strongly influenced by individual characteristics, individual motivation, expectations, and evaluation performed by management (Colquit et al., 2015; Gibson et al., 2012; Riyantoet et al., 2021; Margherita, 2022). Margherita (2022) explained that employees can only do their best when management companies can manage their human resources in the right way. Meanwhile, according to Diamantidis and Chatzoglou (2012) work performance is a person's ability to carry out activities that contribute to the development of the technical core of the organization. Operational management is a transformation process that transforms several sources into products and services (Daft, 2015; Render & Heizer, 2019; Robbins & Coulter, 2018; Ricardianto et al., 2022). A good job can be seen from the statement of performance in a certain period determined by the achievement score (Yusuf et al., 2020). Employees can provide quality performance if they have a strong organizational commitment to the company (Cesário & Chambel, 2017; Ricardianto et al., 2021b; Virgiawan et al., 2021).

Seafarers' operational performance improvements have the potential to increase ship turnaround times, meet ship owner efficiency requirements, and ship operating safety performance. Based on the study by Aldous et al. (2015) that operational performance monitoring is also relevant to outsourcer analysis, and vessel benchmarking, and is useful in better informing policy decisions. Although, in several other studies, it was concluded that some Seafarers still received less attention, especially regarding occupational safety and health as a major maritime aspect (Österman et al., 2020). Some of the main dimensions according to Tsai and Liou (2017) related to seafarer management, such as work attitude, loyalty, and welfare which also have a positive effect on work performance.

Based on these several sources, it can be synthesized that the operational performance of ships is the final result of the organization which is measured based on the goals and objectives that have been set for a certain period, which is influenced by the company's activities in managing its resources in providing services to customers promptly. , which is measured through four dimensions of operational performance variables, namely; (1) human resource management, (2) the important role of line manager support, (3) fairness in the organization, and (4) organizational effectiveness.

The framework of thought in this research is based on a literature review and previous research (Figure 1).

- H₁:** *There is a direct effect of ship worthiness on ship operational performance.*
- H₂:** *There is a direct effect of seafarers' skill on Ship operational performance.*
- H₃:** *There is a direct effect of ship worthiness on minimum service standards.*
- H₄:** *There is a direct effect of seafarers' skill on minimum service standards.*
- H₅:** *There is a direct effect of minimum service standards on ship operational performance.*
- H₆:** *There is an indirect influence of ship worthiness on ship operational performance through minimum service standards.*
- H₇:** *There is an indirect effect of seafarers' skills on ship operational performance through Minimum service standards.*

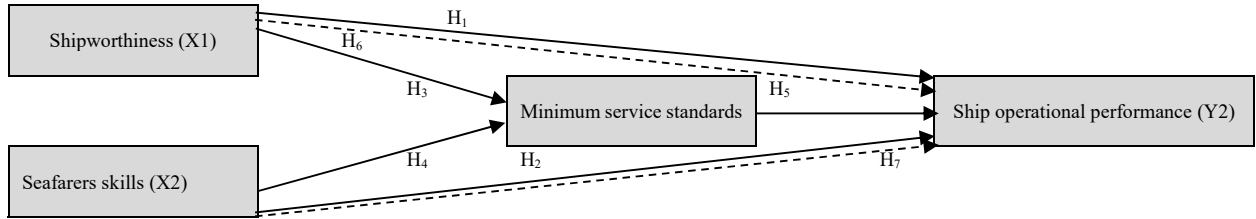


Fig. 1. Research Model

3. Research Methods

This study was conducted to examine the relationship between exogenous variables, namely ship worthiness (X1) and Seafarers' skills (X2) which are predicted to affect the endogenous variables, namely minimum service standards (Y) and ship operational performance (Z), to find out the level of direct causal effect and indirect causal, or simultaneous effect of a set of exogenous variables to an endogenous variable. The sample of this research is the number of seafarers at the national shipping company Baruna Raya Logistics who are onboard, consisting of crew boats, patrol boats, utility boats, supply vessels, anchor handling, towing supply as many as 80 people. Initial testing in addition to the Validity and Reliability Test was conducted by using the classic regression basic assumption test such as the Normality Test, Multicollinearity Test, and Heteroscedasticity Test. Then, to test the significance of the path coefficient, the F test or simultaneous influence and the t-test were used. This study uses Path Analysis and based on the Summary and Path Coefficients of Sub Structure 1 and Sub Structure 2, it can be seen the magnitude of the direct and indirect effects between variables. The test method used for the direct effect is the regression method, while for the indirect effect, the Sobel test is used. Finally, the goodness of fit test was conducted to test whether the proposed model fits the data or not.

4. Results

4.1. Substructure 1 Test Results (Effect of Seafarers' Shipworthiness and Skills on Minimum Service Standards)

Before conducting path analysis on the variables X1, X2, and Y (sub-structure 1), the linearity of the relationship between these variables was tested. The analysis of sub-structure 1 was conducted by using path analysis. Individual testing of the ship's ship worthiness variable to the Minimum Service Standard variable, with the results of the ship worthiness variable having a significant effect on the minimum service standard variable. Individual testing between the Seafarers skill variable and the minimum service standard variable, with the result that the Seafarers skill variable has an effect but is not significant on the Minimum Service Standard variable. Thus, the path diagram of sub-structure 1 is obtained which is presented with the path coefficient values obtained through data analysis so that the sub-structure model 1 (Fig. 2) is obtained.

