:: IJEBD ::
(International Journal of Entrepreneurship and Business Development)
Volume 07 Number 01 January 2024

ISSN : 2597-4785 (ONLINE)
ISSN : 2597-4750 (PRINTED)

Evaluation of International Safety Management (ISM) Code Implementation using Quantitative Descriptive Methods and Quality Function Deployment on Passenger Ferries

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ABSTRACT

Purpose: The International Safety Management Code (ISM Code) has been coming into force for passenger ferries in Indonesia since 1998—ships that are mandatory to apply the ISM Code are subject to audit periodically by the competent authorities. Even so, there are still many non-conformities found in the implementation of the ISM Code, also the number of ship accidents is not significantly reduced to close to zero accidents. It is necessary to carry out an analysis related to the implementation of the ISM Code from another point of view, hence from the point of view of the implementing party of the ISM Code. In this research, the level of implementation analysis is measured by the requirement elements in the ISM Code and the existing obstacles.

Design/methodology/approach: The method used is a mixed method, which is quantitative methods and Quality Function Deployment (QFD). Quantitative methods are carried out using literature studies, interviews, and surveys by distributing questionnaires.

Findings: The results of the quantitative method are analyzed and followed by the QFD method with the main instrument the House of Quality (HOQ), to obtain input (technical response) from ISM Code experts. The technical answer is then selected based on priority level and will become a proposal for improving the level of implementation of the ISM Code. The ship data taken in this study are passenger ferries which are serving routes of Lembar - Padangbai and Lembar - Kayangan. From the results of the descriptive quantitative analysis, ten indicators of implementation and five indicators of obstacles were obtained and became priorities for improvements. Based on these results, twenty-two priority technical responses were received to improve the implementation of the ISM Code on passenger ferries serving routes of Lembar – Padangbai and Lembar – Ketapang.

Paper type: Research paper

Keywords: *ISM Code, Passenger Ferries, QFD, HOQ*

Received : October 6th
Revised : December 18th
Published : January 31th

I. INTRODUCTION

The Government of the Republic of Indonesia itself has regulated the safety and security of shipping through Law No. 17 of 2008 concerning shipping. According to the law, shipping safety and security is a condition of fulfilment of safety and security requirements concerning transportation in waters, ports, and the maritime environment. The elements of shipping safety are the seaworthiness of the ship and the safety of the ship. Ship seaworthiness is the state of a ship that meets the requirements of ship safety, prevention of pollution of waters from ships, manning, loading lines, loading, crew welfare, and passenger health, the legal status of ships, safety management, and prevention of pollution from ships, and management of ship security for sailing in certain waters. While ship safety is the condition of the ship that meets the requirements of material, construction, building, machinery and electricity, stability, arrangement, and equipment including auxiliary equipment and radio, and ship electronics, as evidenced by certificates after inspection and testing.

ISSN : 2597-4785 (ONLINE)
ISSN : 2597-4750 (PRINTED)

Governments and world maritime organizations such as the International Maritime Organization (IMO), also put pressure on shipping companies to pay more attention to safety than their crews. IMO's slogan of Safe, Secure, Efficient Shipping on Clean Oceans must mean that shipping must pay attention to safety, security, efficiency, and a clean marine natural environment. For this reason, IMO issued many regulations related to shipping safety and to protect the marine environment. International shipping safety is enshrined in Safety of Life at Sea (SOLAS) 1974 Article IX i.e. the International Safety Management (ISM) Code amended by the 1978 Amendment applies to all ships sailing between ports in the world. This ISM Code is intended to protect the crew including passengers/cargo from accidents at sea, as well as to protect the marine environment from pollution, by implementing ship operation management in accordance with the provisions in the ISM Code.

There are many job activities in operating a vessel, both light and heavy, both in the office and on board the ship itself, and this poses a risk to the safety of the vessel. This risk can be minimized if a company in work activities related to ship operation management has implemented the ISM Code. Currently, this ISM Code must be applied by companies that own and operate ships. As for Indonesia, the basis of the obligation to implement ISM has been regulated in the Decree of the Director General. Sea Transportation No. No.PY. 67/1/6-96 dated July 12, 1996. The implementation of the ISM Code needs to be assessed periodically through verification of the company, including its ships.

PT. Indonesian Classification Bureau (Persero) commonly referred to as PT. BKI is a state-owned enterprise engaged in inspection services authorized by the Government to verify the implementation of the ISM Code. PT. BKI also has a mission to improve transportation safety. Organizations such as PT. BKI which is authorized to verify the implementation of the ISM Code is called the Recognized Organization (RO).

For companies that have been verified and declared to meet the requirements, a Document of Compliance (DOC) will be issued and every ship that has met the requirements will be issued a Safety Management Certificate (SMC). Both DOC and SMC have a validity period of 5 years. These DOC and SMC will be mandatory documents owned by companies and ships as part of the seaworthiness document requirements. Therefore companies and their vessels that cannot meet the requirements of the ISM Code will face difficulties in their operational activities, both in international and domestic waters.

In conducting audits to verify the implementation of the ISM Code, problems or obstacles are still often encountered. This was revealed during the audit that there were still many non-conformities that reflected the lack of implementation of the ISM Code in the company. If a common thread is drawn, this discrepancy correlates with the high number of ship accidents in Indonesia.

