

Enhancing Ship Seaworthiness Supervision: A Study at KSOP Class II Kendari

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KEYWORDS

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ABSTRACT – Ship accidents often occur due to ships being unseaworthy to sail. The harbor master plays an important role in supervising the seaworthiness of ships and port activities. However, ship accidents still often occur due to the unseaworthiness of ships to sail. This study examines the level of performance of the harbor master at KSOP Class II Kendari. The method used is the Costumer Satisfaction Index (CSI). The questionnaire was given to the sample which was calculated using the Slovin calculation. The results of the questionnaire have gone through validity and reliability tests and show that the results obtained are valid and reliable. The percentage value of CSI obtained reached 84.95%. This figure indicates that customers are very satisfied with the performance of KSOP Class II Kendari. This shows that KSOP Class II Kendari has succeeded in meeting customer expectations and needs well.

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INTRODUCTION

Sea transportation is a means of transportation that has a very vital role as a means of transportation that can reach all regions via water. In order for activities to run smoothly, good ship safety and security management efforts are needed. The management efforts are external, namely supervising ship activities by the KSOP harbormaster [1]. Safety is a critical factor in shipping activity in order to create shipping lane safety [2]. Ship's seaworthiness is one of the requirements must be met by ships in every shipping activity, as well as ship safety and security is marked by the condition of fulfilling ship's seaworthiness [3]. The concept of seaworthiness has evolved over many years, and in common with similar concepts (for instance, the definition and application of "prudent seamanship"), its precise meaning has varied considerably [4]. Currently, there are a number of high-tech systems used on ships to monitor and provide operational services during their navigation at sea [5]. In determining the seaworthiness of the ship, ship inspection is very important to do. KSOP has a very important role in determining the seaworthiness of ships [6].

Overcoming obstacles related to ship seaworthiness requires a holistic approach that includes technical maintenance, compliance with regulations, increasing crew competency, good documentation management, spare parts management, and readiness to face environmental conditions. In other words, to address ship seaworthiness issues, cooperation is needed between ship owners, port authorities, and maritime regulatory bodies. This collaboration will not only strengthen supervision, increase law enforcement, and promote awareness of the importance of compliance with safety and environmental standards, but also enhance the industry's reputation, reduce accidents, and protect the environment [7]. To evaluate the whole seaworthiness before taking over command at sea is important in order to minimize the risk of problems with complicated liability [8]. the sea carrier must apply the seaworthiness operation from the port of origin before the commencement of the ship's movement and before the start of the loading process to take the appropriate protections for the ship to be able to load, depart from the pier, and navigate the sea [9]. Legal arrangements for the qualification and competence of harbormasters in issuing sailing approval letters for sailing safety. Handling law enforcement in Indonesian waters and additional zones has a higher difficulty level than criminal acts and similar violations that occur on land. A thorough understanding of the relevant laws and regulations is still inadequate, compared to both the prevalence of criminal acts and violations that occur and the vast territory of Indonesian waters and additional zones that need to be covered and reached [10].

Ship accidents often occur due to crew errors in operating the ship and the ship's unseaworthiness to sail. Ship accidents based on causal factors can be divided into 3, namely natural factors (force majeure), human error factors (human error factor) and other factors (others factor) [11]. Summarized 29 risk factors through a literature review, including 15 human-made factors, 9 ship-relevant factors, and 5 environment-related factors [12]. Based on data in

1998–2018 from Lloyd’s List Intelligence Casualty Statistics, extracts 16 ship types, 13 sea regions and 11 major accident factors, and builds an improved entropy weight-TOPSIS model. In the end, the analysis of the ship type model and sea region model shows that foundering, stranding and fire/explosion are the most important influential factors of accidents. Maritime authorities need to strengthen safety training for maritime practitioners to increase their sense of operation and sense of responsibility [13]. Carrying out passenger and cargo activities, the ship must fulfill the safety principles that have been emphasized in the applicable regulations in Indonesia and must be obeyed, based on Law No. 17 of 2008 and the International Safety Management Code in Chapter IX of SOLAS which contains provisions on International Management for safe operation of ships and prevention of pollution [14]. Risk analysis must also be conducted to avoid fatal accidents in the future [15]. In this study, the author will examine the performance level of the Kendari Class II KSOP in supervising ship seaworthiness using the Customer Satisfaction Index (CSI) method.