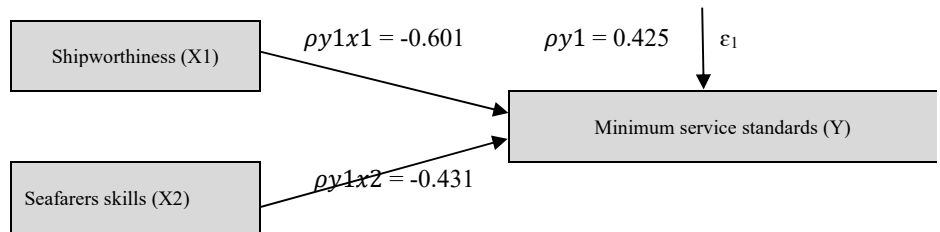


Fig. 2. Sub Structure 1

4.2. Results of Sub Structure Testing 2 (Effect of Seafarers' Shipworthiness and Skills on Ship Operational Performance)

Before performing path analysis on variables X1, X2, Y, and Z (sub-structure 2), the linearity of the relationship between these variables must be tested. Then, the analysis of sub-structure 1 was conducted by using path analysis. Furthermore, testing the influence individually between Variables X1, X2, and Y on Variable Z was conducted. Individual testing between the X1 variable and Z variable, with the result that the ship worthiness variable (X1) on the ship operational performance variable (Z) has an effect but is not significant. Individual testing between the X2 variable and Z variable, with the result that the Seafarers skill variable (X2) significantly influences ship operational performance variable (Z). Individual testing of the Y variable to the Z variable, with the results of the minimum service standard variable (Y), has a significant effect on the ship's operational performance variable (Z).

Thus, the path diagram of sub-structure 2 is presented with the path coefficient values that have been obtained through data analysis so that the sub-structure 2 model (Fig. 3) is exhibited as follows (Fig. 3).

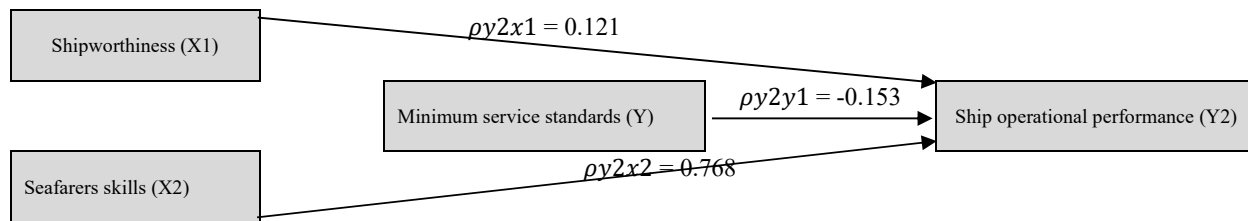


Fig. 3. Sub Structure 2

So, the overall effect of the ship worthiness variable (X1), seafarer skill (X2), through the minimum service standard (Y) on the operational performance of the ship (Z) can be described in a complete structural model (Fig. 4).

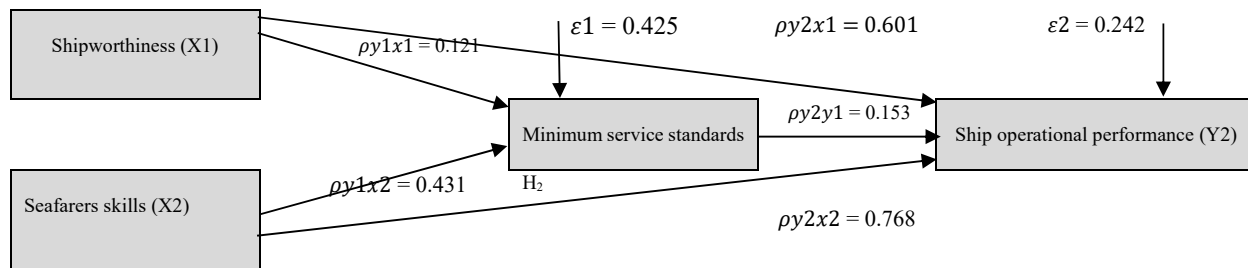


Fig. 4. Empirical Causal Relationship of All Variables

The entire path coefficient of the relationship can be seen from the direct and indirect causal effect, and also from the total causal effect of each variable.