Looking at the current problems, this study was conducted to evaluate the implementation of the ISM Code and also look at the obstacles encountered during the implementation process. This research is also expected to facilitate safety auditors in verifying the implementation of the ISM Code in Indonesia by focusing more on certain areas during the audit. The object of this research is limited to shipping companies that operate crossing ships or ro-ro ferry types on the Lembar - Padangbai and Lembar - Ketapang routes.

Evaluation of the implementation of the ISM Code has been carried out by ship safety auditors through an audit process. The evaluation of the implementation in this study is different from the evaluation of the implementation of the ISM Code which is carried out through the ship safety audit process. In the ship safety audit process, the auditor verifies the fulfillment of the 12 elements in the ISM Code through interviews with crew and office employees accompanied by a review of documents and other supporting records, then will issue discrepancies if there are discrepancies between written procedures and what has been carried out accompanied by existing objective evidence. Meanwhile, in this study, the evaluation of the implementation of the ISM Code was carried out by soliciting opinions from respondents, namely office employees and ship crews who have been auditees during safety audits through questionnaires on what has been done by the management in implementing the ISM Code, whether it is by what is expected by employees with the crew.

Research on the implementation of the ISM Code has been conducted by previous researchers entitled Implementation of the ISM Code on Ships at Tanjung Perak Port (Wahyuni et al, 2018). This study is intended to find out how the implementation of the ISM Code is carried out on ships in Tanjung Perak Port and the level of knowledge of the crew about the ISM Code. This research was conducted by distributing questionnaires, then the results of the questionnaire carried out Importance-Performance analysis which was used to measure the level of understanding of officers about the ISM Code and implementation on board.

Another research on the implementation of the ISM Code with the Evaluation of the Implementation of Safety Management System Policies Based on the International Code of Safety Management (ISM Code) on Ships of PT. Indonesian National Shipping (Saputra, 2013). This study aims to evaluate the application of the ISM Code in PT. Pelni. The policy evaluation method used is in the form of qualitative methods with data collection carried out through interviews, document review, and observation. The model used in the study is CIPP (Context, Input, Processes, Product). This research found that the safety management system policy on ships at PT. Pelni has complied with the ISM Code.

The formulation of the problem taken in this study is:

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1. What is the level of implementation of the ISM Code on crossing vessels in the Lembar – Padangbai and Lembar – Ketapang passes?
2. What are the obstacles to the implementation of the ISM Code on vessels crossing the passage?

What steps are being taken to improve the implementation of the ISM Code on vessels crossing in Indonesia through safety audits?

II. METHODS

A. Research Parameters

Research parameters are a set of characteristics of the object under study (Timotius, 2017). The object of this research is a shipping company that operates crossing vessels on the Lembar - Padangbai and Lembar - Ketapang routes. This study evaluates the implementation of ISM Code based on the level of implementation and perceived obstacles using quantitative approach and Quality Function Deployment (QFD).

The approach used in this study is the Mix Method, which is a combination of qualitative approach and quantitative approach. The mixed method is superior to a single method because it will provide rich insight into research phenomena that cannot be fully understood using only one method. Mix methods can integrate and synergize multiple data sources that can help study complex problems (Dawadi et al., 2021).

B. Models used

The company's management is expected to be committed to improving the quality of ISM Code implementation and also reducing gaps that hinder the implementation of the ISM Code. The commitment to the implementation of the ISM Code starting from top management to the bottom line in the shipping company organization is needed to realize the policies, aims and objectives to be achieved in the implementation of the ISM Code.

This research was conducted by measuring the level of implementation and barriers of the ISM Code and conducting an inventory of the needs of employees or all company personnel (both on land and ships) involved in the implementation of the ISM Code, as well as determining priority technical attributes for improving the implementation of the ISM Code. Measurement of the level of implementation and obstacles to the implementation of the ISM Code is carried out using quantitative methods. Attributes that have low scores will be collected, then mapped to needs and expectations. These needs and expectations will later be discussed with experts to obtain technical responses that will be processed using the QFD model. The QFD model is a method used to translate customer needs into technical responses. In this QFD model, the company personnel involved in the implementation of the ISM Code are defined as customers. Understanding Voice of the Customer (VoC) is the foundation and starting point of QFD. QFD is a methodology for translating customer needs and wants into product design with specific technical requirements and quality characteristics.

The stages carried out by this research are:

1. Stages of field research
2. Stages of problem formulation
3. Data collection
4. Data processing
5. Discussion
6. Drawing Conclusions and Suggestions.

C. Research Design

The study was designed with the following steps:

1. Field studies. During the field study, researchers collected data on the results of internal and external audits of the ISM Code in the period 2019 - 2022. After the existing problem can be identified, then the formulation of the problem is carried out.
2. Based on the identification of problems that are the result of field studies and literature reviews, researchers decide to use descriptive quantitative methods to measure the level of implementation and barriers to implementing the ISM Code and to obtain dimensions or indicators that require improvement.
3. Determination of dimensions and indicators needs to be done first to compile statements that will be poured into the questionnaire, because this is related to the factors to be studied. These dimensions and indicators consist of 2 parts, namely dimensions and indicators related to the level of implementation of the ISM Code, and dimensions and indicators related to factors inhibiting the implementation of the ISM Code.

