UNIVERSITY OF PIRAEUS

DEPARTMENT OF MARITIME STUDIES

MSc in SHIPPING MANAGEMENT

SAFETY MANAGEMENT IN SHIPPING: THE IMPORTANCE OF EMERGENCY PREPAREDENESS

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Contents

TABLE OF FIGURES

LIST OF ABBREVIATIONS

COLREG - Convention on the International Regulations for Preventing Collisions at Sea

DOC – Document of Compliance

DPA – Designated Person Ashore

EMS - Environmental Management Systems

FSMIS - Flight Safety Management Information System

GT – Gross Tonnage

GUARD - Group Unified Accident Reporting Database

IMO – International Maritime Organization

ISM – International Safety Management

ISPS - International Ship and Port Facility Security

MARPOL – International Convention for the Prevention of Pollution from Ships

MARS - Major Accident Reporting System

NEMA - National Electrical Manufacturers Association

PRISMA - Prevention Recovery Information System for Monitoring and Analysis

PSMIS - Predictive Safety Management Information System

RO – Recognized Organization

SADT – Structured Analysis and Design Technique

SMS – Safety Management System

SOLAS – International Convention of Safety of Life at Sea

STWC - International Convention on Standards of Training, Certification, and Watchkeeping for Seafarers

VRP – Vessel Response Plan

ABSTRACT

The Safety Management System (SMS) is an organized system developed and executed by shipping firms to ensure the safety of both the ship and the maritime environment. It includes engagement from the highest levels of management, policy manual, documentation, methods and protocols for audits, liaison between ships and shore personnel, method for determining areas in which actual practices are not satisfied, and regular management review. Industrial activities are characterized by unexpected occurrences and hazards, but there is no such thing as absolute and unqualified safety. Risk is a measure of the probability and consequence of uncertain future events, while safety is defined as freedom from unacceptable risk. Safety management is the process of bringing certain safety functions into being to ensure safety, which means shielding people, the environment, assets, and infrastructure from dangers that are not acceptable.

Therefore, the purpose of this work is to highlight the importance of the terms safety, safety management systems, emergency preparedness for shipping. Therefore, after studying the subject bibliographically and seeing what the international organizations report, we examine through the next case how these terms can find practice in a ship that is at sea.

Among the most important conclusions is the importance of preparation for the safety of seaworthiness and transport at sea in general.

Key-words: safety management, maritime environment, audits, risk, international organizations

ΠΕΡΙΛΗΨΗ

Το Σύστημα Διαχείρισης Ασφάλειας (SMS) είναι ένα οργανωμένο σύστημα που αναπτύχθηκε και εκτελείται από ναυτιλιακές εταιρείες για τη διασφάλιση της ασφάλειας τόσο του πλοίου όσο και του θαλάσσιου περιβάλλοντος. Περιλαμβάνει δέσμευση από τα υψηλότερα επίπεδα διαχείρισης, εγχειρίδιο πολιτικής, τεκμηρίωση, μεθόδους και πρωτόκολλα για ελέγχους, σύνδεση μεταξύ πλοίων και προσωπικού ξηράς, μέθοδο προσδιορισμού περιοχών στους οποίους δεν ικανοποιούνται οι πραγματικές πρακτικές και τακτική αναθεώρηση της διαχείρισης. Οι βιομηχανικές δραστηριότητες χαρακτηρίζονται από απροσδόκητα περιστατικά και κινδύνους, αλλά δεν υπάρχει απόλυτη και ανεπιφύλακτη ασφάλεια. Ο κίνδυνος είναι ένα μέτρο της πιθανότητας και της συνέπειας αβέβαιων μελλοντικών γεγονότων, ενώ η ασφάλεια ορίζεται ως η ελευθερία από μη αποδεκτό κίνδυνο. Η διαχείριση της ασφάλειας είναι η διαδικασία υλοποίησης ορισμένων λειτουργιών ασφάλειας για τη διασφάλιση της ασφάλειας, που σημαίνει προστασία των ανθρώπων, του περιβάλλοντος, των περιουσιακών στοιχείων και της υποδομής από κινδύνους που δεν είναι αποδεκτοί.

Ως εκ τούτου, σκοπός αυτής της εργασίας είναι να αναδείξει τη σημασία των όρων ασφάλεια, συστήματα διαχείρισης ασφάλειας, ετοιμότητα έκτακτης ανάγκης για τη ναυτιλία. Επομένως, αφού μελετήσουμε το θέμα βιβλιογραφικά και δούμε τι αναφέρουν οι διεθνείς οργανισμοί, εξετάζουμε πώς αυτοί οι όροι μπορούν να βρουν πρακτική σε ένα πλοίο που βρίσκεται στη θάλασσα.

Μεταξύ των σημαντικότερων συμπερασμάτων είναι η σημασία της προετοιμασίας για την ασφάλεια της αξιοπλοΐας και της μεταφοράς στη θάλασσα γενικότερα.

Λέξεις-κλειδιά: διαχείριση ασφάλειας, θαλάσσιο περιβάλλον, έλεγχοι, κίνδυνος, διεθνείς οργανισμοί

INTRODUCTION

When it comes to preventing injuries on the job, especially when it's aboard, one definition of "occupational safety" is "the reduction of risk to as low as is reasonably practicable" . This is what a safety management system (SMS) is all about. Risks may be mitigated and their effectiveness monitored with the use of an SMS, which gives a methodical approach to doing so. What is meant by the term "SMS"? It is stated in the literature that this is the case that ...a pragmatic method of ensuring security. It's a methodical, detailed, and all-encompassing strategy for controlling potential dangers. Goals, plans, and metrics to evaluate progress are all features of every good management system, and safety management is no exception. Integral to every successful business is a comprehensive safety management system. It permeates the manner of life and the work itself.

A company must implement a safety management system due to ethical, regulatory, and economical considerations. Employers have a moral duty to ensure the safety of their employees and the workplace, and there are clear legal requirements in every country for doing so. Furthermore, there is a large body of evidence showing that good safety management can cut down on a company's liability and save it money.

Marine safety is concerned with the control of shipping, the security of ports, the protection of seafarers, the provision of search and rescue, and the preservation of the marine environment.

To ensure the safety of ships, it is essential to develop cutting-edge solutions and implement technology in a cost-effective manner.

In today's world, maritime security is a topic of concern on a worldwide scale. As a result of the numerous instances that have taken place in recent years, we know that if maritime security is compromised, severe dangers might emerge. Many observers find that the idea of maritime security is rather expansive and, at times, difficult to grasp completely.

For this reason, in recent years, organizations and related agencies with the maritime sector have been focusing on issues related to safety, safety management systems, emergency preparedness. Such issues are also the main object of investigation of this work

Research aim

Through this work we aspire to highlight the importance of safety at sea and the ways in which the international maritime community tries to ensure it. Special reference is made to the safety management system and its quality assurance. In particular, there is talk about the standards that are followed. The work specializes in examples of cases that have been adopted by a well-known company in order to understand what is analyzed in theory.

Chapter 1: The importance of safety in shipping

1.1 Definition of safety

One of the most important things that the shipping sector has to focus on is maritime safety. Marine accidents are caused by a chain of events that take place in a region where each of the components that influence these conditions might, at any given instant, alter its original state and convert into another state that may or may not be foreseeable. These conditions can range from highly predictable to very unpredictable. A danger is an event that may be anticipated, but only to a limited degree; in contrast, a hazard is a condition that will cause immediate suffering. It is essential to keep in mind that risk always refers to the chance of anything going wrong, and that all a person can do is make an assessment of how likely that possibility is. Accidents at sea are the primary source of risk in the shipping industry. According to Kopacz et al. (2001), accidents at sea may be categorized as follows, based on what caused them:

• mishaps brought forth by carelessness on the part of humans

• mishaps that were brought about on purpose by man

• accidents due to technological problems

• mishaps that occur as a result of adverse weather (including but not limited to wind, waves, and lightning)

In the context of the safety of maritime traffic, a system or a component thereof may be judged to be likely to operate correctly within defined limitations if it is operating within those limits. As a result, the purpose is to lessen or get rid of the sources of unfavorable occurrences that jeopardize the safety of navigation in order to get to the point where marine transportation is completely reliable. In a larger sense, marine transport security may be described as a collection of measures taken to protect human life, but it can also be defined as a set of measures taken to protect physical and intangible assets that are directly or indirectly tied to maritime transport. marine transport security is an umbrella term that encompasses both of these meanings. According to Kopacz et al. (2001), the safety of marine transportation is affected by a wide variety of elements, some of which include shippers, ports and port authorities, coastal nations, the international community, etc.

In its most restricted definition, "safety at sea" refers to the precautions that have been taken to ensure that the transportation of products by water does not have negative effects on human life, cargo, ships, or the environment. In order to reach an acceptable level of safety, there has to be a security system in place at the worldwide level. This system must be able to take the proper and necessary precautions, as well as monitor the execution of these precautions via a variety of channels and institutions, in order to achieve the desired degree of safety. According to Kopacz et al. (2001), the marine safety system that is in place at sea may be broken down into the following components:

• entities that are responsible for the establishment of legal norms (such as international conferences, the International Maritime Organization (IMO) and its institutions, etc.);

• entities entrusted for the implementation and monitoring of safety measures and standards worldwide maritime agreements and other legal instruments connected to safety at sea and users at sea.

1.2. Marine Casualty and Seaworthiness

Because ships operate in a particularly hazardous and ever-changing environment (such as severe weather conditions, tides, currents, and piracy, among other things), the shipping sector as a whole has to be distinguished by stringent quality, safety, and dependability standards. This is especially important in light of the fact that shipping is a worldwide enterprise. In addition, commercial ships are vulnerable to a variety of other dangers, in addition to those provided by natural phenomena. These dangers include the possibility of human mistake on the part of the ships' operators, as well as mechanical failures, damages, and so on. Each one of them, or a combination of them, may lead to significant accidents at sea, which can result in the loss of human lives and economic resources, in addition to producing severe pollution in the ocean and along the shore. This suggests that the dependability of shipping firms and the high quality of the services they provide should be centered on addressing and guarding against the danger of maritime accidents, giving special attention to the preservation of maritime safety and the environment. To far, a number of extremely significant steps have been made in this endeavour; nevertheless, significantly more work has to be done since shipping is an essential component of the international economic system, and the requirements placed on it are always growing (Shappell and Wiegmann, 1997).

The word "marine casualty" refers to any disaster at sea that results in monetary loss, loss of life and/or property, or loss of both. In general, the term covers all maritime mishaps. Because of this, one could define a maritime accident as any event that takes place on a ship and has the potential to result in the total or partial loss of the ship, the loss of cargo, the death or serious injury of crew members or passengers, and the causing of ecological impacts through the leakage of primarily oil derivatives into the sea. There are many and often convoluted factors that might lead to accidents at sea. According to Shappell and Wiegmann (1997), it is important to point out that increasing the size of ships, with the intention of hence decreasing the cost of moving products and people via the creation of economies of scale, is associated with an increase in the severity of the adverse effects that may result from an accident.

According to Shappell and Wiegmann (1997), the following are the most significant contributing factors that contribute to a marine accident:

• Natural reasons, such as high winds and storms, decreased visibility (due to fog or rain), tidal waves and currents, and other natural occurrences.

• Faults in the ship's machinery, which may be the result of inadequate maintenance, damage to the ship's engines or steering system, corrosion on the ship's reefs, and other such issues.

• Dangers associated with the ocean, such as a growth in the volume of shipping activity, particularly in narrow sea passages; the presence of lands and reefs that have only been partially documented; shipwrecks caused by inaccurate maps; inadequate upkeep of the fishing network and the marking system by coastal nations; etc.

• Causes that are tied to the ship itself, such as its size, which can make it difficult to operate the vessel in confined spaces like tiny ports or straits.

• Human error, which is also the most significant reason and has its roots both in the absence of the requisite training and experience of the crews as well as in the lack of knowledge or indifference to safety procedures and regulations. Human error has its roots both in the lack of required training and experience as well as in the lack of knowledge or indifference to safety procedures and rules. According to the findings of a study that was conducted by D. Kokotos on the accidents that occurred on ships flying the Greek flag over the time period of 1995 to 2011, it was discovered that over fifty percent of accidents were the result of human error.