Table 1
Summary of Empirical Causal Relationships for All Variables

Variable	Direct effect	Indirect effect	Total
Shipworthiness on Ship operational performance	0.601		0.601
Seafarers' Skill on Ship operational performance	0.431		0.431
Shipworthiness on Ship operational performance through Minimum Service Standard	0.121	$0.601 \times 0.153 = 0.091$	0.212
Seafarers' skill in Ship operational performance	0.768	$0.431 \times 0.153 = 0.065$	0.833
Minimum Service Standard on Ship operational performance	0.153		0.153
ϵ_1	0.425		0.425
ϵ_2	0.242		0.242

5. Discussion

5.1. Shipworthiness on Ship Operational Performance

The direct effect of ship worthiness (X1) on ship operational performance (Z) is 0.121 with a significance of 0.146. This evidence proves that the ship's worthiness variable has a positive but not significant impact on the ship's operational performance. If the organization wants to optimize the operational performance of the ship, it is necessary to pay attention to ship worthiness to provide comfort for passengers and high trust for seafarers in operating their ships, so that the final

organizational results are measured based on the goals and objectives set by the company for a certain period can be achieved properly.

5.2. Seafarer Skill on Ship Operational Performance

The direct effect of seafarers' skills (X2) on the operational performance of ships (Z) is 0.768 with a significance of 0.000. This signals that the Seafarer's skill has a positive and significant effect on the operational performance of the ship. If you want to optimize the operational performance of the ship, then the company needs to pay attention to the skills of the Seafarers. For that reason, every seafarer, whether personnel from the deck, engine, or radio section, must have expertise and skills that are by the ship and its shipping area. In addition, it is also important to note that the skills of seafarers gained from work experience greatly assist the crew in dealing with all risks and emergencies while working on the ship. Seafarers who have the expertise, skills, and abilities are expected to be able to operate the ship safely, comfortably, and safely. These seafarers, at least have been proven by a certificate of expertise and skills issued by the government of the flag country. So that the result of the organization which is measured based on the goals and objectives that have been set for a certain period, which is influenced by the company's activities in managing its resources in providing services to customers can be fulfilled properly.

5.3. Shipworthiness on Minimum Service Standards

The direct effect of the ship's worthiness (X2) on the minimum service standard (Y) is 0.601 with a significance of 0.000. This confirms that ship worthiness has a positive and significant impact on minimum service standards. If you want to optimize the minimum service standards, it is necessary to pay attention to seaworthiness to provide comfort for passengers and high confidence for seafarers in operating their ships, so that the quality of service can be guaranteed to be enjoyed by the public or customers.

5.4. Seafarers' Skills on Minimum Service Standards

The direct effect of seafarers' skills (X2) on the minimum service standard (Y) is 0.431 with a significance of 0.052. This evidence confirms that seafarer skill has a positive but not significant impact on minimum service standards. If you want to optimize the minimum service standards, it is necessary to pay attention to the skills of the Seafarers. For that reason, every seafarer, whether personnel in the deck, engine, or radio sections, must have expertise and skills that are by the ship and its shipping area. The seafarers who have the expertise, skills, and abilities are expected to be able to operate the ship safely, comfortably, and safely. So that it can provide the best quality service to be enjoyed by the community or customers.

5.5. Minimum Service Standards on Ship Operational Performance

The direct effect of minimum service standards (Y) on ship operational performance (Z) is 0.153 with a significance of 0.007. This shows that the minimum service standard variable has a positive and significant effect on the ship's operational performance variable. If you want to optimize the minimum service standards, it is necessary to pay attention to the skills of the Seafarers. For that reason, every seafarer, whether personnel in the deck, engine, or radio sections, must have expertise and skills that are by the ship and its shipping area. The seafarers who have the expertise, skills, and abilities are expected to be able to operate the ship safely, comfortably, and safely. So that it can provide the best quality service to be enjoyed by the community or customers.

5.6. Shipworthiness and Ship Operational Performance on Minimum Service Standards

The influence of ship worthiness (X1) indirectly affects the operational performance of the ship (Z) through (Y) of 0.091 so that the path analysis for structure 1 is 0.212. This shows that the minimum service standard variable can function as a mediator or mediate the indirect effect of the seaworthiness variable on the operational performance of the ship.

5.7. Seafarers' Skill and Ship Operational Performance on Minimum Service Standards

The influence of seafarer skill (X2) indirectly affects the operational performance of the ship (Z) through the minimum service standard (Y) of 0.065 so that the path analysis for structure 1 is 0.833. This shows that the minimum service standard variable can function as a mediator or mediate the indirect effect of the Seafarers skill variable on the operational performance of the ship.

6. Conclusion

It is necessary to inspect the repair and maintenance of the ship on certain parts that will need to be replaced or repaired. In the future, before the ship is seriously damaged, the company should order in advance or already have spare parts so that ships undergoing repairs or maintenance do not have to wait longer because they have to buy spare parts from abroad, and the need for other spare parts supplies that are needed must be provided at the company warehouse. To be able to maintain and improve

the skills of Seafarers, it is necessary to increase efforts both in terms of education or Seafarers can take part in skills training related to their field of work so that they can provide a positive value to the operational performance of the ship.

To be able to increase customer satisfaction with many competing companies, it is necessary to improve the quality of the fleet where durability, cleanliness of the fleet, and safety facilities of the fleet are expected to provide a high guarantee for each safety. As well as improving Seafarers' workability to provide services quickly and accurately in handling customer complaints, respond quickly to every request and demand from the business and customer environment, and be able to understand and solve problems faced by each customer by using training methods with integrated materials to create behavior and work culture that prioritizes service quality to increase customer satisfaction.

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