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4. After the dimensions and indicators are determined, the preparation and dissemination of questionnaires are carried out. In the preparation and dissemination of questionnaires, some of the essentials are population and research samples and data collection.
5. Population is the entire group of people, events, or things of interest that researchers want to investigate (Sekaran, 2003). In this study, the target population includes all parties in the crossing ship operator company at various structural levels, ranging from management, DPA, and staff directly involved in the implementation of the ISM Code. In addition to the company, the ship's crew ranging from captains, and officers to ratings as parties who implement the ISM Code on board are also part of the target population.

The population in this study can be seen in Table 1 below:

Tabel 1. Researh Population

No	*Company*	*Number of Employee*	*Name of Ship*	*Number of Kru*	*Path*
1	*PT. Jemla Ferry*	*15*	*Naraya*	*20*	*Lembar - Padangbai*
			Putri Yasmin	*20*	*Lembar - Padangbai*
			Nawasena	*19*	*Lembar - Padangbai*
2	*PT. ASDP*	*23*	*Parama Kalyani*	*20*	*Lembar - Ketapang*
			Portlink II	*16*	*Lembar - Padangbai*
			Roditha	*16*	*Lembar - Padangbai*
			Port Link VII	*21*	*Lembar - Ketapang*
3	*PT. Dharma Lautan Utama*	*15*	*Dharma Kencana IX*	*19*	*Lembar - Padangbai*
			Dharma Ferry VIII	*18*	*Lembar - Padangbai*
			Dharma Ferry IX	*22*	*Lembar - Ketapang*
4	*PT. Samoedra Jaya Giri Nusa*	*9*	*Rama Giri Nusa*	*16*	*Lembar - Padangbai*
			Shita Giri Nusa	*16*	*Lembar - Padangbai*
5	*PT. Gerbang Samudra Sarana*	*12*	*Gerbang Samudra III*	*20*	*Lembar - Padangbai*
			Salindo Mutiara I	*20*	*Lembar - Padangbai*
6		*10*	*Sindu Dwitama*	*19*	*Lembar - Padangbai*

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ISSN : 2597-4750 (PRINTED)

No	Company	Number of Employee	Name of Ship	Number of Kru	Path
	PT. Agung Tama Raya		Sindu Tritama	19	Lembar - Padangbai
			Wihan Bahari	18	Lembar - Padangbai
7	PT. Trimitra Samudra	8	Gemilang Viii	20	Lembar - Padangbai
			Surya 777	16	Lembar - Padangbai
			Nusa Sakti	15	Lembar - Padangbai
8	PT. Putra Master Sarana Penyeberangan	15	Nusa Bakti	15	Lembar - Padangbai
			Nusa Penida	15	Lembar - Padangbai
9	PT. Pewete Bahtera Kencana	8	Pbk Muryati	24	Lembar - Padangbai
10	PT. Munic Line	12	Munic III	23	Lembar - Padangbai
			Marina Segunda	19	Lembar - Padangbai
			Marina Primera	19	Lembar - Padangbai
11	PT. Jembatan Nusantara	15	Prima Nusantara	19	Lembar - Padangbai
			Gading Nusantara	19	Lembar - Padangbai
			Swarna Cakra	19	Lembar - Ketapang
12	PT. Duta Bahari Menara Line	10	Jambo X	23	Lembar - Ketapang
13	PT. Raputra Jaya	14	Tunu Pratama Jaya	20	Lembar - Ketapang
14	PT.Tri Sakti Lautan Mas	10	Trimas Laila	25	Lembar - Ketapang
	Karyawan Total	176	Kru Total	610	
	Populasi Total		786		

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ISSN : 2597-4750 (PRINTED)

In Table 1 above, the population in this study is employees of crossing ship operator companies and ship crews on the Lembar – Padanbai and Lembar – Ketapang routes. The employees referred to here are employees in companies directly involved with the implementation of the ISM Code who become auditees when safety audits are carried out.

1. The sample is the part of the population selected from the members of that population (Sekaran, 2003). The number of samples in this study was set as an even number, which was 270. The data collection required in this study was obtained through a survey using questionnaires. A survey is quantitative research using the same structured questions in each person, then all the answers obtained by the researcher are recorded, processed, and analysed. Structured questions are called questionnaires. The questionnaire contains questions that will be given to respondents to measure variables, relate among existing variables, and can be in the form of experiences and opinions from respondents (Sugiyono, 2014).
   The questionnaire in this study was distributed using an online survey method using mobile device media to the respondents who were sampled. Respondents who are the object of this survey are company personnel, both employees on land and ship crews with the following criteria:
   a. Office employees with a minimum of 2 years of service
   b. Placement at the head office or branch office where the ship operates
   c. Holding structural and functional positions
   d. Crew (captain, officer and rating) who have undergone a contract of at least 5 months.

   With the respondent criteria above, to meet the number of samples of 270, the questionnaire was distributed as follows:
   a. The crew selected are: Nahkoda, Mualim 1, Head of Engine Room, 1 person rating from the deck department and 1 person rating from the engine department, so the total number per ship is 5 people. With a total of 32 ships, the respondents taken from the ship's crew were as many as 160 respondents.
   b. The remaining 110 respondents were divided proportionally among all companies. With a total number of companies as many as 14, for each company 7-8 respondents were taken.

   The statements in the questionnaire were prepared to obtain respondents' opinions on the level of implementation of the ISM Code and the obstacles experienced. The questionnaire in this study was divided into three parts, namely:
   a. The first section contains a statement regarding the description of the shipping company and information about respondents
   b. The second part contains the main statements regarding respondents' perceptions and opinions regarding the level of implementation of the ISM Code
   c. The third section contains the main statements regarding respondents' perceptions and opinions regarding the obstacles experienced during the implementation of the ISM Code.