• Causes that are associated with the conveyed cargo, such as hazardous chemicals, fuel, or radioactive materials; moreover, causes that are associated with the instability that the cargo itself might produce, whether it is stowed below deck or atop it.

• An accident might have been caused by any combination of the factors listed above. Therefore, in order for a vessel to be regarded as being of high quality, it must fulfill a fundamental requirement known as seaworthiness.

A ship needs to have the following qualities in order to be considered seaworthy: it needs to be technologically equipped (with all of the necessary and as modern as possible devices and machines to assist its mission, such as radar, navigation systems, fire safety systems, etc.), it needs to comply with all of the mandatory international safety regulations (ISM Code, SOLAS, etc.), it needs to be properly maintained, and it needs to have qualified crew members with the support of its employer-shipowner. Of course, quality should not be confined to the ship alone but should also be applied to the business as a whole. If the ship's seaworthiness and, by extension, its quality are not managed and maintained by the managing business onshore using an effective safe management system, then even a cutting-edge ship that is fully stocked with modern amenities might pose a threat to its crew and passengers. In addition to the potential for causing an accident, the repercussions of an unseaworthy ship might include the loss of confidence of the shipowner or management business as well as harm to the reputation of either party. In addition, they may occur with gross financial compensations from insurance and ship-owning firms to pay for environmental damage, injury or death, destruction of products, and repairs (Shappell and Wiegmann, 1997). These compensations may be used to make up for the cost of repairs.

There are many different kinds of maritime accidents, and depending on how severe they are, the aftermath may range from relatively modest damage and casualties to the complete sinking of a ship along with all of its people aboard. According to Schroder-Hinrichs et al. (2011), the following are the most significant marine accidents:

• The explosion

• The fire

• The oil spill

• The immersion

• The collision between ships

• The stranding on the seabed owing to faulty navigation

• The fire

• The oil spill

• The immersion

The damage or death that may be caused as a consequence of any of the aforementioned incidents, but also as a result of the crew's carelessness or lack of adequate training while they are doing their duties. According to Schroder-Hinrichs et al. (2011), the repercussions of a marine catastrophe may be broken down into four primary categories:

1. Contamination that occurred as a result of an oil leak is included in the first category. Oil may be delivered either as a commodity or as a fuel. No matter how small the oil spill is, it will have serious ecological and financial effects, including the costs of cleaning and restoring the marine environment, compensations for affected coastal areas, court costs, legal penalties and fines, and a loss of the company's reputation and credibility. These effects will occur regardless of the size of the spill.

2. The second category is the deterioration or destruction of property. Marine mishaps sometimes result in the ruined or lost of valuable goods and apparatus.

There is a spectrum of severity in the damage that may be inflicted on a ship and the cargo it carries when it is involved in a collision with another vessel, a grounding, a fire, or an explosion.

3. Accidents that result in bodily harm or death fall under the third category. In addition to the psychological toll, the physical harm and potential loss of life that result from a maritime catastrophe may also have a significant financial effect owing to the need for compensation (this is particularly true if the victims were passengers).

The lack of dependability that might occur when a shipping firm does not have a quality and safety policy in place is the subject of the fourth category. This lack of credibility is highly essential because it prevents the firm from competing successfully with its rivals in terms of its capacity to recruit consumers. In addition to this, the company is unable to readily insure its vessels or have access to the essential finance sources for investments and continued development.

1.3. The International Maritime Organization (IMO)

The maritime industry is obligated to put in place a policy that is founded on conventions, regulations, and standards designed to maintain the integrity of shipping services while also protecting the safety of ships. Given that shipping is a worldwide sector, the above should all have an international flavor; more specifically, the regulations should be applicable to all shipping firms and the ships they operate, irrespective of the country to which the companies and ships belong. The International Maritime body (IMO-International Maritime Organization) (IMO, 2006) is the most significant body that has an effect on all aspects of global shipping due to its policies, activities, rules, and regulations (IMO-International Maritime Organization). This includes nations, shipowners, charterers, classification organizations, and insurance firms.

According to the research conducted, beginning in the middle of the 19th century, a number of treaties governing international shipping were established. As an example, in 1963, an agreement that was signed by 30 governments specified standard maritime norms for ships encountering each other out at sea in order to prevent accident. However, the terrible sinking of the Titanic in 1912 sparked an urgent demand for the establishment of international regulations to control safety in the maritime industry. This resulted in the creation of the first international safety treaty, which was given the name "Solas for the Safety of Life at Sea." The International Maritime Organization (IMO) later updated and reaffirmed the treaty, and it is still in effect to this day. The SOLAS treaty (of which the ISM code was originally a part) regulates critical concerns such as the design, structure, equipment, stability, fire protection, and loading of a ship along with many other vital problems connected to the ship's safety (IMO, 2006).

On March 17, 1948, in Geneva, under the supervision of the United Nations, the International Maritime Organization was created; its first meeting was held in 1959. The International Maritime Organization (IMO) is a specialized organization of the United Nations that serves as a worldwide authority in defining standards for the environmental performance and safety of international shipping. It is primarily responsible for developing the regulatory framework for the shipping industry in such a way that it is just and effective, as well as globally recognised and applied (IMO, 2006). The International Maritime Organization (IMO) now has 171 member nations and maintains its headquarters in London. According to IMO (2006), the most significant treaties of the organization, which play a catalytic role in decreasing accidents and restricting pollution of the maritime environment, are as follows:

• In 1972, the International Convention for the Prevention of Collisions at Sea was established. This convention is also known as the Convention on the International Regulations for Preventing Collisions at Sea (COLREG).

• In 1973, the International Convention for the Prevention of Pollution from Ships (MARPOL - International Convention for the Prevention of Pollution from Ships) was established. In 1978, the convention was revised.

• The International Convention for the Safety of Life at Sea (also known as SOLAS or the International Convention for the Safety of Life at Sea), which was first ratified in 1914 and later revised in 1974.

• In 1978, the International Convention on Standards of Training, Certification, and Watchkeeping for Seafarers (STWC- International Convention on Standards of Training, Certification, and Watchkeeping for Seafarers), which was subsequently revised in 1995 and again in 2010, was adopted.

• In 1993, the International Maritime Organization published the International Ship Safety Code (also known as the International Safety Management Code), which was later revised in 2000, 2004, 2005, 2008, and 2013.

Following a series of extremely significant maritime mishaps, the circumstances described above began to develop.

1.4. The ISM Code

The International Maritime Organization (IMO) has established the International Safety Management Code (ISM Code) as the standard for the safe management and operation of ships when they are at sea. The aim behind the creation of the ISM Code

- To protect people, property, and the environment when at sea, as well as to guarantee that everyone stays safe.

In order to ensure that the vessel is operating in accordance with the ISM Code, the company that is running the vessel must first be audited (after they have submitted their Safety Management System Manual (SMS) and it has been authorized by the Flag Administration or a Recognized Organization) (RO). After an inspection of the company, the Document of Compliance (DOC) will be sent to the business (validity 5 years). Audits are performed on each and every company on an annual basis (three months before and after anniversary date and before DOC expiration date). Immediately after the issuance of a DOC to the Business (or the Management Company), an audit of each vessel to verify ISM Code compliance is possible. Each vessel will be given a Safety Management Certificate (SMC) with a validity of 5 years, and this certificate will be subject to verification of compliance with the ISM Code between the second and third years of its validity.

The following constituent parts are included in the Safety Management System Manual:

• A commitment from the highest levels of management

• A policy handbook of the highest caliber

• A handbook of procedures that details all of the actions that are taken on board the ship, both during regular operations and in the event of an emergency.

• Methods for ensuring that the ship is adhering to the standards outlined in the procedures handbook, including both internal and external auditing methods

• A designated person ashore (DPA) to act as the interface between the vessel and the shore employees and to check the execution of the Safety Management System

• A system for detecting areas in which actual practices deviate from those that are described and for putting accompanying remedial action into place

• Regular management reviews

In addition, the ship's maintenance is required to be performed in accordance with the terms of all applicable laws and regulations, as well as any extra requirements that the firm may impose from time to time. The comments from the ship, as well as the auditor and/or audit body, are integrated into the SMS by each relevant department.

All commercial vessels with a gross tonnage of more than 500 are subject to the standards of the ISM Code. SOLAS includes the ISM Code as a chapter in its book. If SOLAS is not applicable, then ISM does not have to be followed. Compliance with the ISM Code may at times be demanded by the vessel customer regardless of the Gross Tonnage of the vessel (GT).

The International Maritime Organization (IMO) and others, including Capt. Graham Botterill of Ferriby Marine, who serves as a Specialist Adviser to the House of Lords in the United Kingdom on ship safety, were responsible for the creation of the ISM Code.

1.5 Safety and quality protocols in shipping companies.

The safety and quality manual management system is an advanced system that is planned and implemented by shipping companies to ensure the safety of the ship and the quality of the ship and vessel in the marine environment. The goal of the system is to reduce the risk of accidents and improve the overall quality of the ship and vessel. The International safety management (ISM) code outlines all of the essential policies, practices, and procedures that need to be adhered to in order to guarantee the safety of ships in the maritime environment. Safety and quality management is an essential component of the code, and it is one of the most important aspects of the code.

The safety and quality manual ensures that all vessels comply with the mandatory safety rules and regulations, as well as the codes, guidelines, and standards established by the IMO, classification societies, and other maritime organizations. What exactly are the contents of the safety and quality manuals?

For the sake of the ship's overall safety, it is necessary for each and every safety and quality manual to fulfill a number of the ship's fundamental functional requirements:

- Guidelines and procedures for acting in response to unexpected or urgent circumstances

For example, imagine a cargo ship en route to deliver essential supplies to a remote island community when it suddenly encounters a severe storm. The crew is faced with unexpected high winds and rough seas, putting both the ship and its valuable cargo at risk. In this urgent circumstance, having clear guidelines and procedures in place can mean the difference between safely navigating through the storm or succumbing to its destructive force.

- Policy with regards to the preservation of the environment and public safety. One example of a policy related to the preservation of the environment and public safety in the sea is the establishment of marine protected areas. These areas are designated to conserve and protect marine ecosystems, including coral reefs, seagrass meadows, and endangered species habitats, while also ensuring safe and sustainable recreational activities such as diving and boating.

- Standard operating procedures and guidelines for the reporting of accidents and other types of non-conformities. For example, a detailed example of standard operating procedures and guidelines for reporting accidents in the sea could include instructions on immediately notifying the Coast Guard or relevant authorities, documenting the incident with photographs or videos, collecting witness statements, and conducting a thorough investigation to determine the cause and prevent future occurrences. Additionally, the guidelines might outline specific reporting formats and timelines for submitting incident reports to ensure efficient communication and prompt response from regulatory agencies.

- Access to information that is unambiguous on the degrees of authority and communication channels held by ship crew members, as well as those held by workers on land and those on board ships, is crucial for effective coordination and decision-making. For instance, during a maritime emergency, a clear understanding of the authority levels and communication channels can prevent confusion and ensure timely response. In such a scenario, having access to explicit information about who has the final say in initiating evacuation procedures or communicating distress signals can save lives and facilitate efficient collaboration between ship crew members and land-based workers.

- standards and processes designed to ensure that a ship's safety and the conservation of its environment are maintained in conformity with applicable international and flag state legislation.
- Auditing and evaluation processes carried out internally by management. For example, a company's management team may conduct internal auditing and evaluation processes to ensure compliance with financial regulations and identify any potential fraudulent activities within the organization. They may review financial statements, assess internal controls, and examine transaction records to detect any discrepancies or irregularities. Additionally, management may evaluate the effectiveness of operational processes and procedures to identify areas for improvement and make informed decisions regarding resource allocation and strategic planning.
- Specifics about the vessel. For example, a shipping company may conduct internal audits to evaluate their operational efficiency and compliance with industry regulations. They could review their vessel maintenance records, crew training programs, and safety protocols to identify any areas that require improvement. Additionally, they may evaluate the ship's specifications such as its size, cargo capacity, and fuel efficiency to assess its suitability for specific trade routes or customer requirements.