METHOD

The measurement of the performance level of KSOP class II Kendari is by using the Customer Satisfaction Index (CSI) Method. The first step taken is to create a questionnaire based on the level of importance (X) and the level of satisfaction (Y) using a Likert scale. To obtain the CSI value, the following steps are taken:

1. Determining Mean Importance Score (MIS) and Mean Satisfaction Score (MSS)

Mean Importance Score (MIS) is calculated using equation 1. MIS is the average importance score of an attribute derived from the average supervision of the harbor master.

$$MIS = \frac{[\sum_{i=1}^n Y_i]}{n} \quad (1)$$

Mean Satisfaction Score (MSS) is calculated using equation 2. MSS is the average satisfaction of an attribute derived from the average performance of the harbormaster's supervision felt by consumers. n is the total respondents. Yi is the score of the i-th importance attribute. Xi is the score of the i-th performance attribute.

$$MSS = \frac{[\sum_{i=1}^n X_i]}{n} \quad (2)$$

2. Calculating Weighting Factor (WF)

Weight Factor (WF), is calculated using equation 3. WF is a function of the MIS or average score of the level of importance of each attribute in the form of a percentage of the total MIS or average score of the level of importance for all attributes tested..

$$WF = \frac{MIS_i}{\sum_{i=1}^n MIS_i} \times 100\% \quad (3)$$

3. Calculating Weight Score (WS)

Weight Score (WS) is calculated using equation 4. WS is a function of MSS or the average score of the level of satisfaction of each attribute multiplied by the Weighting Factors (WF) of each attribute.

$$WS_i = WF_i \times MSS \quad (4)$$

4. Calculating Weighted Total (WT)

Weighted Total (WT) is the total of the overall Weighted Score (WS) values. It is calculated using equation 5..

$$WT = WS_1 + WS_2 + \dots + WS_i \quad (5)$$

5. Determining Customer Satisfaction Index (CSI) value.

The CSI percentage value is calculated by dividing the weighted score by the maximum scale used, it is calculated using equation 6.

$$CSI = \frac{WT}{HS} \times 100\% \quad (6)$$

The next step is to interpret the CSI values into a 5-scale form with a range of 20% based on the categories in Table 1.

Table 1. Satisfaction Index Criteria

No.	Indeks Value %	Customer Satisfaction Index
1.	81 – 100	Very Satisfied
2.	66 – 80,99	Satisfied
3.	51 – 65,99	Quite Satisfied
4.	35 – 50,99	Not Satisfied
5.	0 – 34,99	Not Satisfied

RESULTS AND DISCUSSION

Validity and Reliability Test

Validity is related to the accuracy of the research procedure so that the research results and conclusions can be trusted as a general truth. The validity of the instrument can be known by comparing the product moment person correlation index at a significance level of 0.05/5%. If the significance of the correlation results is less than 0.05 (5%) then it is considered valid, while if the significance of the correlation results is more than 0.05 (5%) then it is considered invalid. In degree of freedom (df) = number of samples (n) - 2. In this study df was calculated 85 - 2 (df = 83) with alpha 0.05 which resulted in an R table of 0.2133. The statement element is considered valid if the calculated r value is greater than the r table value and the r value is positive. Based on the data obtained in the study, the results of the validity test of the research instrument can be seen in Table 2.