   The main statement types of the second and third parts use Likert scales. An interval scale that specifically uses five ranks: Strongly Disagree, Disagree, Neutral, Agree, and Strongly Agree. In the questionnaire used in this study, the scale used in assessing the level of implementation and barriers of the ISM Code consists of 5 rating categories.
2. Validity and reliability tests are carried out after researchers collect the results of questionnaires that have been filled out by users.
   Validity is a measure that shows that the variable measured is really the variable that the researcher wants to examine (Cooper and Schindler, in Sultane, 2006). This analysis is done by correlating each item's score with the total score. Reliability is a tool to measure a questionnaire which is an indicator of a variable or construct (Ghozali, 2009). A questionnaire is said to be reliable if a person's answers to statements are consistent or stable over time.
3. The next step is data processing with quantitative methods by measuring central tendencies and dispersion. The measurement of central movement in this study is done by measuring the mean or mean, which gives an idea of the data. Dispersion measurement is carried out by measuring the standard deviation of a sample. The results of the analysis from quantitative method calculations are then classified into two types, namely the level of implementation and obstacles to the implementation of the ISM Code. Implementation level variables and barriers with low average scores and high standard deviations will be grouped and then considered the needs and expectations of top priorities for safety management system improvement.
   At this stage there are several assumptions in the framework of using the QFD method with the House of Quality, including:
   a. All respondents according to predetermined criteria who fill out the questionnaire are summed as customers.
   b. The implementation of the ISM Code is a product that needs improvement.
4. The need and expectation of improvement of the safety management system based on the variables that have been obtained will later be prepared technical responses through the interview stage with experts in the field

ISSN : 2597-4785 (ONLINE)
ISSN : 2597-4750 (PRINTED)

of ISM Code, namely representatives from the government who have authorization to apply the ISM Code on crossing ships (Ministry of Transportation) and ISM Code auditors from PT. BKI.

5. The results of technical responses obtained based on interviews with experts are made based on the relationship or correlation of the level of importance and need through the QFD tool, namely the House of Quality so that there will be a need for corrective steps that must be taken immediately or technical responses chosen as priorities. In this study, modifications will be made to the *House of Quality* so that it is in accordance with the implementation of the *ISM Code*.
   The steps taken in creating a House of Quality are: (Besterfield et al., 2012):
   Step 1—Create Customer Requirement Lists (WHATs)
   Step 2—List of Technical Descriptors (HOWs)
   Step 3—Develop a Relationship Matrix Between WHATs and HOWs
   Step 4—Develop a Linkage Matrix Between HOWs
   Step 5—Develop Prioritized Customer Requirements
   Step 6—Develop Prioritized Technical Descriptors

At the conclusion stage, the results of research will be explained on shipping companies that have been selected as research samples. From the results of the study, suggestions will be presented for improving the implementation of the ISM Code in each company. In addition, the results of this study can be used for ISM Code auditors to determine the focus of the audit area when auditing the implementation of the ISM Code on ships in the Lembar - Padangbai and Lembar - Kayangan crossings.

III. RESULTS AND DISCUSSION

A. Description of Research Variables

The results of the study are presented in the form of the average value of each of these items described in the following sections.

1. Implementation Variable

Tabel 2 Distribution of Implementation Variables

Indicator	*Mean*	*Deviation*	*Element (Dimention)*	*Mean*
OBJ1	*4.19*	*0,659*		
			Safety Management System Objectives	*4.24*
OBJ2	*4.30*	*0,652*		
POL1	***4.31***	*0,638*		
			Environmental Safety and Protection Policy	*4.25*
POL2	*4.19*	*0,662*		
COM1	*4.23*	*0,643*		
			Corporate Responsibility and Authority	*4.20*
COM2	*4.18*	*0,668*		
DPA1	*4.24*	*0,660*		
			Designated personnel	*4.25*
DPA2	*4.26*	*0,669*		
MAS1	*4.27*	*0,666*		
			Responsibilities and Authorities of the Nahkoda	*4.28*
MAS2	*4.30*	*0,665*		

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Indicator	*Mean*	*Deviation*	*Element (Dimention)*	*Mean*
SDM1	*4.26*	*0,649*		
SDM2	*4.26*	*0,669*		
SDM3	*4.22*	*0,656*		
SDM4	***4.14***	*0,638*	*Resources and manpower*	*4.21*
SDM5	*4.16*	*0,664*		
SDM6	*4.18*	*0,640*		
SDM7	*4.26*	*0,635*		
OPS1	*4.30*	*0,637*	***Ship Operation***	***4.30***
EMC1	*4.27*	*0,636*		
EMC2	*4.23*	*0,647*	*Emergency PreparednessEmergency Preparedness*	*4.25*
EMC3	*4.25*	*0,646*		
NCR1	*4.16*	*0,647*		
			Reporting Analysis of Nonconformities, Accidents and Dangerous Events	*4.17*
NCR2	*4.18*	*0,662*		
MAN1	*4.23*	*0,668*		
MAN2	*4.15*	*0,661*		
			Ship Maintenance and Equipment	*4.18*
MAN3	*4.15*	*0,632*		
MAN4	*4.17*	*0,688*		
DOK1	*4.22*	*0,670*		
DOK2	*4.20*	*0,638*	*Documentation*	*4.21*
DOK3	*4.20*	*0,615*		
VER1	*4.24*	*0,649*		
			Company Verification, Review and Evaluation	*4.21*
VER2	*4.20*	*0,664*		