A safety and quality management system would describe, in a nutshell, how a vessel runs on a daily basis, what procedures to follow in the case of an emergency, how drills and training are carried out, what safety measures are taken, who is the designated person, and so on and so forth. The primary person accountable for the safety management plan is either the owner of the vessel, the designated person, or the person nominated by the owner. On the other hand, the captain and the crew of the ship are the kinds of people who are ideal candidates to transmit the safety and quality manuals. This is because they are intimately familiar with the ship. In what aspects should the safety and quality management system be comprised? For example, the safety and quality manual has been broken up into parts for the sake of making reference more convenient:

- **General:** The Company provides management services to ship owners for vessels operating world wide. Presently manages and operates a fleet of Oil Tankers and LPG

Carriers. The management consists of a team of experienced and professional ship managers with either sea going experience or long service in the shipping industry.

- **Policies regarding health and the environment:** To be a world leader in shipping services by maintaining trustworthy relationships with our customers, employees and partners yielding safe, environmental excellence and best returns for shipping society and the environment.
- **Individual to be designated:**

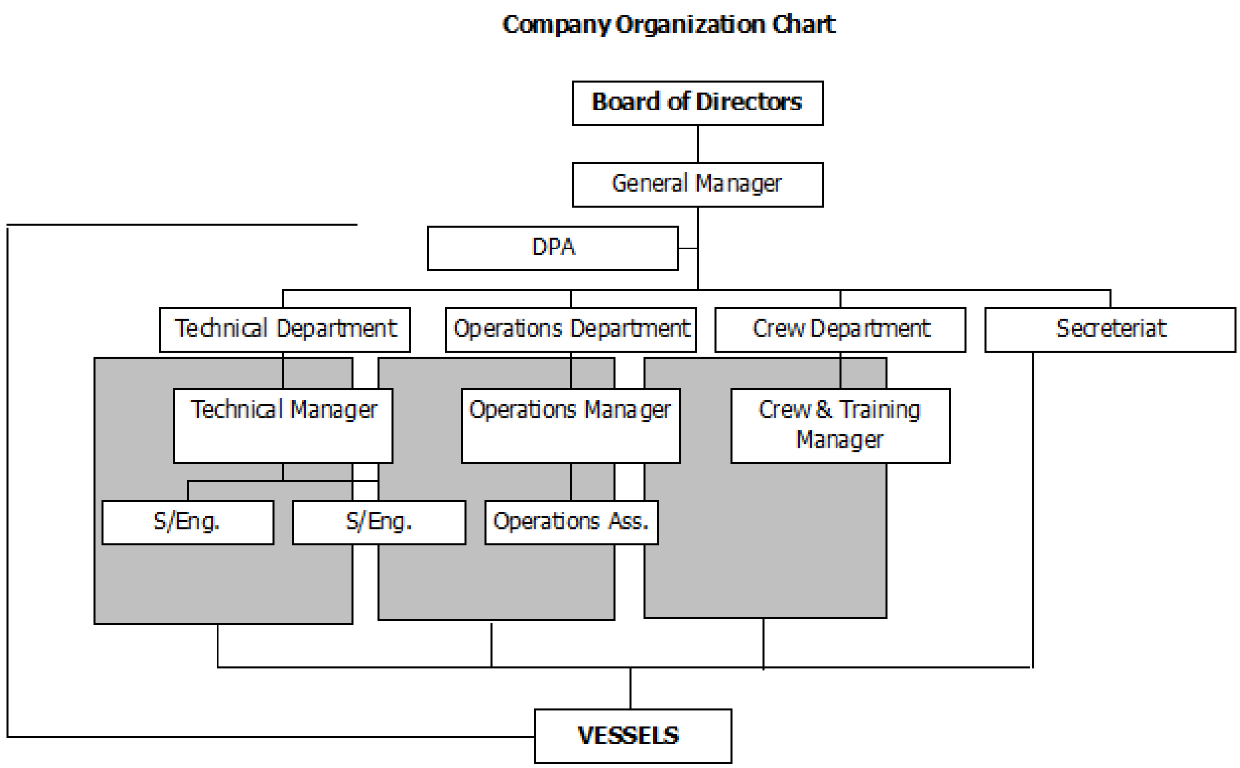

Figure 1: *Company Organization Chart*

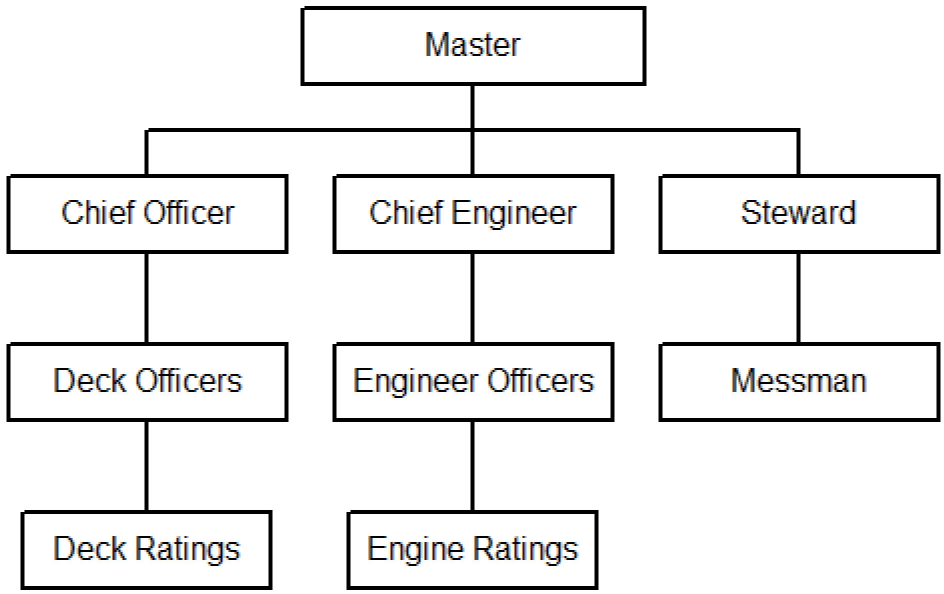

Figure 2: *Organization Chart - Vessel*

- **The available assets and personnel:** The Company ensures that all the personnel , both ashore and onboard , involved in the company's SMS are qualified, competent and conversant with SMS with respect to their position and duties. All persons involved in the implementation of SMS have good understanding of relevant rules, regulations, codes and guidelines and they can effectively communicate with each other.
- **The tasks and the authority of the master:** Ship's Masters have the overriding authority and the responsibility to make decisions with respect to safety and pollution prevention and to request the company's assistance as may be necessary."
- **The responsibilities and authorities of the company:** The Company has defined and documented the responsibility, authority and interrelationships of all personnel who manage, perform and verify work relating to and affecting safety and pollution prevention.
- **Standard operating procedures:** This procedure is established to ensure that non-conformities (NCR's) , accidents and hazardous occurrences (H.O.) are reported to the Company, investigated and analyzed with the objective of safety and pollution prevention and to ensure the implementation of corrective actions.

- **What to do in an emergency:** Regarding an emergency, the company should identified potential emergency shipboard situations, and establish procedures to respond to them. This procedure is established to ensure that at all times the organization can respond effectively to hazardous situations, accidents or emergencies involving its ship or the environment.
- **Notification of accidents and incidents:**

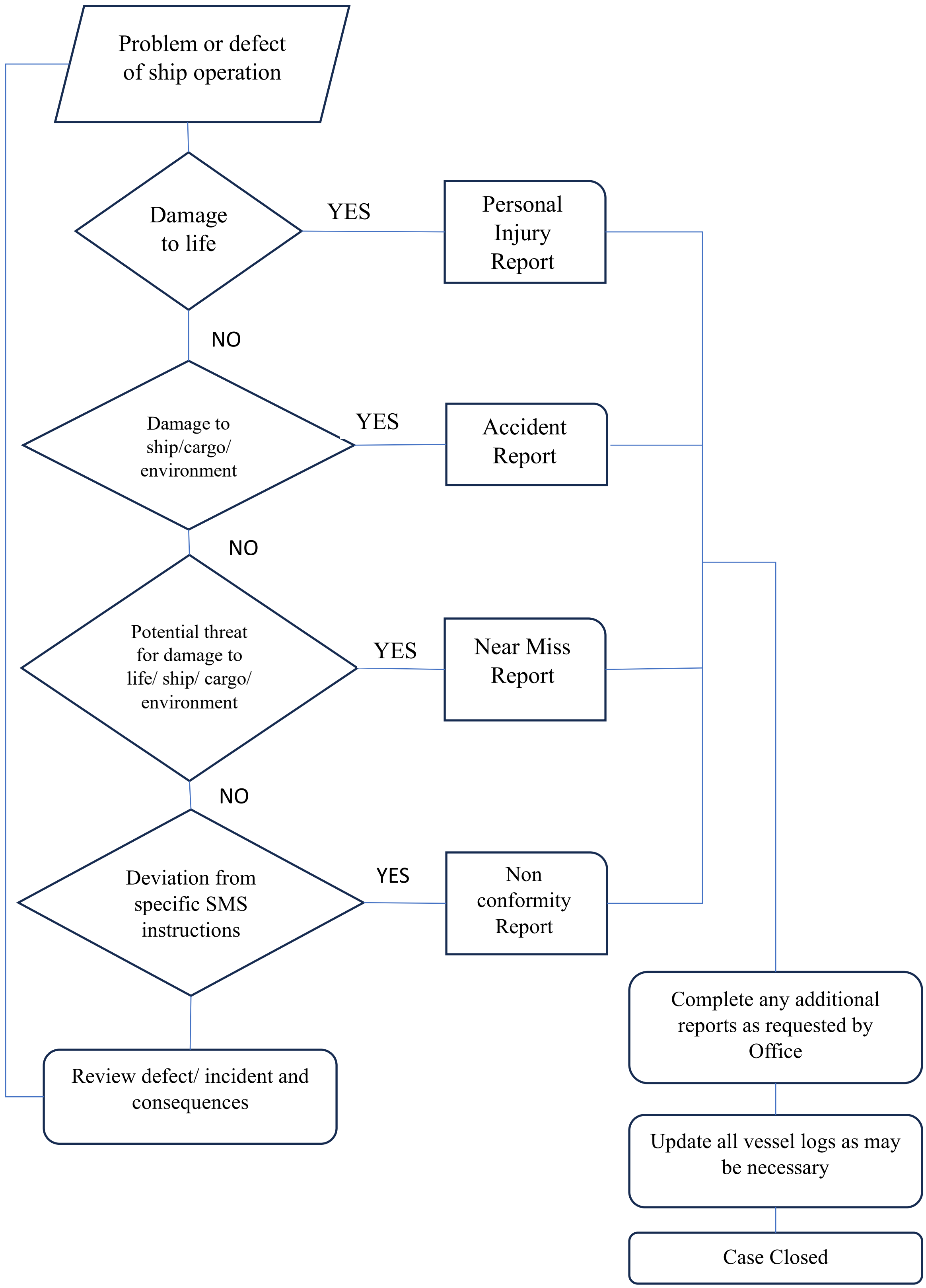

Figure 3: *Non Conformities, Accidents and Near Misses flowchart*

- **Keeping up with the upkeep and records:** The prescribed record books and logs should always be kept updated and in an official manner and they should be presented in every inspection from Port Authorities, P&I Surveyors and/or any person authorized by the Company. Vessels may keep the Record Books as convenient for them, but care should be taken that all the above records should be included in the ship's system of record keeping.
- **Documentation:** Documents relevant to the Safety management System are prepared, reviewed and approved by the competent persons of the shore management. All the documents relevant to the company's SMS are controlled through a formal and defined system. All documents to and from the ship shall be accompanied by the acknowledgement of receipt where the recipient shall sign and send back a copy to the sender. This procedure is established to meet the ISM requirement for documentation, viz,

- Documents consisting the company's Safety Management System are properly prepared, reviewed, approved, issued, and controlled
- Valid documents are available at all relevant locations.
- Obsolete documents are properly removed.
- Each ship carries onboard all documentation relevant to the ship.

These are the most important aspects of the fundamental safety and quality manual; the approach, on the other hand, may be different depending on the kind of vessel and the cargo that it delivers. The implementation of the ISM code on board ships is significantly aided by the safety and quality manual's contributions.

