

The Effect of Vessel Seaworthiness and Crew's Competence on Marine Safety

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ABSTRACT

The objective is to study the effect of vessel seaworthiness and crew's competence on marine safety in PT Pulau laut year 2015. This research is quantitative research with correlation and regression methods are applied as data analysis technique to determine the relationship between each variables. The primary data were obtained from questioner which distributed to 73 ship's crew of PT Pulau Laut using population sampling technique. The result of this research shows that there is a positive and significant relationship between seaworthiness ship and crew competence with the safety of sea transport. H3 research hypothesis is accepted where $F_{count} > F_{table}$ or $86.179 > 3.128$ and the significance probability of $0.000 < 0.05$. The R square value is 0,711 or 71,1%. It shows that the contributions of seaworthiness ship and crew competence to marine safety are 71,1% and 28,9% are influenced by other factors.

Keyword : Sea-worthiness ship, Crew Competency, Transportation safety.

Introduction

Indonesia is the largest archipelago in the world with more than 17,000 islands with a population of more than 200 million people. Shipping in Indonesia has an important role in serving the mobility of people, goods, and services both domestic and international. Shipping also has a role as a means of supporting the trade, industry and economy, as well as other sectors. In addition, shipping is also expected to stimulate economic growth in particular regions or undeveloped specific areas. Another important shipping serves as the lifeblood of economic, social, cultural, defense and national security, so that the shipping performance will greatly affect the acceleration of national development

Mobility or movement of ships and demand for marine transportation services in Indonesia tends to increase from year to year, in line with the increase in the progress and development of the area-based regional autonomy. Enhancement and growth of marine transport services must be supported by a high level of safety in the operation of shipping, so that the shipping community service users feel comfort and safety in the vessel.

However, it turns out that the expectations have not been fully realized because the frequency of ship accidents in Indonesia is still quite high causing many accidents aboard, material loss or casualty, and marine environmental pollution caused by oil spills from ships.

Table 1 Vessel Accidents

Year	Number of Accidents	Effect of Vessel Accidents
2007	159 Vessel	Oil spills
2008	137 Vessel	Cargo damages
2009	124 Vessel	Damages in marine bio diversity
2010	151 Vessel	Fisherman settlement
2011	178 Vessel	
2012	161 Vessel	

Source : Sea Transportation Directorate

Table 2 Name of Vessels Involved in Accidents

Year	Name of Vessel	Location of Accident	Casualties
2007	KM. Senopati	Mandalika waters, Sea of Java	1.117 lives
2008	KM. Levina	Kepulauan Seribu waters	Dangerous goods/passengers
2009	KM. Tristar	Musi River, Palembang	Loaded cargo

Source : Sea Transportation Directorate

Based on the data of the ship accidents, the type of vessel accidents that occur such as sinking, fire, collision, and running aground. Meanwhile some of the underlying causes of ship accidents are internal factors, human error, technical aspects, boat construction, vessel load factor; and external factors, such as nature, bad weather, Means of Navigation Aid Sailing (SBNP), and other factors such as wars, the deliberate and fault acts or decisions made by ship safety officer

A sailing boat or at a jetty can suffer damage or accidents due to poor weather conditions. Bad weather conditions which can be derived from the hurricanes, strong wind, wave tidal and limited visibility. Accidents can also occur as a result of the limitations of weather news, current and wind, or the weather report was not obtained in accordance with shipping route.

Human error which cause ship accidents is generally related to the competence of the crew to operate the ship. Problems that often occur include an inadequate number of personnel, expertise, and skills of the crew not in accordance with the type and size of vessel. Additionally, there is also incompetence of skipper, navigator and engineer in navigation, cargo handling, operating machinery, equipment and ships, as well as negligence in performing other tasks. There has been found many cases when poorly trained crew are in an emergency on board (crisis management).

In addition to the dominant factors above, there are other causes, such as lack of carefulness of marine inspector in conducting the examination of vessel seaworthiness, bombing, hijacking, war conditions and intent. This condition is also encouraged because the government's lack of transparency in revealing the cause of the ship accidents, so that stakeholders can not determine the appropriate measures to prevent ship accidents due to the same cause.

The increasing number of ship accidents in Indonesia and their losses has demanded systematic, planned and sustainable improvement efforts, so that marine safety can be achieved. Marine safety is the condition of the ship and the fulfillment of the requirements for seaworthiness and navigation. According to Government Regulation No. 3 of 2009 on Safety and Aviation Security, "Safety is a state of transportation realized from the implementation in accordance with operating procedures and technical requirements".