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Indicator	*Mean*	*Deviation*	*Element (Dimention)*	*Mean*
VER3	*4.25*	*0,646*		
VER4	*4.18*	*0,634*		
VER5	*4.20*	*0,698*		

Source : data processed, 2023

The table presents data related to the distribution of implementation variables along with their corresponding means and deviations. The indicators, represented by abbreviations such as OBJ1, POL1, COM1, DPA1, MAS1, SDM1, OPS1, EMC1, NCR1, MAN1, DOK1, and VER1, pertain to different aspects of a Safety Management System. Each indicator is associated with a specific element or dimension, denoted by detailed descriptions like "Safety Management System Objectives," "Environmental Safety and Protection Policy," "Corporate Responsibility and Authority," and so on. The data was processed in the year 2023.

For each indicator, the table provides the mean and deviation values. The mean indicates the average score obtained for that particular element, and the deviation measures the variability or dispersion of the data points around the mean. The data seems to indicate relatively high mean values across most indicators, suggesting that the Safety Management System is generally well-implemented in the given context.

2. Obstacles Variable

Tabel 3. Distribution of Obstacle Variables

Indicator	*Mean*	*Deviation*	*Element (Dimention)*	*Mean*
BUD1	***3.15***	*1,082*		
BUD2	*2.53*	*1,167*	*Cultural and Behavioral Barriers*	***2.74***
BUD3	*2.54*	*1,104*		
ORG1	*2.33*	*1,074*		
ORG2	*2.32*	*1,112*		
ORG3	*2.33*	*1,092*	*Organizational Barriers*	***2.35***
ORG4	*2.48*	*1,065*		
ORG5	***2.28***	*1,083*		
TEK1	*2.47*	*1,074*		
TEK2	*2.50*	*1,042*	*Technical Obstacles*	*2.60*
TEK3	*2.81*	*1,075*		

Source : data processed, 2023

ISSN : 2597-4785 (ONLINE)
ISSN : 2597-4750 (PRINTED)

The table provides data on the distribution of obstacle variables, along with their corresponding mean and deviation values. The indicators, represented by abbreviations like BUD1, ORG1, and TEK1, pertain to different types of barriers that might be hindering progress or implementation in a certain context.

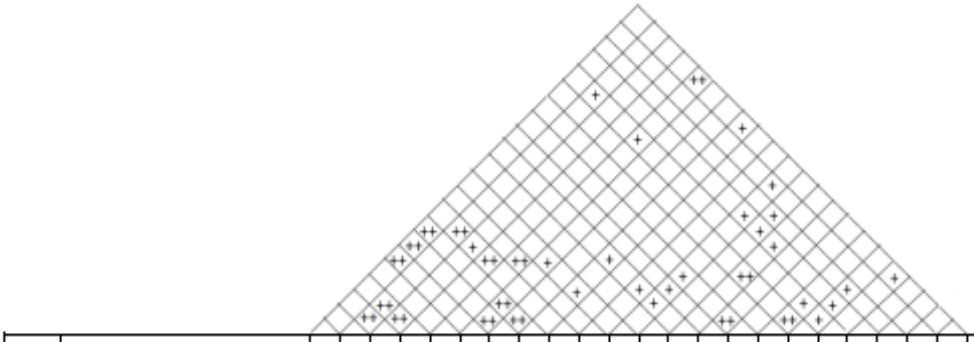
The data suggests that various barriers exist within the context being studied, including cultural and behavioral barriers, organizational barriers, and technical obstacles. The mean values for these indicators are relatively low, indicating that these barriers may be perceived as significant challenges in the given context. Additionally, the high deviation values suggest considerable variability in responses or perceptions about these obstacles among the participants or respondents. Further analysis and understanding of these barriers would be crucial in developing strategies to overcome or mitigate their impact on the desired outcomes.

B. House of Quality (HOQ) Matrix

The house of quality matrix can explain what is needed (what) and how to meet the needs of the customer (how) including priorities for fulfillment. In this study, a complete house of quality matrix was obtained with the following components:

1. The left wall is a customer need in the form of an indicator of the level of implementation and barriers to the implementation of the ISM Code.
2. The ceiling is a technical requirement *(how)* in the form of a technical response from experts.
3. The roof is a relationship between technical requirements, that is, the relationship between one technical response to another.
4. The right wall is a prioritized customer requirement, consisting of:
    a. Customer satisfaction level, namely the average score of implementation levels and barriers to implementing the ISM Code based on survey results.
    b. Goals to be achieved to increase customer satisfaction (improve implementation and reduce barriers to implementation of the ISM Code).
    c. The amount of effort required to achieve the goals that have been set (improvement ratio).
    d. Sales point, namely the magnitude of the increase in the application of the ISM Code if improvements are made in accordance with the technical response of experts.
    e. Raw weight and normalized raw weight are indicators of implementation levels and obstacles that require the greatest improvement efforts and contribute the most improvement if improvements are made.
5. The inner content of the *house of quality* is the relationship between customer needs and technical responses, ie. how much influence the technical response will have on improving implementation and lowering barriers to implementing *the ISM Code*.