Chapter 2: SMS in shipping

2.1 Safety Management System

For a safety management system to be considered compliant with the International Safety Management Code (ISM Code), which serves as an international standard for the safe management and operation of ships while they are at sea, the system must meet these requirements. The International Safety Management (ISM Code) outlines all of the essential rules, practices, and procedures that must be adhered to in order to run a ship while it is at sea. In order to achieve ISM Code compliance, the Safety Management System (SMS) Manual must be authorized. The Safety Management System (SMS) is an organized system that is developed and executed by shipping firms to assure the safety of both the ship and the maritime environment. The SMS is comprised of the following components:

- Engagement from the highest levels of management
- Policy manual
- Documentation including procedures for both routine operations and for use in times of emergency
- Methods and protocols for carrying out both internal and external audits
- Person onshore who is designated to act as the liaison between the ships and the shore personnel.
- Method for determining the areas in which actual practices are not satisfied
- Regular management review

Because it is such a broad and nebulous notion, "safety" is often discussed in terms of a specific condition or circumstance. Within the framework of industrial activities, this condition of freedom is characterized by the occurrence of unexpected occurrences and hazards. However, there is no such thing as a scenario with zero risks, sometimes known as absolute and unqualified safety. Even if a certain amount of time passes with no reports of accidents or injuries at one of today's businesses, this does not always signify that the business is risk-free. Because "risk is a measure of the probability and consequence of uncertain future events; it is the chance of an undesirable outcome" (Yoe, 2011, p. 1), but "safety" is defined as "freedom from unacceptable risk" (NEN, 2005, p. 13) in accordance with IEC 61508, risk is "a measure of the probability and consequence of uncertain future events" (Yoe, 2011, p. 1). As a result, we are able to draw the conclusion that the level of risk that an industry is willing to take determines how safe it is.

In each given scenario, the overarching concept of safety may be broken down into three distinct categories: safety for people, safety for the environment, and safety for equipment (Dezfuli et al., 2011a, 2011b).

2.1.1. The meaning of the term "safety management"

After the first workmen's compensation statute was passed in 1908, which stated that 'in effect, that regardless of fault, management would pay for injuries happening on the job' (Petersen, 1978, p. 11), safety gradually became an issue that was the responsibility of management. According to DNV (2012), page 2, "safety management" refers to the notion of "the MANAGEMENT [capitalization in original] of safety and uses the same concepts, principles, and techniques as used in other areas of management." When compared to safety management, the term "safety" refers to a condition or state, while "safety management" describes a process or a sequence of specified operations. In addition, safety refers to the absence of undesirable outcomes, whereas safety management refers to the process of bringing certain safety functions into being. In this particular setting, the purpose of management of safety is to ensure safety, which means shielding people, the environment, assets, and infrastructure from dangers that are not acceptable.

A thorough effort is required to manage safety, and an organization will need to develop safety requirements (Strutt et al., 2006), create a safety management structure and process, and select which actions will need to be carried out in order to meet pre-defined safety standards. According to Harms-Ringdahl (2004), management often creates a safety management system by consolidating the management process and activities into a single structure. This results in the system being more efficient. But how exactly can a methodical and scientific approach to the design of safety management operations be taken?

Methods (Leveson, 2011; Petersen, 2003), strategies (Dhillon, 2010; Petersen, 2001; Wu et al., 2010), and models (Gower-Jones and van der Graf, 1998; Hale et al., 1997) should be used in order to accomplish this goal.

2.1.2. The meaning of the phrase "safety management system"

Since 1973, when Kysor published his seminal work on the subject, "The Safety Management System," the field of safety research has been progressively shifting its focus toward the safety management system. It is usual practice to describe an SMS as the management processes, components, and activities that an organization engages in with the intention of enhancing the safety performance of the organization itself. According to Thomas (2011), on page 3, "Modern SMSs could be defined as an arbitrary collection of activities that were deemed necessary actions to discharge responsibilities under the new age of the delegated responsibility of self-regulation." According to Heinrich et al.'s definition from 1980 on page 4, "safety management" refers to "a systematic control of worker performance, machine performance, and the physical environment." The safety management system organizes and combines all of the safety management operations in a logical fashion so that the systematic control may be structured as desired. A short message service (SMS) is a highly useful idea that is used across many different fields.

In addition to safety, management, and system, an SMS is characterized by a number of other essential concepts, including activity, approach, control, operation, process, and procedure. Even though these definitions are presented in a variety of settings, they are representative of the overarching meaning of an SMS and the user community's consensus on what it means.

2.1.3. The idea of a risk management and mitigation system

The structure of a risk management system may be thought of as a rough representation of a safety management system (SMS), but in reality, it is just a portion of a full SMS. Safety management centers on the management of risk. According to Greenwood and Spadt (2004), a risk management system should have a policy, a risk data system, and a risk system for assessing and evaluating risks. These three components should work together. Risk is not only related to the subject of safety, but also to the field of economics, specifically the subject of financial risk. On the other hand, the fundamentals are the same for all different kinds of risk management systems (ISO, 2009). This indicates that the items that are subject to risk management may extend well beyond the purview of safety risks. A risk management system is not the same thing as a safety management system, however the two are related. Despite the fact that some people consider a safety management system to be a phase of risk management (Demichela et al., 2004), there are numerous instances of SMSs in which a (safety) risk management system is an essential component. These examples may be found in both public and private sectors. The International Civil Aviation Organization (ICAO) and the Federal Aviation Administration (FAA) have both recommended that safety management systems (SMSs) include safety risk management as an essential component. One of the two major components that make up Hale's SMS is a risk control system (2005). Hale's SMS also comprises an incident reporting system. Although there are many other SMS frameworks that do not have a risk management system as an actual component, they do detect, analyze, and control risks, which is also a technique to manage risk. This is because these other SMS frameworks have a risk management system as an actual component.

2.1.4. The idea of a command and control system

Control systems provide functions that are similar to those of an SMS. According to Anthony's definition from 1980, Management Control Systems (MCSs) are the procedures that managers use to guarantee that resources are collected and utilized in an organization in a way that is both effective and efficient in the pursuit of the organization's goals. This idea originates from the field of systems engineering, which proposes that an input may be transformed into an output by the application of control. Identification and evaluation of risks are at the heart of a risk control system, which works in a manner similar to that of a risk management system (You, 2003). According to Zizzamia (1999), on page 1, "A loss control system for an insurance classification plan has a policy holder database, a predictive apparatus, and a derived actual loss ratio generator." While working in the insurance industry, Bird created a loss control system as well as a concept for loss control management. According to Bird (1974) and Bird and Loftus (1976), on page iii, loss control management "provides ideas, tools, and inspiration to help keep personal injuries, with the resulting human suffering and severe economic losses, to a minimum." Control loops are also included in a number of more current models, such as Leveson's STAMP control loop for operational processes (2004) and the SADT approach that Hale utilized for his SMS framework (1997); to name just two examples. It is common practice to refer to a certain engineering or management system at a workplace as a risk control system when such a system requires control in order to accomplish a predetermined degree of dependability or safety. A management system for an organization should place a significant emphasis on control, with particular attention paid to dangers, risks, and safety operations.

2.2. Safety and Quality Management System

The main purpose of a safety management system is control. As discussed, the control of loss, accidents, hazards and risks is central to safety management (research), so the question arises as to what exactly SMSs have to control and by which means they perform this control function.

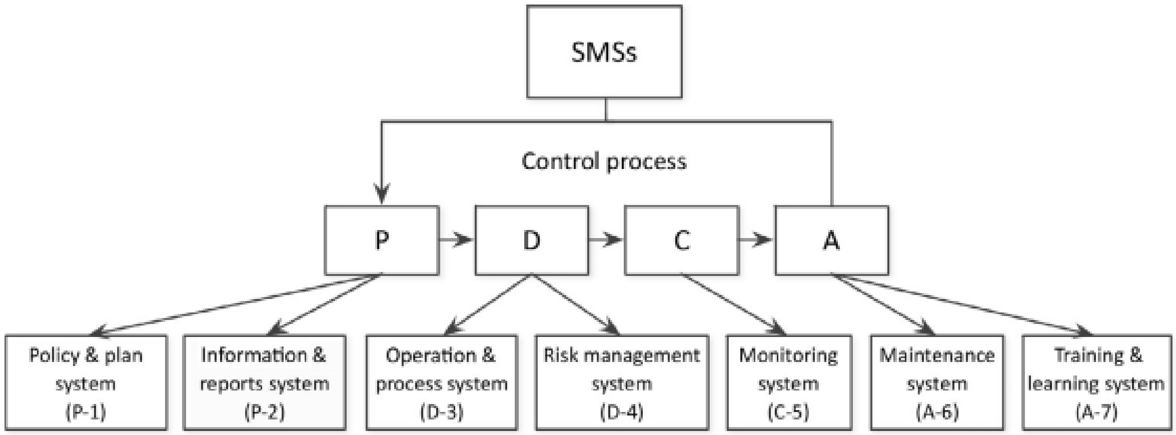

Figure 4: *Safety management systems from a control perspective (Y. Li, F.W. Guldenmund, Safety Science 103 (2018) 94–123)*

The Fig. 4 illustrates the PDCA (Plan-Do-Check-Act) control process of an SMS and also gives its seven generic sub-systems. A PDCA-cycle is the most common feature of most safety management systems. Originally, the PDCA cycle was proposed by Deming in the 1950s.

Since that time, it has "evolved into an improvement cycle and a management tool" (Moen and Norman, 2006, page 7) and is currently used by a large number of people. The PDCA cycle is used in this context not only by the management system but also by its seven subsystems in order to carry out their tasks and continually enhance them.

System of policies and plans (P-1): a safety policy is an organizational strategy, and a plan is the SMS's operational playbook. Even if having a policy and strategy in place does not ensure that there will not be any accidents or incidents at the organization, it does demonstrate the organization's readiness and attitude toward participating in safety initiatives. Because safety is always a byproduct of a project plan or because safety planning is a stage in a management system, there are very few models that define the safety plan as a distinct sub-system. The function of safety planning and controlling defines the processes involved in safety planning and safety control, as well as the connection between the two. According to Saurin et al. (2008), it takes preventative measures when it comes to assessing and monitoring safety performance. To put it another way, if the goal is to have a safe policy, then safety planning is the manner that it should be accomplished.

Information and reporting system (P-2): the information system is supported by a complete analysis capacity. This capability makes use of mathematical or statistical analysis tools in order to find important links between the data and any dangers in the system (Stewart et al., 2009). The reporting system is dependent on the information system, and it differs from organization to organization according to the many goals and indicators that are being tracked. Some information and reporting systems are based on accident causation models such as TRIPOD. One example of this is the "information flow model," which specifies the order of sensing, perceiving, deciding, and acting (Saari, 1984). Some of these technologies were developed expressly to provide assistance to auditing procedures for safety management. For instance, information obtained from GUARD (Group Unified Accident Reporting Database), which may be used to enhance the auditing system (Koene and Waterfall, 1992, 1994). Other examples include the Major Accident Reporting System of the European Commission (MARS), the Predictive Safety Management Information System (PSMIS), the Flight Safety Management Information System (FSMIS), and many more. These are all huge data systems that are used for the management of safety in international or industrial settings. The vast majority of information and reporting systems essentially provide safety management systems (SMSs) with data from the past to enable the SMS to construct scenarios and evaluate risks.

The operating procedure is a component of a process safety management (PSM) framework (Shimada and Kitajima, 2010). This is due to the fact that process activities are also the constituent components of major business operations. Research into this function may be broken down into one of these two categories: operations or processes. In point of fact, PSM is a comprehensive system that incorporates all aspects and functions of an SMS into its constituent parts. One example of this is chemical process safety management. Within the context of the process framework (96/82/EC), PSM offers ways for successfully resolving potentially hazardous situations and preventing accidents. The actual process activities, procedures, and operational performance of safety countermeasures are the primary areas of attention for the operation and process system in order to achieve the goal of safety control.

Risk management system (D-4): risk management refers to the needed architecture (principles, structure, and procedure; for example, ISO 31000) for successfully managing risks; managing risk refers to the application of that architecture to individual hazards. This concept was covered in the previous section, and its definition as a component of SMS was provided by Demichela et al. (2004).