Vessel accidents are unpredictable and can occur anywhere. Therefore, before the ship leaves port, the ship shall carry out preparations for any disaster at sea. The essential requirements that must be met before the sail is the availability of a navigation map that has been checked from starting point to destination; testing of emergency steering (emergency Rudder); checking GPS (Global Positioning System); checking the feasibility of lifeboats and

other equipment checks; and conduct emergency tests on main engines.

The basic principle states that the safety of vessels departing to be in a state of sea-worthiness. This means, the ship should be able to deal with the case of a natural or natural events in the world of shipping. In Law No. 17 Year 2008 on Shipping, article 124, paragraph (1) states that every procurement, construction and ship construction, including equipment, as well as the operation of ships in Indonesian waters must meet the safety requirements of the ship. Vessel safety requirements referred to in paragraph (1) includes the materials, construction, building, machinery and electrical, stability, arrangements, and equipment --- including auxiliary tools and radio equipment, as well as electronics.

Additionally, seaworthiness, marine safety is also influenced by the competence of the ship. Harsono et.al (2005: 4-4), stated, "The crew is a person employed in any capacity on board a ship (seagoing ship) or vessels used for commercial shipping at sea which are owned by individuals and public companies, besides warships. "

In this case, the purpose STCW Convention 1995/1997 and the International Safety Management Code (ISM Code) provision, one of them is to obtain international crew or as a world-class professionals. Thus, the performance and skills crews continue to grow dynamically in accordance with the progress of science and technology in shipping (DA Lasse, 2006: 66-67)

The crew must have competence through education in educational institutions that have received government recognition, so that each crew required will have various certificates of competency in accordance with the ship where they work. Competence is a fundamental characteristic of the individuals associated with the referenced criteria for superior performance or effective in a job or situation. Competence a behavioral dimension that is behind competent performance. In this case, often termed behavioral competencies with the aim to explain how people behave when they function well (Armstrong and Baron in Wibowo; 2010: 326)

In addition to the crews who are expected to have recognition in terms of competence, the ship as a mode of transport is also required to have various seaworthiness recognition from the government to be able to sail. The recognition was marked by the issuance of a certificate of seaworthiness. The certificates also vary on the ship, such as certificates of seaworthiness for ship construction, engine, hull, communications equipment, safety equipment shipping. Recognition set forth in the form of certificates of competency --- both crew and seaworthiness --- indicates that the crew has the ability and skills in maintenance and operation. Competent crew will certainly try to keep the ship in seaworthy condition for fulfilling the safety of shipping.

Seaworthiness shall be met in accordance with the sail area which includes the safety of the ship; prevention of pollution from ships; manning of ships;

loading and unloading of ships; well-being of the crew and passenger health; the legal status of the vessel; safety management and the prevention of pollution from ships; management and security of the ship. The fulfillment of each seaworthiness is evidenced by certificates and letters of the vessel. Meanwhile, navigation consists of navigational aid-shipping; telecommunications; hydrography and meteorology; groove and crossings; dredging and reclamation; scouting; handling ship framework; and salvage and underwater works

Therefore, vessel seaworthiness and crew competence must be met together in a good operation of the ship will either increase the safety of the ship. The higher the level of safety of the ship, the prevention of ship accidents will also increase. Thus, there is a positive influence between the competence of the crew and vessel seaworthiness to safety. This means, the better the competence of the crew operating the ship and supported by the ship unseaworthy condition, the more increasing marine safety.

One study on the safety of shipping on the effect of shipping crews on safety was conducted by Nora Berg (Publication of The Centre for Maritime Studies: 2013). The study is uses literature that focuses on the issues related to safety and the crew and common mistakes because 80% of accidents aboard are caused by human factors. The study resulted in that cooperation among cultures (intercultural cooperation), communication, fatigue and language skills

is a major factor contributing to the safety of the ship at the individual level so that the training to understand the different cultures is indispensable.

This article aims to look at the effect of vessel seaworthiness and crew competence for the safety of shipping. In this paper, the study was conducted in PT. Pulau Laut in 2015, with the consideration that the company is a public in the sea transportation field. As a public company PT Pulau Laut is considered to have introduced a system of management that is required, so it will be visible the influence on the variables to be studied. In addition, the company is continuously working to increase transport capacity with the procurement of new ships that have adopted the technical condition of technological advances and international rules.