ISSN : 2597-4785 (ONLINE)
ISSN : 2597-4750 (PRINTED)



Indikator	Kebutuhan Pelanggan (What)	Respon Teknis Dari Para Expert (How)																					Tingkat Kepuasan Pelanggan	Goal	Improvement Ratio	Sales Point	Raw Weight	Normalized Raw Weight
		RSP1	RSP2	RSP3	RSP4	RSP5	RSP6	RSP7	RSP8	RSP9	RSP10	RSP11	RSP12	RSP13	RSP14	RSP15	RSP16	RSP17	RSP18	RSP19	RSP20	RSP21	RSP22						
Tingkat Implementasi	Perusahaan telah memastikan bahwa semua personil yang terlibat dalam panduan sistim manajemen keselamatan perusahaan memiliki pengetahuan yang cukup terhadap aturan, peraturan-peraturan, kode, dan pedoman yang relevan	o					x	x	x			n		x				x				x	n	4,14	4,91	1,186	1,50	1,779	0,051
	Perusahaan telah memastikan bahwa inspeksi dilakukan pada interval yang sesuai, segala ketidaksesuaian dilaporkan disertai dengan kemungkinan penyebabnya, dilakukan tindakan perbaikan yang sesuai, serta pencatatan terhadap aktifitas ini dipelihara		o	o	o	x				x	n							x					o	4,15	4,91	1,183	1,20	1,420	0,041
	Perusahaan telah mengidentifikasi peralatan kritis di kapal yang apabila mengalami kegagalan dapat mengakibatkan situasi berbahaya.		n	o	o							n												4,15	4,91	1,183	1,20	1,420	0,041
	Perusahaan telah menetapkan pada panduan sistim manajemen keselamatan prosedur yang memastikan bahwa ketidaksesuaian, kecelakaan, dan keadaan berbahaya dilaporkan kepada perusahaan, disidiki dan dianalisis dengan tujuan meningkatkan keselamatan dan pencegahan pencemaran					o					o	n						x					n	o	4,16	4,91	1,180	1,50	1,770	0,051
	Perusahaan telah menetapkan dan memelihara prosedur guna mengidentifikasi dan memberikan pelatihan yang diperlukan oleh semua personil guna mendukung sistim manajemen keselamatan.	o					o	o	o			n		n	n			x	x	n	n	x	n	4,16	4,91	1,180	1,50	1,770	0,051
	Perusahaan telah memastikan bahwa semua kegiatan inspeksi terintegrasi dengan rutinitas operasional perawatan kapal		o	n	o					o		n												4,17	4,91	1,177	1,20	1,413	0,040
	Perusahaan telah menetapkan prosedur untuk pelaksanaan tindakan perbaikan beserta langkah-langkah yang diperlukan apabila terjadi ketidaksesuaian, kecelakaan dan kejadian berbahaya, untuk mencegah terulangnya kejadian tersebut.					o					o	n						n	n				n	o	4,18	4,91	1,175	1,50	1,762	0,050
	Perusahaan bertanggung jawab dan menjamin ketersediaan sumber daya yang memadai guna mendukung personil yang ditunjuk untuk dapat menjalankan tugas dan fungsinya.	o					n	n	o			o		x	o	o			x				n		4,18	4,91	1,175	1,50	1,762	0,050
	Perusahaan telah menetapkan prosedur bahwa kru dapat menerima informasi yang relevan terkait sistim manajemen keselamatan dalam bahasa yang dimengerti.											n	o	x			x	x	n			o		4,18	4,91	1,175	1,50	1,762	0,050
	Perusahaan telah memastikan bahwa personil yang melakukan audit memiliki independensi dari area yang diaudit.											n			o	o								4,18	4,91	1,175	1,20	1,410	0,040
Hindrance	Adanya resistensi personil perusahaan dan kru kapal terhadap perubahan, terkait prosedur dan instruksi	n										n	n	o			o	o	n			o		3,15	1,00	3,15	1,50	4,725	0,135
	Terlalu banyak pelaporan dan dokumentasi								x			n		x			n	n	o				x	2,81	1,00	2,81	1,20	3,372	0,096
	Sulitnya dilakukan pendekatan dengan budaya yang berbeda.								x			n	o	x						o	o	x		2,54	1,00	2,54	1,50	3,810	0,109
	Rendahnya motivasi personil baik di darat maupun kru kapal terhadap manajemen keselamatan	x				x						n	x	o				x		n	n	o	n	2,53	1,00	2,53	1,50	3,795	0,109
	Kurangnya analisis sistematis, tindakan perbaikan dan umpan balik dari manajemen terhadap pelaporan insiden											n										x	o	2,50	1,00	2,50	1,20	3,000	0,086
Tingkat Kepentingan Respon Teknis		31	21	21	21	20	15	15	21	18	18	51	22	26	21	18	13	20	21	15	15	38	30						
Prosentase Tingkat Kepentingan Respon Teknis		6,31	4,28	4,28	4,28	4,07	3,05	3,05	4,28	3,67	3,67	10,39	4,48	5,30	4,28	3,67	2,65	4,07	4,28	3,05	3,05	7,74	6,11						
Peringkat ResponTeknis		3	7	7	7	8	10	10	7	9	9	1	6	5	7	9	11	8	7	10	10	2	4						