NASA makes a distinction between risk management with a confined scope and a large scope. The former is concerned with hardware hazards, while the latter is far more complicated and includes several organizations (Dezfuli et al., 2011a, 2011b). Consequently, risk management—which includes locating, analyzing, mitigating, and evaluating potential threats to health and safety—is an essential component of any and all safety management systems.

System for monitoring (C-5): The purpose of monitoring is to examine or observe the current status of the organization's safety performance. During the monitoring process, it is possible to acquire and evaluate information in real time on the performance of safety measures. According to Zolghadri (2000), the monitoring system is able to get specific values of various parameters thanks to the use of sensors. These values provide information on the performance of machines or operators. For instance, the initial intention behind the creation of the Prevention Recovery Information System for Monitoring and Analysis (PRISMA) was to reduce the number of mistakes made by humans in the chemical processing business. (Dye and van der Schaaf, 2002; Snijders et al., 2009) It contains a causal event tree, the Eindhoven Classification Model (ECM), and measurements for improvement. Additionally, the connection between information and monitoring is shown by this system. The monitoring system sends an SMS to the user with accurate information, which is essential for making consistent advancements.

The term "maintenance" in this context always refers to mechanical maintenance. The maintenance system (A-6) refers to this. This entails that the SMS as a whole should undergo routine maintenance on each and every component in order to guarantee its users' safety. Planning, control, and improvement are all components of maintenance according to the quality triad model developed by Juran (1999). The Deming cycle model for maintenance was developed by Tucci et al. (2006). This model was used to develop a process for maintenance, which included planning and execution, data feedback, data analysis, and the development of legal, technical, and economic solutions. It should come as no surprise that maintenance models place a focus on the PDCA cycle;

the method of continuous improvement it employs continues to provide an SMS with control measures.

Training and learning system (A-7): training and learning are often seen as vital activities in a management system and an accident prevention strategy (Gherardi and Nicolini, 2000; Hale 1984). In other words, training and learning are a component of an A-7 system. Training and educational pursuits that are well-planned and organized may also function as a standalone system. Even while some of these programs may eventually grow into mature systems like STOP at Dupont (1986), many businesses do in fact establish their own training programs for the purpose of improving workplace safety. (Chua and Goh, 2004; Cooke and Rohleder, 2006) Other learning systems place an emphasis on incident learning as a means of providing feedback and mitigating risk. Therefore, training and learning systems are essential to the quality of SMSs since they increase both the capabilities of the organization and the individuals it employs with respect to safety. Overall, these seven categories provide a comprehensive description of the duties that safety management systems perform from the point of view of control. According to the available research, a model or system may realize one or more of the functions of an SMS. They are a reflection of the specific function that a control is intended to fulfill in safety management systems.

2.2.1. Compliance perspective

This overview also pays attention to another goal, which is compliance with standards, rules, and regulations. Although the control of accidents, losses, and defenses is believed to be the primary objective of an SMS, this overview also pays attention to this purpose. The acquisition of a certificate is essential for many businesses, and this fact alone is often sufficient justification for the development and enhancement of SMSs. It's possible that some of the more broad standards won't go into specifics about how certain operational procedures work, but rather they'll direct attention to the aspects of the management system that are most important (ISO, 2011). Other examples include particular occupational safety requirements and standards for the management of important industrial hazards. The standards of safety acts are spelled out in great detail in laws and regulations, which are drafted in order to provide a legal foundation for the kinds of risks that are considered acceptable. As a consequence of this, they provide a distinct perspective on the study of SMSs in terms of how to design an SMS that satisfies the safety criteria established by various governments, organizations, or industries and how to make the safety management of enterprises conform with certain standards.

Understanding, comparing, and integrating the information presented in the safety compliance literature are the three primary focuses of this body of work. To have an understanding of something is to explain particular standards or regulations in such a way that hints are supplied as to how the management system of an organization might conform to the requirements. Comparison aids in overall comprehension by illuminating both the positives and negatives associated with certain criteria. A comparison might offer consumers with a variety of perspectives on the appropriateness of the standards, given that different governments or organizations presumably apply different standards. The term "integration" refers to the process through which an organization adopts necessary rules or regulations into their own management system for a particular purpose.

The integration of management systems is described by Beckmerhagen et al. (2003) as "a process of putting together different function-specific management systems into a single and more effective integrated management system (IMS)" (p. 214). However, the extent to which management systems are "integrated" may vary significantly from one company to the next, necessitating the need for some workable definition of this term. In the business world, it's very uncommon for companies to have more than one formal management system, and the aforementioned three facets are all helpful in their respective phases of growth.

An integrated safety management system (SMS) is much more advanced than a barebones SMS built for the sake of compliance or certification. The establishment of SMSs was the result of the aforementioned collective managerial efforts. Integrating safety management with other aspects of organizational management has been an ongoing process because of the centrality of safety management to organizations. When comparing the structure and outcomes of simple compliance and integration, NEN (2013) defines simple compliance as "an independent environmental management system, quality management system, occupational health & safety system, etc." (NEN, 2013) in which the indicators are to be considered and audited independently, and "integration" as "a uniform system in which indicators of all different aspects are included in the same information system."

When transitioning from an independent safety management system to an integrated safety management system, there are two distinct methods that may be taken: the first is the integration of systems that were originally designed to operate independently, and the second is the development and implementation of an integrated system from the very beginning (Labodova, 2004). The first strategy is one that is founded on conventional management systems, which were at one point in time established with a variety of management goals. These different systems are combined into a single, unified one as part of an advanced management system, which also includes a set of goals.

The second strategy is constructing an integrated management system from the ground up with comprehensive goals that include a variety of domains, such as quality, health, and safety, among others. The real environment of the firm will determine how an integrated system may be obtained in the future. Obtaining a certificate or proving that you comply with standards are not as essential as effectively implementing a management system. The goal here is not necessarily an integrated system in and of itself, but rather the process of improving safety performance.

Even though the concept originated with quality and environmental management systems (EMS), there are a few different models that explain how SMSs and standards may be linked or aligned with one another. This can be done so from the standpoint of compliance. Total quality safety management was first presented by Adams (1995), who also made a distinction between conventional management and total quality management (TQM). He emphasized that the quality of the process should include consideration of safety. Puri (1996) established a framework for integrated EMS/TQM and focused on addressing the following three particular aspects: managerial accountability, process management, and support systems. Renfrew and Muir (1998) came up with the idea for a management systems evolution model, which explains the process of merging certain ISO standards and some single management systems into one's own management system. This model was suggested by Renfrew and Muir. (Rasmussen, 2007) This form of model works to link an occupational health and safety management system with the management system of a corporation, and it may be used in either a national or multinational setting.

Another kind of management model shows how to implement general management practices in a specific context. In order to enhance a company's safety performance, Nelson et al. (1997) established a model for a project safety management system (SMS); Kegg (1998) implemented an EH&S management system; and Griffith and Bhutto (2008), drawing on their experience working with contractors, developed a model from best practices for integrated management system (IMS) development, integrating certain ISO standards into business management. The "architecture of a company management system of transmission system operator (TSO)," which includes the SMS standard for gas transmission infrastructure and pipeline integrity management (PIMS), is another frequent example in a real-world context. The safety management system (SMS) is an integral part of the CMS, along with other subsystems like the Integrated Management System (IMS) for high-risk equipment, the Design, Construction, and Auxiliary Processes (DCAP), the Emergency Preparedness and Response Procedure (EPR), and so on (NEN, 2013). NEMA is the National Electrical Manufacturers Association and they designed this standard. Technology, documentation, data, and structure are all crucial to the functioning of the management processes from the top down.

2.3 ISO Standards

ISO 9001 is the name of an international standard that describes procedures and norms for the management of quality, as stated by Elmuti and Kathawala (1997). The whole continent of Europe is home to a sizable population engaging in this custom. The ISO 9001 standards have been embraced as a precondition for the first stage of certifying the use of their mark in a variety of product-certification schemes by a large number of national and international quality standards as well as certification schemes. This has been place on the national level as well as the international level.

This includes fundamental principles for safety management such as management commitment, communication, work environment, involvement of employees, and so on. This also includes quality management ideas such as these. Since they explain the essential components, the ISO 9001 standards have been of considerable help to many companies in their attempts to embrace quality integrated safety management (Herrero et al., 2002). This is because the standards provide an overview of the key components. Regulations that are based on ISO 9000 have been produced in order to help companies in the process of developing systems for the management and prevention of dangers to employees. These regulations were developed in order to assist businesses in the process of establishing these systems.

The standards for a quality management system are specified in ISO 9001:2008 and in its development ISO 9001:2015. These requirements guarantee that a firm offers goods and services that fulfill the expectations of its customers in addition to any relevant legislative and regulatory requirements. Additionally, the goal of ISO 9001 is to increase the level of pleasure felt by customers.

ISO 9001 and the International Safety administration Code (ISM Code) both require individuals in charge of the administration of ships to have a methodical approach to their work. Together, the ISM Code and ISO 9001 provide a foundation for ensuring that management systems are also driven by the requirements of customers, which is essential to the ongoing success of a shipping firm (Patmiko, & Andriani, 2023).

In terms of shipboard management, the organization is expected to have created a set of corporate goals and policies in order to comply with both the ISM code and the ISO 9001 standard. To be more explicit, the ISM code method mandates that the firm must have produced a safety and environmental protection strategy that outlines the ISM Code goals that are to be accomplished, implemented, and maintained (Leimu, 2018).

These goals have to be aimed in the direction of maintaining safety at sea in addition to the avoidance of human harm or loss of life as well as property damage. The preservation of the environment, in particular the marine environment, should be another significant goal of the policy. This should not, of course, preclude the pursuit of other important environmental goals, such as the reduction of air pollution or the promotion of recycling.

In order to accomplish such goals, the firm should give Safe Working Practices standards and procedures relating to the ship operations, such as entrance into confined spaces, hot work, and other similar activities. Additionally, the company should supply equipment that contributes to the maintenance of a Safe Working Environment aboard. The firm should have designed the policies, processes, and guidelines that are going to be adopted or followed in such a manner that they may also represent protections against potential hazards that the company has recognized. A requirement that is also mentioned in a similar manner in the ISO 9001 standard is that the firm must have protocols for reaction in the event of a safety or environmental emergency, and of course, the Safety Management System must be continually improved. The company must also have in place rules addressing response in the event of a fire (Leimu, 2018).

All of the aforementioned should always be in compliance with mandatory rules, regulations; applicable codes, guidelines, and standards (such as SOLAS, MARPOL, STCW 95, COLREGS, Regulations on Navigation in Panama Canal Waters, etc.) recommended by the International Maritime Organization (IMO), Flag Administrations, Port State Authorities, Classification Societies, and maritime industry organizations.

On the other hand, in order to meet the requirements of the ISO 9001 standard, the organization is required to have formulated a quality policy, complete with goals that should be carried out onboard.

Such a quality policy should include a commitment to comply with any requirements (such as customer requirements, regulatory requirements, etc.) and to continually improve the effectiveness of the quality management system. This means that a management review procedure should be established in order to assess and evaluate the implementation of the management system (a requirement that is also stated in a similar way in the ISM code). In addition, the quality policy should include a commitment to continually improve the effectiveness of the quality management system. Additionally, the policy has to be disseminated across the business so that it may be understood, and it should also be evaluated to ensure that it remains appropriate. In addition, the business must demonstrate a dedication to safeguarding the quality management system's credibility anytime new additions or modifications to the quality management system are being deliberated about or put into action (Patmiko, & Andriani, 2023)..

It is important for the organization to develop quality targets that are quantifiable and in line with its quality policy. These objectives should be developed within the applicable corporate processes. These goals might include the following (Leimu, 2018).:

- Services of a high quality, as determined by both internal and external audits and non-conformances,
- Satisfaction of the consumer, which may be determined via the use of customer surveys and processes for managing complaints,
- Improvements in crew training as evaluated by crew training assessments,
- Reduction in Non-Conformities as Measured by Internal and External Audits and Monitoring Procedures

Both the International Safety Management (ISM) and the International Organization for Standardization (ISO 9001) demand that all obligatory rules, laws, and regulations be observed and executed appropriately. The International Safety Management Code (ISM code) includes specific language stating that a company's developed safety management system should ensure compliance with mandatory rules and regulations throughout shipboard operations and that any other applicable codes, guidelines, and other standards that are being recommended by the Flag Administrations, the Classification Societies, the IMO, and other organizations are taken into account. This language is included because the ISM code is required by the International Maritime Organization (IMO).