Table 2. Validity Test Results

No.	Variabel	Indicator Code	Indicator	r count	r table	Description
1.	Direct Supervision (X1)	X1.1	Has the navigation equipment on the ship been checked and is it functioning properly?	0,356	0,2133	valid
		X1.2	Is the global positioning system (GPS) functioning properly?	0,490	0,2133	valid
		X1.3	Is the radio communication system on the ship functioning properly?	0,263	0,2133	valid
		X1.4	Have the dimensions of the ship been measured accurately?	0,264	0,2133	valid
		X1.5	Has the stability of the ship been calculated accurately?	0,221	0,2133	valid
		X1.6	Do the measurements show safe and standard stability?	0,291	0,2133	valid
		X1.7	Are all ship equipment and systems turned off and audited before entering the dock?	0,302	0,2133	valid
		X1.8	Is the docking process carried out in accordance with established procedures?	0,359	0,2133	valid
		X1.9	Are all ship systems and equipment checked and retested after the docking process is complete?	0,383	0,2133	valid
2.	Indirect Supervision (X2)	X2.1	Have all the documents required for the extension of the ship's certificate been prepared in full?	0,459	0,2133	valid
		X2.2	Is a physical inspection of the ship carried out as part of the certificate extension process?	0,612	0,2133	valid
		X2.3	How is the interaction with the authorities during the certificate extension process?	0,302	0,2133	valid
		X2.4	Have all crew members received and understood the contents of the memorandum before the ship	0,295	0,2133	valid

No.	Variabel	Indicator Code	Indicator	r count	r table	Description
3.	Harbormaster supervision performance (Y1)		arrives/departs?			
		X2.5	Are all procedures listed in the memorandum carried out properly before the ship arrives/departs?	0,503	0,2133	valid
		X2.6	Are there regulatory and safety compliance checks before the ship arrives/departs?	0,276	0,2133	valid
		Y1.1	How often does KSOP Class II Kendari conduct inspections and supervision of ships and port activities every week?	0,229	0,2133	valid
		Y1.2	How long does KSOP Class II Kendari spend on one inspection or supervision on average?	0,358	0,2133	valid
		Y1.3	supervision by the harbor master reduces errors in my work	0,218	0,2133	valid
		Y1.4	The harbor master demonstrates a professional attitude in every supervision	0,388	0,2133	valid
		Y1.5	I am satisfied because the KSOP Class II Kendari office provides accurate information	0,325	0,2133	valid
		Y1.6	The harbor master's supervision encourages me to work better	0,395	0,2133	valid
		Y1.7	How active is KSOP Class II Kendari in responding to public reports or complaints regarding port activities?	0,263	0,2133	valid
		Y1.8	How good is KSOP Class II Kendari in evaluating and preparing recommendations regarding ship compliance with shipping safety regulations?	0,235	0,2133	valid
		Y1.9	How do you assess the quality of documentation and reports produced by KSOP Class II Kendari after conducting supervision?	0,287	0,2133	valid
		Y1.10	The harbor master's supervision helps improve my work efficiency	0,471	0,2133	valid
		Y1.11	How effective are the actions taken by KSOP Class II Kendari in responding to incidents of shipping safety?	0,509	0,2133	valid
		Y1.12	Does KSOP Class II Kendari always carry out inspections and supervision according to the predetermined schedule? How is the compliance of KSOP Class II Kendari with the deadline in providing reports on the results of supervision?	0,235	0,2133	valid
		Y1.13	The harbor master gives instructions on time so as not to disrupt the work schedule	0,456	0,2133	valid
		Y1.14	Can KSOP Class II Kendari respond quickly to changes in situations or conditions immediate action?	0,438	0,2133	valid
		Y1.15	How often does KSOP Class II Kendari conduct inspections and supervision of ships and port activities every week?	0,471	0,2133	valid

The results of the validity test on the data in table 4.4 show that all statement items on the variable x1 $r_{count} > 0.2133$ so that the data on all items on the variable are valid. This instrument can be used to conduct research.

Reliability testing refers to the consistency of the score results on the items in your questionnaire so that the reliability test actually tests the accuracy of the measurement scales of the research instrument [17]. A research instrument is considered a reliability coefficient if it has a reliability coefficient or alpha of 0.60 or higher and is not considered a coefficient if it has a reliability coefficient or alpha below 0.60. The results of the reliability test of the research instrument can be seen in Table 3.