Figure 1. House of Quality (HOQ) Matrix

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KETERANGAN :

Respon Teknis:

RESP1	Menyusun matriks pelatihan terkait peraturan nasional dan internasional yang relevan untuk semua karyawan dan kru kapal
RESP2	Membuat form rencana perawatan berkala (PMS) dan mewajibkan dilakukan pelaporan secara berkala.
RESP3	Menginventarisasi peralatan kritis di kapal sesuai kriteria bahwa apabila mengalami kegagalan dapat mengakibatkan situasi berbahaya
RESP4	Menetapkan prosedur perawatan, pengujian dan perbaikan peralatan kritis tersebut ke dalam PMS
RESP5	Membuat form pelaporan ketidaksesuaian, kecelakaan dan kejadian berbahaya beserta petunjuk teknisnya, serta melakukan sosialisasi penggunaan form tersebut
RESP6	Menetapkan kamus kompetensi untuk setiap jabatan di dalam perusahaan
RESP7	Menetapkan kamus kompetensi kru kapal mengacu pada STCW 1995 dan PP. No. 7 Tahun 2000
RESP8	Mengadakan pelatihan berkala berdasarkan kamus kompetensi masing – masing jabatan
RESP9	Memperhatikan sifat operasional kapal dalam menentukan jadwal inspeksi
RESP10	Mendefinisikan dan membuat database ketidaksesuaian, kecelakaan dan kejadian berbahaya beserta langkah antisipasinya
RESP11	Membuat pernyataan komitmen untuk manajemen puncak dalam memberikan dukungan kepada personil yang ditunjuk dalam rangka menjalankan tugas dan fungsinya masing - masing, dan memasang pernyataan komitmen tersebut pada tempat yang mudah dilihat baik di kantor maupun di kapal
RESP12	Menetapkan bahasa kerja di kapal adalah bahasa Indonesia
RESP13	Manajemen secara berkala memberikan penyegaran pengetahuan terkait deskripsi kerja kru kapal pada saat kunjungan ke kapal.
RESP14	Menyediakan internal auditor dengan jumlah yang mencukupi sesuai struktur organisasi perusahaan dan jumlah armada kapal yang dimiliki
RESP15	Mengatur penempatan masing – masing internal auditor sesuai struktur organisasi perusahaan
RESP16	Memastikan perubahan prosedur dan instruksi melalui mekanisme usulan yang dibahas secara berjenjang
RESP17	Melakukan sosialisasi setiap ada perubahan prosedur
RESP18	Menyederhanakan mekanisme pelaporan, termasuk yang bisa dilakukan secara digital, serta melakukan pembagian tugas pelaporan secara proporsional
RESP19	Menetapkan dan mendefinisikan dengan jelas budaya perusahaan
RESP20	Membuat panduan internalisasi nilai budaya
RESP21	Memberikan penghargaan kepada karyawan darat dan kru kapal terkait awareness terhadap manajemen keselamatan
RESP22	Memberikan pelatihan mengenai Analisa kecelakaan kepada para Nakhoda dan DPA dengan melibatkan pihak eksternal, misalnya KNKT dan marine adjuster

Hubungan Antara Respon Teknis dan Kebutuhan Pelanggan:

" "	Tidak Berhubungan	Nilai = 0
"s"	Sedikit Berhubungan	Nilai = 1
"n"	Berhubungan Normal	Nilai = 3
"e"	Berhubungan Erat	Nilai = 9

Korelasi Antar Respon Teknis

Hubungan Kuat dan Saling Mempengaruhi	Simbol "xx"
Saling Berhubungan Normal	Simbol "x"
Tidak Berhubungan	Tanpa Simbol

6. The floor is a prioritized technical requirement, that is, a technical response that is a priority to be implemented based on its rating.
   The complete house of quality matrix can be seen in Appendix 6. Meanwhile, after ranking technical responses according to table 4.30, the order of priority of 22 technical responses that need to be carried out by shipping companies operating vessels in order to improve the application of the ISM Code is as follows:
   a. Make a statement of commitment to top management in providing support to designated personnel in order to carry out their respective duties and functions, and post the commitment statement in a place that is easily visible both in the office and on board.
   b. The commitment of top management is needed as the main key to the successful implementation of *the ISM Code* and is the first priority.
   c. Rewarding land employees and crew for awareness of safety management.
   d. Employees both on land and on ships need to be rewarded for being more concerned about the safety management system.
   e. Prepare training matrices related to relevant national and international regulations for all employees and crew.
   f. The crossing transport industry is an industry that has a lot to do with regulations related to safety and environmental protection. It is necessary to provide knowledge and understanding for all employees both

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on land and in the kapakl regarding both national and international regulations related to the safe operation of ships.

g. Provide training on accident analysis to skippers and DPAs by involving external parties, such as HCV and marine adjusters.
h. Analysis of ship accidents and their causes so that the same incident does not repeat itself is a provision of knowledge that is needed by the ship's captain and DPA.
i. Management periodically refreshes knowledge related to the crew's job description during visits to the ship.
j. The knowledge of the crew needs to be constantly improved, especially related to their duties and responsibilities, so that the implementation of the safety management system on board can be carried out properly.
k. Establishing a working language on board is Indonesian.
l. Communication plays an important role in implementing a safety management system. Safety management guidelines must therefore be built into working language that is easily understood by the crew.