The ISO 9001 standard and the ISM code both demand clearly defined levels of authority, as well as lines of responsibility and communication.

The International Safety Management Code requires that roles, authority, and the interaction between people aboard and onshore, whose job is connected and also impacts safety and pollution control, be clearly defined and recorded. This is to ensure that everyone is on the same page. For instance, in most cases, the power and responsibility for the execution of the drills program are often delegated to the Master, who does so with the assistance of the Chief Officer. The Master and the Chief Officer are in charge of supervising the Cook, who is responsible for maintaining a clean galley as well as the supplies, and who works under their direction. In addition, the ISM code mandates the inclusion of a clear statement that places an emphasis on the Master's overriding authority and the obligation to make choices about the avoidance of pollution and other hazards. The standards of the ISO 9001 standard are comparable, notwithstanding the fact that they are quality-focused and connected to the fulfillment of client needs (Patmiko, & Andriani, 2023).

Certain obligations and duties on land are required to meet the requirements of both the International Safety Management Code (ISM code) and the International Organization for Standardization (ISO 9001). As a result, the International Safety Management Code mandates the presence of a Designated Person Ashore, also known as a DPA, who is responsible for ensuring and monitoring the safe operation of company ships and who acts as a connection between the business and the personnel serving aboard. Direct access to the highest level of management must be available to the DPA at all times. On the other hand, meeting the requirements of the ISO 9001 standard necessitates the employment of a Quality Management Representative. This individual is to be entrusted with the duty as well as the authority of seeing to it that the quality management system procedures are developed, put into action, and kept up to date. Additionally, it is necessary of him to make sure that the organization is aware of the needs that the customers have set out, and he is accountable for reporting the performance of the quality management system to the top management.

Regarding the firm's human resources, the ISM code specifies that the corporation shall guarantee that each ship is staffed by seafarers who possess the relevant credentials and certificates in accordance with the standards of both national and international law. In addition to this, the ISM regulation mandates that all seafarers must be in good physical health in order to be employed. A further requirement of the ISM code is that all crew and people with tasks connected to safety and environment protection should be suitably acquainted. This is to guarantee that the activities will be carried out in a manner that is both safe and kind to the environment. This kind of familiarization is often carried out in accordance with the company's own forms, in addition to any training items that may be necessary in accordance with the company's policies. It should go without saying that records need to be kept for everything mentioned above.

The standards established by ISO 9001 are similar, however they are more generic and call for additional things like an analysis of how effectively measures have been performed and the education of staff on how they may best contribute to quality goals.

The Emergency Preparedness criterion is an example of a criteria that is not included in the ISO 9001 standard but is addressed in the ISM code. The International Safety Management Standard (ISM) mandates that possible shipboard emergency scenarios must be recognized and characterized in order to guarantee that measures are taken to deal with them and effectively react to them. This need may be satisfied by the use of checklists, drill procedures, posters, or any other medium that contains instructions that are clear and concise about what should be done in the event of an emergency. The necessity for control of non-conforming items is the criterion of ISO 9001 that most closely resembles the demand for disaster preparation (Patmiko, & Andriani, 2023)..

Establishing an efficient command, communications system, operating procedures, and set of controls is necessary in order to travel in a safe manner. Planning a passage entails determining which route between ports is not only the safest but also the most cost-effective, as well as recognizing and naming any potential dangers in order to steer clear of them. Because there is always the possibility of unanticipated circumstances and malfunctioning machinery, it is essential to have a plan B in place in order to be ready for anything that may come your way. In order to do their jobs effectively, watch officers aboard ships need to be able to maintain a correct lookout while also monitoring charts and radar. Bridge notes have to be supplied in order to explain how to handle certain pieces of apparatus and how to carry out maintenance operations wherever they are required.

All of the aforementioned are only examples of a small portion of the activities that take place on the bridge of a ship, but they serve to highlight the need of having well-developed plans for shipboard operations that are compliant with the standards of the ISM code. In order to maintain compliance with the ISO 9001 standard, you are also required to plan your activities. Every shipping business should provide helpful advice to its customers on safe navigation, and the following should be included in the firm's policies:

a categorical assertion that protecting people's lives and the integrity of the ship is the single most essential operational priority

protocols for the distribution of tasks and responsibilities on the bridge duties and obligations for trip planning

techniques for correcting charts and other nautical publications

Essential navigational equipment is readily accessible, as are fully functional contingency response plans, accident and near miss reporting processes, documentation of voyage events, familiarization training and handover protocols, and corporate contacts, including the person designated as the "designated person" under the International Safety Management Code.

A well-managed ship requires not just a clear set of rules and an orderly bridge, but also an effective management system in the engine room. The ISM code and the ISO 9001 standard both call for detailed planning of the ship's operations. Bridge operations, like engine room operations, need careful preparation. The safe operation of all involved equipment and the safety of the crew necessitates procedures for identifying and controlling the operation of main and auxiliary machinery, steering gear, bunkering, waste management, and other such things. Because of this, it's crucial to have a well laid out system for the Engine department's structure, complete with roles and duties, standards for Maintenance that state best practices, ways to report issues, and precautions to take, etc.

Chapter 3: Emergency Situations on board

3.1 Methodology

For the writing of this paper, surveys are used as secondary sources of study to complete the first part, while the case study is used to give examples to better understand what applies to maritime safety. Actual emergency situations are not happened till now in the company. However, drills are carried out at frequent intervals on board and company's emergency response team is ready to assist in case of emergency.

3.2 Case Study

We will explain how all of this functions in reality by referring to the firm Asia charm ltd fze. and the manner that it deals with risk while sailing. Due to the fact that the researcher is employed by the organization under scrutiny, she was the one who actually accessed the data, after receiving written permission from the CEO.

3.3 Fire

To start a fire, you need three things: fuel, oxygen, and some kind of igniting source. The removal of heat, fuel, or air from a fire allows for its management and eventual extinguishment. When putting out flames, the primary objective must be to lower the temperature as quickly as feasible, eliminate the fuel source, or cut off the air supply, whichever of these three can be accomplished first.

The following are the procedures to follow in the event of a fire:

1. Every member of the crew should have a thorough understanding of the method for combating fires and the organization that exists on board. You should familiarize yourself with the tasks associated with your fire emergency station as well as the whistle and bell signals, and make sure to give the muster lists for the life boats and emergency stations close reading.

2. Familiarize yourself with the evacuation strategy and always refer to it. Find out where all of the different pieces of fire-fighting equipment and systems are located on board.

3. Locate the fire alarm switches that are the closest to your cabin and take note of their placements.

4. Find the fire hose and hydrant that are located closest to your cabin, and get familiar with the correct manner to operate the three-way nozzle.

5. Commit to memory the telephone numbers for the Engine Control Room, Cargo Control, and the Bridge.

6. Determine how many different kinds of fire extinguishers are available on board, and familiarize yourself with how to use them and any accessories they come with. It is important to keep in mind that extinguishers that utilize water cannot be used on electrical fires. On oil fires, you should use foam, powder type extinguishers, whereas for electrical fires, you should use CO_2 type extinguishers.

7. To prevent frost burns, keep your hands away from the nozzle of a CO_2 type fire extinguisher while you are using the extinguisher. When CO_2 is allowed to escape into the atmosphere, the result is a significant drop in temperature due to the gas's fast expansion.

8. Be aware of the variety of different self-breathing gadgets that are available on board. Be able to determine whether or whether they have a constructive or difficult design, and ensure that you are completely proficient in their use. Take note of the one that is closest to your cabin.

9. You should be informed of the quickest route to the emergency muster point that has been assigned.

10. You should get familiar with the position of the emergency exit doors and the escape path from your cabin, and you should be able to perform this evacuation even when it is completely dark.

11. You should be familiar with how to start and operate the emergency life boat motor, the emergency fire pump, and the emergency generator.

12. It is important to be familiar with the ship's fixed-fighting system and how it functions.

13. Determine where the emergency shut-off panel or box for the fuel oil and diesel oil is located and get familiar with its controls.

14. Give yourself plenty of practice putting on the firefighter's gear.

15. Be familiar with the location of the fire blankets and how to utilize them.

16. You are responsible for personally inspecting the fire-fighting equipment that has been allotted to you and ensuring that it is in working order.

17. If there are any aspects of this that you are unsure about or do not completely understand, bring them up in a conversation with the Chief Officer or the Head of your department.

18. You should be familiar with the locations of the Emergency Stop buttons for the Engine room, the Pump room, and the accommodation fans, as well as how to use them.

19. You should be familiar with the location of the Emergency Stop buttons for the cargo oil pumps and how to activate them.

In a recent fire drill carried out by the company with the supposed fire breaking out in the engine room, the workers acted according to the instructions. They were driven very quickly to the assembly station and took on tasks that they undertake in emergency scenes, most importantly the evacuation of the engine room and the containment of the fire in the area in question.

3.4 Abandon ship

In the case that the issue gets so severe that it is necessary to depart the ship, the regulations stipulate the following actions to be taken in such situation:

Good communications are crucial in all scenarios (real or drill)

The following instructions should be followed in order to complete the activity properly.

Master

1. Is currently stationed on the Bridge and in charge of the ship.

2. Performs an analysis of the situation and comes to the conclusion that it is best to abandon the ship.

3. The captain issues the command to retransmit the distress signal.

4. Advises the Emergency Squad and Support Teams and gives the order to sound the General Emergency Signal on all internal alarms and the ship's whistle.

5. Ensures that the muster check has been finished, that all people have been accounted for, and that details of any missing individuals have been given on to the lifeboat commanders.

6. The command to "Abandon Ship" is given verbally.

7. Ensures that the lifeboats can be deployed without incident.

8. Put on the lifejacket, and go to the location where you will board the boat.

9. If necessary, sends a message indicating a state of emergency or distress.

10 Is responsible for reporting to the main office and keeping in touch with the company through follow-up communications

The Officer on Duty

1. Keeps a record of what has happened and gathers log books.

2. Keeps an eye on how the lifeboats are being prepared.

3. Provides the Radio Officer with the ship's current location.

4. Remain in this position until further instructions from the Master are given.

5. Upon receiving orders from the Master, go to the life boat that has been given to you.

The Engineer on Duty

1. Ensures that there is sufficient electricity for the lights and pumps whenever it is required.

2. Waits for the command to operate the main engine while simultaneously launching the life boats.

3. In accordance with the directions given by the Master, shut down the main engine, secure the engine room, and report to the lifeboat station allocated to you.

Rescue Boat Crews

1. Upon getting instructions to prepare to abandon ship from the Master. Proceed to the ship stations for abandoning the ship.

2. Carry out the muster check and make sure that everyone is wearing their lifejackets correctly.

3. Inform the Master of any people who have gone missing and, if required, organize a search.

4. have the lifeboats ready; bring them down to the embarkation deck, and have everything set up for speedy boarding.

5. Inform the Master that the lifeboats are ready and the crew is getting ready to abandon ship.

6. When you get the order to abandon ship, give all of the employees instructions to enter the lifeboats.

7. Embark boats.

8. Put the boats into lower gear.

9. Upon reaching the water, disengage from the falls and wait to be picked up by the Master and the launch team.

The evacuation scenario that took place a few months ago to train workers in emergency situations was effective. the workers gathered in the indicated area, put on the appropriate life jackets and were led to the lifeboats to leave the ship with them

3.5 Collision/Grounding

The process of anchoring a vessel is covered in this exercise.

For the sake of the exercise, it will be assumed that the vessel has become aground somewhere in the vessel's front portion. After all of the soundings and other measurements have been taken, it has been determined that it should be able to refloat the vessel by releasing ballast from the bow on the next rising tide.

Good communications are crucial in all scenarios (real or drill).

The following instructions should be followed in order to complete the activity properly.

Officer on Duty of the Deck

1. If you sense that the vessel is about to ground, stop all of the engines immediately and use the Emergency Stop button if required.