Data were analyzed using correlation and regression to determine the relationship between each variable kelaiklautan vessel (X1) and competence of the crew (X2) with marine safety variable (Y). The sample in this study were 73 crew on PT Pulau Laut with a population of saturation sampling technique. While the research hypothesis proposed is, "It is proposed that there is positive and significant relationship between vessel seaworthiness and crew competence for the safety of shipping." The relationship can be described by the following diagram paradigm

Results and Discussions

Based on the analysis of the data obtained, it is known that the three research

hypothesis proposed is positive and significant, namely the relationship between vessel seaworthiness (X_1) and competence of the crew (X_2) with the safety of shipping (Y), either individually or collectively, as listed in Table 1 below

Table 1 reflects a strong and positive relationship between vessel seaworthiness with marine safety in PT. Sea Island. The relationship between

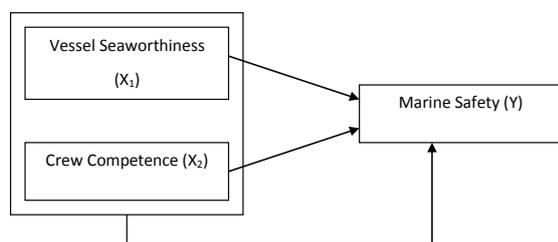


Figure 1 Variables of Study

variables seaworthiness and marine safety is seen in the value of the correlation coefficient (r) resulting from the calculation of the correlation between the independent variables vessel seaworthiness (X1) with the safety of shipping the dependent variable (Y), is 0.632. Determination coefficient of 0.400 showed 40% of marine safety variable (Y) is determined by variable factors kelaiklautan vessel (X1), while the remaining 60% is determined by other factors

Table 1 also shows the results of calculations or tcount obtained 6.873. Meanwhile, the value of t table with the df = 71 to α (0.05) is 1.667. This means tcount

Table 3 Relationships among variables

	R	R Square	Adjusted R Square	t count	t table	F count	F table
X1 – Y	,632 ^a	,400	,391	6,873	1,667		
X2 – Y	,814 ^a	,663	,658	11,815	1,667		
X1, X2 - Y	,843 ^a	,711	,703			86,179	3,128

Table 4 Regression

No	Relationships among variables	Regression
1	X1 – Y	$\hat{Y} = 67,491 + 0,825 X_1$
2	X2 – Y	$\hat{Y} = 51,756 + 1,001 X_2$
3	X1, X2 – Y	$\hat{Y} = 42,660 + 0,344 X_1 + 0,822 X_2$

obtained is greater than the value t_{table} , so H_0 rejected and H_a accepted. This indicates that the vessel seaworthiness variable has a positive and significant relationship with the safety of shipping.

Seaworthiness of the vessel influences the safety of shipping which can be seen from the regression equation in Table 2.

$$\hat{Y} = 67,491 + 0,825 X_1$$

Constants of 67.491 states that if there is no value vessel seaworthiness (X_1), then the safety of shipping (Y) worth 67.491, while the regression coefficient of 0.825 X_1 states that each additional one (1) value of the variable vessel seaworthiness, that will increase the variable safety shipping equal to 0.825 times the constant 67.491

Efforts to improve marine safety through increased vessel seaworthiness should be a company's top priority for vessel seaworthiness has an influence on the marine safety.

The results show that there is a very strong and positive relationship between the competence of the crew with marine safety. The relationship variables crew competence with marine safety, reflected in the value of the correlation coefficient (r) at 0.814. Meanwhile, the value of the coefficient of determination generated 0.663. It shows 66.3% variable competence of the crew (X_2) is determined by the variable factor of safety of navigation (Y), while the remaining 33.7% is determined

to other factors (see Table 1).

In addition, Table 1 also shows that t_{count} obtained is 11.815. With $df = 71$ and $\alpha (0.05)$ of 1.667. This means that the value is greater than the value t_{count} 11,815 t_{table} 1.667, so that H_0 is rejected and H_a is accepted. This shows that the regression coefficient of variable competence of the crew has a positive and significant impact with marine safety.

The effect of crew competence with the safety of shipping can be seen from the following simple regression equation.

$$\hat{Y} = 51,756 + 1,001 X_2$$

The regression equation above shows a constant value of 51.756. This means that if there is no competence of the crew value (X_2), then the safety of shipping (Y) with 51.756, while the regression coefficient of 1.001 X_2 states that each additional one (1) the value of the variable competence of the crew will improve the safety of shipping variables equal to 1.001 times the constant 51.756.