7. In the seventh rank there are 6 technical responses with the same value, namely:
   a. Create a periodic maintenance plan (*PMS*) form according to the condition of the equipment on board.
   b. Inventory critical equipment on board according to criteria that failure could lead to dangerous situations.
   c. Establish procedures for maintenance, testing and repair of critical equipment into PMS.
   d. Conduct periodic training based on the competency dictionary of each position.
   e. Provide an adequate number of internal auditors according to the company's organizational structure and the number of ships owned.
   f. Simplifying reporting mechanisms, including those that can be done digitally, as well as proportionally distributing reporting tasks.
8. In the eighth rank there are 2 technical responses with the same value, namely:
   a. Create a form for reporting nonconformities, accidents and dangerous events along with technical instructions, and socialize the use of the form.
   b. Socialize every time there is a change in procedure.
9. In the ninth rank there are 3 technical responses with the same value, namely:
   a. Pay attention to the operational nature of the vessel in determining the inspection schedule.
   b. Define and create a database of nonconformities, accidents and dangerous events along with anticipatory steps.
   c. Arrange the placement of each internal auditor according to the company's organizational structure.
10. In the tenth rank there are 4 technical responses with the same value, namely:
    a. Establish a competency dictionary for each position within the company.
    b. Establish a dictionary of crew competence referring to STCW 1995 and PP. No. 7 of 2000.
    c. Establish and clearly define the corporate culture.
    d. Create guidelines for internalizing cultural values.
11. Ensure changes in procedures and instructions through a proposed mechanism that is discussed in stages.

At the last stage of prioritized technical response, it is necessary to ensure that changes to procedures or instructions have been through the mechanism of proposals from employees both on land and on ships whose activities will be affected by the change in procedures.

V. CONCLUSION

Based on the analysis, it can be concluded that the results of the evaluation of the application of the ISM Code on crossing vessels in the Lembar – Padangbai and Lembar – Ketapang trajectories are as follows:

1. The implementation rate of the ISM Code is at the level of 4.14 – 4.31 which illustrates that the implementation of elements in the ISM Code is at a good level.
2. Barriers to the implementation of the ISM Code are at levels 2.28 – 3.15. This illustrates that the majority of obstacles are in the category between rarely experienced and sometimes experienced. However, there is one indicator of obstacles that fall into the category often experienced, namely the resistance of company personnel and crew to changes, related to procedures and instructions. These barriers fall into the category of cultural and behavioral factors.
3. There are ten implementation level indicators and five obstacles that require priority of technical response to improvement and become focus areas according to the elements in the ISM Code when conducting safety audits, namely:

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a. Implementation Level

1) The Company has ensured that all personnel involved in the Company's safety management system guidelines have sufficient knowledge of the relevant rules, regulations, codes and guidelines (*ISM Code* Element 6.4).
2) The Company has ensured that inspections are carried out at appropriate intervals, that any nonconformities are reported with possible causes, appropriate corrective actions are taken, and that records of these activities are maintained (ISM Code Element 10.2).
3) The Company has identified critical equipment on board that failure could lead to dangerous situations (ISM Code Element 10.3).
4) The Company has established in its guiding safety management system procedures that ensure that nonconformities, accidents and hazardous circumstances are reported to the Company, investigated and analyzed with the aim of improving safety and pollution prevention (ISM Code Element 9.1).
5) The Company has established and maintained procedures to identify and provide training required by all personnel to support the safety management system (ISM Code Element 6.5).
6) The Company has ensured that all inspection activities are integrated with the operational routine of ship maintenance (ISM Code Element 10.4).
7) The Company has established procedures for the implementation of corrective actions along with necessary measures in case of nonconformities, accidents and dangerous events, to prevent the recurrence of such occurrences (ISM Code Element 9.2)
8) The Company is responsible for and ensures the availability of adequate resources to support the personnel appointed to be able to carry out their duties and functions (ISM Code Element 3.3).
9) The Company has established procedures that crews can receive relevant information related to the safety management system in an understandable language (ISM Code Element 6.6).
10) The Company has ensured that the personnel conducting the audit have independence from the area being audited (ISM Code Element 12.5).

b. Obstacles

1) There is resistance of company personnel and crew to changes, related to procedures and instructions (ISM Code Element 11.2).
2) Too much reporting and documentation (ISM Code Element 11.3)
3) Difficult approach with different cultures (ISM Code Element 6.6)
4) Low motivation of personnel both on land and crew towards safety management (ISM Code Element 6.2).
5) Lack of systematic analysis, corrective action and feedback from management on incident reporting (ISM Code Element 9.1).

Suggestions that can be given in this study are:

1. Shipping companies operating vessels in Indonesia can consider carrying out 22 technical responses to improve the application of the ISM Code produced by this study, because the 14 shipping companies that are respondents in this study generally also operate crossing vessels in other passages in various regions in Indonesia.
2. ISM Code auditors can consider focus areas when conducting safety audits on vessels crossing in Indonesia on elements related to improving implementation and reducing barriers according to the results of this study.

This study has limitations in collecting questionnaires due to tight deadlines, so socialization of the material from the questionnaire has not been carried out optimally. Because most respondents are crossing ship crews with daily work activities that are relatively denser than other ship crews (freighters, oil tankers and others), in the next study it is recommended to make direct visits to each ship and conduct more detailed socialization of the material from the questionnaire, in the hope of obtaining more accurate results.

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