2. Make the sound of the emergency alarm.

3. Closes waterproof doors.

4. Offers Guidance to the Master

5. Plots vessels position.

6. Shows aground indications in the display.

The Engineer on Duty

1. Upon obtaining the knowledge, the subject transforms to strong sea suctions.

2. Determines whether there is a leak in the E.R. bilges.

Master

1. The Captain arrives on the Bridge and is given a comprehensive briefing on the situation and the action that has already been taken by the Duty Officer.

2. Seizes the initiative and takes complete command of the situation.

In any event, it is imperative that the Master adhere to the protocol that is outlined in the vessel's SOPEP or VRP.

3. The possibility of using the engines in reverse to refloat the vessel is being considered. Chooses to hold off until the extent of the harm can be determined.

4. Takes out the applicable plan and check lists from the vessel's SOPEP or VRP and begins the record of the event.

5. Ensures that the muster check has been performed, that every individual has been accounted for, and that any missing people have been reported to the Incident Squad.

6. Makes certain that all essential elements on the SOPEP or VRP check list have been completed as detailed below.

a. Coordinates the activities that are carried out in order to reduce pollution.

b. Makes sure the lifeboats are ready and that they are lowered down to the embarkation deck.

c. Messages were despatched in accordance with the Check list.

d. Acquires the most recent meteorological and tidal data, in addition to other pertinent information.

e. Assesses activities feasible to refloat.

7. After performing the refloating maneuvers, the vessel clears the water and heads for the closest safe port.

8. Sends a report to the main office and keeps the lines of communication open by sending follow-up communications.

The Rescue and Support Teams in Case of an Emergency

1. Conduct the muster check and report your findings to the Bridge.

2. Upon obtaining information on the grounding from the bridge, the following procedures were carried out as fast as possible:

a. Soundings of all tanks, holds, and bilges were collected, and the information were sent to the bridge.

b. Soundings over side taken and reported to bridge.

b. The Chief Officer and the Chief Engineer are to evaluate the damage and report their findings to the Bridge.

c. Make sure the lifeboats and liferafts are ready.

3. The situation was evaluated using the Loadicator, and the following checks were performed:

a. The drafts that are necessary to refloat the vessel.

b. Discharge of ballast in order to refloat the vessel.

c. The stability of the vessel once it has been refloated.

d. Pressures on the process of refloating.

4. The preparation of the ballast system and the beginning of the de-ballasting process.

5. Upon refloating, each compartment on the ship sounded its alarm, and the information were sent to the bridge.

6. A comprehensive check of the vessel was performed and the results were submitted to the Master.

In the context of the exercise scenario, it is predicted that a ship, during mooring maneuvers, hits the pier. As a result of the impact there is a fuel leak (2 m3 Diesel) after a small crack on the right side of the ship and a small fire in the engine room of the ship. In order to deal with the incident, the staff of the relevant port authority will be mobilized, who have the ability to independently intervene in small-scale events, with the appropriate restrictive or anti-pollution means and individual equipment that is permanently kept within the port premises. At the same time, all cooperating services will be mobilized to block the area, evacuate it, transport/provide first aid to the injured and deal with the fire. The mobilization of individual agencies and staff is carried out in accordance with the port's Contingency Plan. In the context of this, an order is given to immediately limit the leak and the Port Authority, the municipal authorities as well as neighboring facilities are notified. This is how the Fire Service is mobilized to fight the fire and the EMS to transport the injured to the hospital and the EL.AS. for precautionary reasons. Also the Pollution Response Teams and the person in charge of the auxiliary boat. Once the fire is extinguished and the safety of the public and Pollution Response Teams is ensured, the mobilization of anti-pollution equipment begins, the laying of barriers and containment of the oil spill and the ship, the operation of an oil collector to recover the spilled amount and the placement of a tank near the pier for the temporary storage of recovered petroleum waste. Absorbent materials are then dropped in order to collect small amounts of oil inside and outside the dam formation that may have escaped, recovered with hand tools, placed in heavy-duty bags and transported to the oil waste temporary storage area. After the end of the work, the Marine Pollution Response Team undertakes the recovery of all the equipment and means, their restoration and maintenance (washing with fresh water) and their repositioning in the Container held by the port management organization

3.6 Extreme Weather

The following table is the one to be completed in case of bad weather

HEAVY WEATHER DAMAGE

1. Master informed ☐
2. Inform the Operations Manager ☐
3. Check for crew injuries ☐
4. Check cargo lashings ☐
5. Check anchor lashings ☐
6. Check windlass brakes, winched, capstans ☐
7. Check lifeboat man roped tightness ☐
8. Assess nature of damage ☐
9. Sound tanks and bilges ☐
10. Assess weather and weather forecast ☐
11. Verify if any assistance is required ☐
12. Surveyor atttandance / report ☐
13. P & I attendance / report ☐
14. If possible take photos ☐
15. Enter facts in log book ☐
16. Notify interested parties ☐

An example of a bad weather drill in ships would involve simulating rough sea conditions such as high winds and heavy rain. The crew would practice securing loose items on deck, closing watertight doors, and adjusting the ship's course to minimize the impact of the weather. This drill helps prepare the crew for potential stormy conditions at sea and ensures they are ready to respond effectively to maintain the safety of the ship and its passengers.

3.7 Engine breakdown

If there is a mechanical problem, then the instructions state the following:

MAIN ENGINE FAILURE

1. Call Master ☐
2. Rudder, bow and/or stern thrusters used to best navigational advantage ☐
3. Preparations for anchoring, if in shallow water ☐
4. Not under command shapes or lights exhibited, switch on deck lights ☐
5. Check proximity to other vessel nearby hazards, sound whistle, broadcast warnings on channel 16 VHF. ☐
6. Fix position of the vessel ☐
7. Pass position of the vessel to Master ☐
8. Assess weather, current and drift ☐
9. Inform the Operations Manager ☐
10. Check for the vessel in the vicinity ☐
11. Check for navigation hazards in the vicinity ☐
12. Continuous watch o VHF channel 16 ☐
13. Use sound or light signals if necessary ☐
14. Check crew for absence / injury ☐
15. Note time of breakdown ☐
16. Establish if repair is possible by vessel's staff ☐
17. Establish time required to repair ☐
18. If required, determine assistance needed (tugs, salvage, navy, rescue) ☐
19. Spare parts required at next port ☐
20. Sound all tanks and bilges ☐
21. Retain broken parts if any ☐
22. Enter facts in log book ☐

An example of an engine breakdown in a ship would be when one of the ship's engines suddenly fails due to a mechanical issue. The crew would quickly assess the situation, activate emergency procedures, and work together to troubleshoot and repair the engine. This drill helps train the crew on how to handle unexpected engine failures, ensuring they can efficiently restore propulsion and maintain the safety and operation of the ship. Additionally, in the event of an engine breakdown, the ship may be temporarily immobilized or unable to maintain its intended speed. This can create delays in reaching the ship's destination and disrupt the travel plans of passengers. However, the crew's prompt response and effective troubleshooting can minimize the impact on both the ship and its passengers, ensuring their safety and minimizing inconvenience. Furthermore, proper maintenance and regular inspections of the ship's engines can help prevent unexpected breakdowns and ensure smooth sailing for both crew and passengers.

3.8 Flooding

The steps that are outlined in the following paragraphs should be carried out in case of flooding.

Person finding Flooding (i.e. Crew member assigned for sounding vessels tanks/bilges).

1. Upon witnessing water at the sounding tape inside of a cargo hold or cargo tank that was previously emptied and dry 2. He is unable to determine where the waters are coming from.

2. Putting a stopper in the sounding pipe.

3. Immediately makes contact with the bridge and reports the situation to the duty officer using the most expedient methods available.

4. He continues on his way to the muster station.

The Engineer on Duty

1. As soon as you hear the Alarm, report to the room where the Engines are controlled.

2. When the stand by bell is rung, lower the speed of the main engine to a speed suitable for maneuvering and wait for bridge telegraph commands.

3. Begins repairing the pumping system in response to the request from the bridge.

4. Stays in standby mode for further instructions.

Master

1. Upon arriving on the bridge, the duty Officer provides a comprehensive briefing on the current situation.

2. Steps in and ensures that they have complete control of the situation.

3. Maneuver the ship in the proper manner to:

Safeguard staff

Lessen the impact of the floods (if the source is known).

4. Ensure that the muster check has been finished, that all workers have been accounted for, and that they are engaged in the emergency party.

5. Maintains order, keeps a careful eye on the situation, and makes certain that the appropriate protocols are being followed.

6. Depending on the severity of the issue, communicate with the appropriate shore or port state authorities and, if necessary, transmit urgent or distress communications.

7. Sends a report to the main office and keeps in touch with them by sending follow-up communications.

8. As a safety measure, urge everyone to ensure that life boats and other life-saving equipment are prepared in case it becomes necessary to depart the vessel. In this particular instance, the ship must be docked in the water.

9. If necessary, the vessel's SOPEP and/or VCP are put into effect.

The Chief Officer, or the Chief Engineer in the event of flooding in the Machinery space.

1. Appointing workers to carry out his orders and conduct particular and frequent soundings of the flooded region and the areas that surround it in order to determine: a) The scope of the flooding; and b) When the flooding will recede.

b) Confirmation that the level in the surrounding tanks and regions is correct.

d) A ballpark estimate of the water seepage rate.

2. Calculating the current impacts of floods on the stability and stress of the area based on the data from the soundings.

3. Calculating the effect on stability and stress, based on the data from the soundings, of any expected corrective measures to be taken against the flooding (i.e. to correct any consequent list etc.). This is done using the data.

4. Determine if the ship is equipped with pumping mechanisms (both permanent and portable ones, as well as a combination of the two if required) and the ability to either release flood water or prevent it from entering. When it is practicable, pump out flooded areas using the methods described above.

If the answer to this question is "No," then you should determine the most likely outcome of the flooding in terms of how it will affect the structure's stress and stability.

5. Make preparations for oil pollution prevention wherever there is a likelihood that it may occur (see to the SOPEP handbook for further information).

6. Once the water has been drained out, examine the source of the flooding with the Chief Engineer by accessing the flooded area and making required arrangements for help and repairs to be carried out.

Before entering an enclosed space, the supplied procedures need to be read, comprehended, and carried out.

7. The bridge must be alerted for any and all of the activities conducted in the previous paragraphs.

Support Group or Emergency Response Unit

1. Finish the check of the Muster, then report to the Bridge.

2. Get the lifeboats and any other equipment that might save lives ready.

3. Soundings are performed on the designated tanks and areas in accordance with the orders of the Chief Officer (or the Chief Engineer in the Engine room), and the results are sent to both the bridge and the Chief Officer or Chief Engineer.

4. In the event that you get such orders, prepare for the possibility of oil contamination.

5. Moving the portable pumps and getting them ready to use.

6. Moving and preparing all of the things and equipment that have been given for entrance into the enclosed area.

7. Moving goods in order to reduce the impact of floods or make repairs in accordance with the muster list or other orders that have been received.

Flooding a ship can be a catastrophic event that puts the lives of passengers and crew at risk. For example, if a breach occurs in the hull due to a collision or mechanical failure, water can quickly enter the ship, causing it to lose buoyancy and potentially capsize. However, well-trained crew members who follow emergency procedures such as sealing off affected areas and activating pumps can help control the flooding and ensure the safety of everyone on board. Additionally, regular inspections of the ship's hull integrity and maintenance are crucial in preventing breaches and identifying any potential weaknesses. These inspections involve thorough checks for corrosion, cracks, or other structural issues that could compromise the hull's integrity. By addressing these issues promptly, ship operators can minimize the risk of a breach and ensure the continued safety of passengers and crew. Furthermore, implementing advanced technologies such as sonar systems can aid in detecting underwater obstacles and potential dangers, further enhancing the overall safety of the ship.