Table 3. Reliability Test Results

No.	Variabel	Cronbach' s Alpha	Standard Value
1.	Direct supervision (X1)	0,86	0,60.
2.	Indirect supervision (X2)	0,72	0,60.
3.	Performance of ship seaworthiness supervision (Y1)	0,83	0,60

Based on table 4.5, the results of the reliability test show that all variables have a Cronbach's Alpha value of more than 0.60. This indicates that the items or instruments used in this study can be considered reliable and trustworthy for data collection purposes.

Customer Satisfaction Index (CSI)

The Mean Importance Score (MIS) represents the average level of importance assigned to each attribute, based on respondents' assessments of harbormaster supervision. Meanwhile, the Mean Satisfaction Score (MSS) reflects the average satisfaction level perceived by users regarding the actual performance of harbormaster supervision. The calculated MIS and MSS values for each attribute are presented in Table 4. These indicators are essential for identifying gaps between user expectations and the quality of services delivered. A higher MIS relative to MSS indicates attributes requiring improvement, while attributes with high MSS demonstrate areas where service performance is already meeting or exceeding user expectations. The MIS–MSS comparison also provides a strategic basis for prioritizing improvements in harbormaster operational procedures. Furthermore, the analysis facilitates clearer decision-making by highlighting critical service components that directly influence user perceptions and operational effectiveness. Overall, the combined use of MIS and MSS offers a comprehensive approach for evaluating service quality and determining targeted enhancements within port administration. Table 4.

Table 4. Mean Importance Score (MIS) and Mean Satisfaction Score (MSS)

No.	MIS	MSS
1	4,8	4,8
2	4,8	4,1
3	4,8	4,1
4	4,0	4,1
5	4,1	4,0
6	4,1	4,6
7	4,0	4,5
8	4,3	4,5
9	4,1	4,1
10	4,6	4,0
11	4,5	4,3
12	4,5	4,1
13	4,1	4,0
14	4,3	4,3
15	4,1	4,1
Total	65,1	63,7

The next step is to calculate Weight Factors (WF) and Weight Score (WS). The results of WF and WS values can be seen in Table 5.

Table 5. Weight Factors (WF) and Weight Score (WS)

No.	WF	WS
1	7,35	35,13
2	7,39	30,00
3	7,32	29,96
4	6,22	25,67
5	6,29	25,45
6	6,34	29,03
7	6,18	27,70
8	6,63	29,96
9	6,29	25,75
10	7,07	28,43
11	6,92	30,04
12	6,88	28,27
13	6,25	25,08
14	6,63	28,79
15	6,23	25,52
Total	100,0	424,8 (WT)

Next, the CSI percentage value is calculated by dividing the weighted score by the maximum scale used. Based on the calculation results, it was found that the customer satisfaction index (CSI) reached 84.95%. This figure indicates that customers are very satisfied with the performance of KSOP class II Kendari. This shows that KSOP class II Kendari has succeeded in meeting customer expectations and needs well.

CONCLUSION

The harbor master as a government official at the port plays an important role in supervising the seaworthiness of ships and supervising activities at the port. The seaworthiness of ships is very important in shipping to maintain the safety of ships and prevent pollution at sea. Meanwhile, the role of the harbor master at the port is to supervise activities at the port so that accidents do not occur and to maintain the smooth loading and unloading activities at the port. The increase in the number of ship visits to Kendari Port will be a challenge for the harbor master to supervise the seaworthiness of ships and the port. Therefore, a study was conducted to measure the performance of the Kendari harbor master using the Customer Satisfaction Index (CSI) method. The CSI method is a method that is able to measure the level of satisfaction or performance of a service. Based on the data analysis that has been carried out, it was found that the customer satisfaction index Customer Satisfaction Index (CSI) reached 84.9552%. This figure indicates that customers are very satisfied with the performance of KSOP Class II Kendari according to the CSI method. This shows that KSOP Class II Kendari has succeeded in meeting customer expectations and needs well. It is hoped that all KSOPs can demonstrate good customer service performance for sailing safety and smooth activities at the port.

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