By performing multiple linear regression analysis can be seen that the correlation coefficient (r) = 0.843 which means the relationship of vessel seaworthiness and variable competence of the crew together with marine safety variable is strong and positive. Determination coefficient 0.711 shows 71.1% marine safety variable is determined by variable factors vessel seaworthiness and crew competence variables, while the remaining 28.9% is determined other

factors.

The influence of vessel seaworthiness together with the competence of the crew to the safety of shipping can be seen from the following multiple regression equation.

$$\hat{Y} = 42,660 + 0,344 X_1 + 0,822 X_2$$

The regression equation above shows a constant value of 42.660. In this case, means that if there is no value of vessel seaworthiness and competence of the crew, then the safety of navigation worth 42.660, while the regression coefficient of 0.344 X_1 states that each additional one (1) the value of the variable vessel seaworthiness will increase the variable marine safety equal to 0.344 times the constant of 42.660 and a regression coefficient of 0.822 X_2 states that each additional one (1) the value of the variable competence of the crew will increase the variable marine safety of 0.822 times at constant 42.660.

Table 1 shows the value of F_{count} of 86.179, while the critical value of F_{table} with 2 degrees of freedom numerator and denominator 70 on α (0.05) of 3.128. That means the value of F (86.179) is greater than the value of F_{table} (3.128), making it clear that H_0 is rejected and H_a is accepted. This shows that the regression model variables vessel seaworthiness and the competence of the crew significant variables marine safety.

Vessel seaworthiness and the competence of the crew jointly have a significant positive correlation marine safety. Therefore, the more improved

vessel seaworthiness and the competence of the crew, the higher the safety of shipping. Vessel seaworthiness can be increased by scheduled docking on regular basis, periodic maintenance as required, providing spare parts on board, and appropriate safety equipment and proper navigation, meanwhile improving the competence of the crew with bonuses, incentives, adequate salaries and boost morale or aims to encourage employees to make them more eager and able to achieve the desired results, so as to improve marine safety.

Conclusion

Hypothesis testing shows there is a significant positive correlation between vessel seaworthiness with marine safety. Thus the research hypothesis H_1 is accepted, $t_{count} > t_{table}$ ($6.873 > 1.667$) and with the probability of significance $0.000 < 0.05$, and is also supported by the determination coefficient 0.400 or 40%. This shows the magnitude of the effect of vessel seaworthiness contribution to the safety of shipping by 40%, while the remaining 60% is the influence of other factors, such as training, work environment, and so forth. Similarly, the relationship between the competence of the crew with the safety of shipping, there is a positive relationship too. Thus, H_2 research hypothesis is accepted, ie $t_{count} > t_{table}$ ($33.665 > 1.667$) and with the probability of significance $0.000 < 0.05$, and also supported by determination coefficient of 0.663 or 66.3%. This shows the magnitude

of the effect of the competence of the crew contribution to the safety of shipping by 66.3%, while the remaining 33.7% is the influence of other factors such as training, work environment and other things that are not investigated.

Hypothesis test shows that there is a positive and significant relationship vessel seaworthiness and crew competence together with the safety of shipping, thus H3 research hypothesis is accepted, ie $F_{count} > F_{table}$ or $86.179 > 3.128$ and the significance probability of $0.000 < 0.05$, and also supported determination coefficient of 0.711 or 71.1%. It shows the contribution of the vessel seaworthiness and the competence of the crew with the safety of shipping by 71.1%, while the remaining 28.9% is the influence of other factors, such as training, work environment, etc.

Thereby, improving the safety of shipping should be more focused on the maintenance of the ship's structure and completeness of safety equipment, as well as the supervision of the ship's structure. The fact that seaworthy vessels are required --- both in terms of structure and completeness of safety tools --- so as to create a sense of safety for the crew and the shipping services. Therefore, companies should always consider and evaluate the structure of the vessel and safety equipment --- in terms of both quality and quantity --- with docking regularly, provide appropriate safety equipment sail area, providing sufficient spare parts when suddenly damage occurs, so it can be solved quickly, and set a list of all the repair equipment that

has to be repaired.

Marine safety is highly influenced by a competent crew and high motivation. Motivation to work can be obtained through a program of rewards in the form of bonuses and incentives on job performance has produced. Giving this award aims to improve the performance of the crew in helping companies achieve goals. It is also expected to avoid a high turnover because of job offers from the foreign vessels with more attractive compensation packages.

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