3.9 Piracy

Piracy is a phenomenon that very often causes problems on the high seas. The company we are studying deals with piracy incidents as follows:

SHIP IN PORT OR AT ANCHOR

1. When possible avoid remaingn in anchorages ☐
2. Stream or drift, with engines on stand by, st least 20 and up to 40 miles off0shore at night, only returning within VHF range at intervals for orders/news from Agents. ☐
3. In port or at designated anchorage, provide full lighting on deck and over side particularly at the bow and stern ☐
4. Maintain a constant supply of water to the hawse pipes, and same to be kept closed by their covers ☐
5. Keep fire line always under pressure and some fire hoses duly connected ready to be used ☐
6. In port restrict access to the ship to one point ☐
7. Ensure the gangway is linked by walkie talkie to the other watch keepers ☐

8. After arrival organizes system of immediate notification of the authorities/Coast Guard ☐

WHEN AT SEA

1. Increase surveillance and vigilance during hours of darkness ☐
2. Maintain constant visual and radar watch ☐
3. Establish radio (VHF) contact as necessary with anti-piracy centers if applicable ☐
4. Seal off all means of access to the ship ☐
5. Maintain fire line under pressure and have water hoses duly rigged ☐
6. Illuminate the deck, particularly at the stern ☐
7. Brief the Engine Room and crew about precautions to be taken and agreed signals on piracy/robbers activities ☐
8. Have a GMDSS Officer in the Radio Station Room on watch ☐

WHEN RAIDERS ARE DETECTED NEAR THE VESSEL

1. Sound the general alarm and ship's whistle ☐
2. Increase speed and alter course to seaward, if at sea and if possible ☐

Drills against piracy in a ship are crucial to ensure the safety and security of crew members and passengers. These drills often involve practicing emergency response protocols, such as locking down the ship, alerting the authorities, and following specific procedures to deter and counteract pirate attacks. By regularly conducting these drills, ship personnel can be better prepared to handle potential piracy threats and minimize the risk of harm or loss of life at sea. Additionally, these drills help crew members familiarize themselves with the ship's security measures, such as installing barriers and implementing safe rooms, which can be crucial during a pirate attack. Moreover, practicing these response protocols also allows the crew to assess any weaknesses in their security systems and make necessary improvements. Furthermore, these drills serve as a deterrent to potential pirates, as the visible preparedness of the ship's personnel can discourage them from attempting an attack. Overall, these drills play a vital role in ensuring the protection and well-being of everyone on board a ship. For example, a cargo ship company may conduct regular drills to prepare their crew for potential pirate attacks. During these drills, crew members would practice quickly and efficiently securing the ship's safe rooms, which are fortified areas where they can seek shelter during an attack. By simulating different attack scenarios, the crew can identify any vulnerabilities in their security systems and address them before a real threat arises. The visible preparedness of the crew during these drills can also act as a deterrent to pirates, as they may think.

Chapter 4: Necessary actions for safety management

4.1. Human factor on board

According to the findings of the 2017 Safety Shipping Review conducted by Allianz, human error has been identified as the primary factor in the majority of events that have occurred in the shipping industry. It is believed that human error is responsible for somewhere between 75% and 96% of all maritime accidents. In 2017, human error accounted for 58% of all accidents, while shipboard operations were a significant factor in 70% of all incidents that were not caused by accidents. It has been determined that the human component is the primary reason for crises that have negative consequences on people's health, their lives, their property, and the environment. The study of marine fatalities and attempts to establish their causes is one of the ways that may be used to identify the many forms of human mistakes that are pertinent to the maritime business. The Human Factor Analysis and Classification System (HFACS) is an ideal instrument for analyzing the elements that lead to human failure in a maritime environment. The Human Factors Analysis and Critical Thinking System (HFACS) is a human error framework that was established inside the United States military. It is a tool for studying and data-analyzing the human causes in a wide variety of sectors. According to Materna et al. (2018), the primary purpose of the classification system's development was to provide an evaluation framework for the purpose of analyzing and classifying operator mistakes in naval aviation incidents.

Not only in times of crisis, but also in the course of daily life, the human element is the most unpredictable factor. Due to the fact that everyone behaves and comprehends things in their own unique way, people's capacity to deal safely and effectively with the complexity, pressures, workload, or difficulty of the daily tasks can vary. According to Sanders and McCormick's (1993) definition, a human mistake is any choice or action made by a human being that is improper or unsatisfactory and that results in a decrease in efficiency, safety, or system performance. Rasmussen (1982), who conducted a significant research on the topic of human failure, identifies three stages of human behavior as follows:

• activities that are knowledge-based entail the creation of a strategy for the solution of a problem;

• activities that are rule-based describe activities that require the use of instructions or processes;

• skills-based conduct refers to the normal actions that are performed in an unplanned manner.

Reason (1990) added to Rasmussen's study by describing the mistake related with human behavior as "unsafe acts" made by a person in the front line with the purpose of avoiding an accident. Rasmussen's research was improved as a result of Reason's work. The dangerous activities might manifest themselves in a variety of ways, including mistakes and violations. Errors are primarily associated with failures of memory or attention, while violations, on the other hand, reflect the chance of making an error with a negative consequence. The first part of the categorization of probable human failures during maritime transportation is the investigation of all notable deaths that have occurred at sea in the preceding few years. The information was taken directly from the National Transportation Safety Board's online database. There have been occurrences that have taken place as a result of a single factor mistake, while others have taken place as a result of many factors (such as construction plus human error, environmental factor plus human factor, etc.)

4.2. Future options for safety management

Maritime operations are notoriously difficult to understand because they include a myriad of interacting human, mechanical, technical, and environmental components in addition to outside factors. As a direct consequence of this, the dangers that come with managing a vessel are equally complicated and varied. In the grand scheme of things, it is generally accepted that human factors contribute more significantly to major marine catastrophes than do technological faults. elements linked with human error, such as crew credentials, working and housing circumstances, and compliance with rules for working hours and safety management, are quite different from elements relating to the management and technology of marine accidents. This need to be taken into consideration in the process of developing leading risk indicators. When gathering new information, it is important that both the inspection points and the categorization schemes take into consideration the many ways in which human variables and technological circumstances interact with one another. In addition, regardless of whether previously gathered data are utilized or fresh data are acquired, the process of aggregation should take into account the distinct roles that human factors and technological failures play in the chain of circumstances that culminate in marine catastrophes. The number of serious mishaps that have occurred in the past has been significantly cut down thanks to the efforts of the maritime sector. Innovating new leading risk indicators is one way that may make a substantial contribution to ensuring that this evolution will continue in the years to come. They allow for a forward-looking detection and evaluation of current hazards for the ship and the crew, which in turn allows for the application of mitigation actions before to the occurrence of unfavorable events provided they are constructed correctly. The increasing digital revolution in the marine sector is now having a beneficial effect on the possibilities for establishing such leading risk indicators. Innovative approaches to risk management are able to make use of the vast amounts of data that are becoming accessible from ship operations. (Kretschmann, 2020).

4.3. Improving safety management

The criteria for SMS are comprehensive and stringent. Constant vigilance is consequently required in order to ensure complete compliance with the requirements. Any departure that may be identified from the standards of the SMS that constitutes a significant hazard to safety or harm to the environment calls for rapid remedial action.

These kinds of abnormalities are quite easy to miss. Possible dangers include, but are not limited to, a malfunctioning fire alarm system, issues with the oil and water separator system, or an inadequate quantity of life rafts. All of these represent possible dangers that need to be resolved, recorded, and documented. The validity of the paperwork presents still another obstacle, given that any changes to the status quo need the documentation being revised and updated in accordance with the new circumstances. A ship may change its flag, the safety measures it takes for certain cargoes may be modified, or it may switch from normal lifeboats to free fall lifeboats. All of these examples are examples of the kind of changes that may be brought about by such alterations.

The sheer amount of paperwork that is required presents the primary obstacle. Every single process has to be well documented, and this paperwork needs to be easily accessible to all of the essential parties involved. When there is a large amount of work to be done or when there is difficulty in sticking to timetables, it is simple for there to be mistakes or omissions in the reporting process.

Audits, both internal and external, are carried out in order to check for any SMS inadequacies or non-conformities that may exist. They also check to see whether the ship's management systems conform with the criteria of the ISM Code. However, there is no instruction on how to carry out an internal audit, nor is there any indication of what should be included in one. The processes and paperwork requirements take up an almost wholly disproportionate amount of attention in these standards.

At least once a year, internal audits are carried out with the primary goals of verifying compliance with the rules, ensuring that the SMS is being correctly implemented, and supervising the steps made to enhance safety performance. A designated person on land will oversee the audit and compile a report based on the results of the investigation. In response to the report, the corporation and the crew of the vessel are obligated to take action, which may include remedial as well as preventative measures. Documentation of such acts must be complete and correct at all times.

In order to have a complete SMS system, shoreside employees need to have a high degree of monitoring over the operations that take place aboard. This, in turn, makes it necessary for there to be a continuous interchange of papers between the ship and the land, which may be difficult to do, particularly in cases when the vessels do not have regular internet connectivity (Safety4sea, 2022).

The expansion of legislation is likely to be accompanied by an increase in the quantity of documents that must be submitted. In recent years, environmental laws in particular have seen a significant expansion, and it is anticipated that this expansion will continue as the IMO works towards achieving its goals for 2030 and 2050. This will result in an increase in the amount of labor that must be done to precisely complete all of the necessary paperwork, as well as an increase in the likelihood that human mistake may occur (Safety4sea, 2022).

Despite the availability of digital technology that may simplify and enhance the efficiency of this activity, the traditional and most popular way for dealing with SMS requirements is still the manual documenting and processing of papers. This is the case even if the latter can be done digitally.

The majority of instances of non-compliance may be traced back to problems with the manual documentation. An excessive amount of the time, failure to follow the most recent regulations correctly leads in the usage of antiquated processes, checklists, or work permissions. occasionally checklists and forms are not fully completed, and occasionally signatures are not included when they should be. The processing of incident reports is not always done in the correct manner, and the auditor is sometimes unable to get copies of the relevant documents (Safety4sea, 2022).

Documentation accounts for almost half of the audit procedure, and the bulk of non-compliance findings are caused by inappropriate human completion and processing of papers. The use of digital technologies almost eliminates the possibility of this occurring and helps to speed up the process overall.

Ship surveys, which are primarily concerned with the technical state of the vessel, but demand that all paperwork be in order, provide a scenario that is similar to the one described above. The possibility of making errors in the documentation is removed when using a system for handling that is digitalized.

Since more and more "official" papers, such as class and statutory certificates as well as certain flag registration certificates, are being made available in digital format, it only seems fair that SMS handling should also be made available in digital format. In addition, the International Ship and Port Facility Security (ISPS) is considered to be a component of the International Safety Management Code by a select number of flag states; the Marshall Islands is one of these nations. In situations like this, the audits for ISM, ISPS, and the Maritime Labour Convention (MLC) are often carried out concurrently. There is a noticeable lack of efficiency if the paperwork for each code is stored separately in various places, since this prevents the audits from being carried out in a timely manner. These difficulties may be solved by using digital solutions (Safety4sea, 2022).

When compared to a comprehensive digital system that is dynamic, inter-connected, and readily accessible by all stakeholders, manual handling is laborious and time consuming. shift is being driven across the marine industry by the increased efficiency made possible by digital technology, and arguably there is no other area where this shift is more necessary than in the handling of SMS obligations.

Conclusions-Remarks

The most fundamental aspects that define a crisis as a whole are the fact that it disrupts the smooth functioning of the organization, poses a danger to the good image of the organization, and in general causes harm to the services and products the organization provides in any form.

It is possible to effectively handle any risk or uncertainty, and hence the crisis. Crisis management is a methodology that includes specific planning, organization, guidance, and control during the important period just before, during, and after the occurrence of an emergency event. The goal of this methodology is to minimize any losses of an organization's resources, particularly those resources that are considered to be highly necessary for the organization's complete repair.

In order for corporations to effectively handle crises, they must first have a thorough understanding of the many stages and procedures that comprise the overall crisis management process.

In order to forestall and lessen the impact of unwelcome happenings on your ship's regular operations, you must practice emergency planning and crisis management. An investigation conducted in compliance with national and international rules and the expectations of insurance providers is one way to maximize the learning and benefit for your firm after an accident or high-potential occurrence.

For the purpose of delineating roles and responsibilities, maritime emergencies are divided into four categories: maritime casualty, oil spills, hazardous and noxious substance spills, and wildlife affected by marine pollution events.

The representatives of the companies or any member of the corporate entities that are going through a crisis are able to make the right decisions in light of the general principles of management, in conjunction with the guidelines, regulations, and standards that have been determined both by International Organizations and by the respective national competent authorities.

Despite the availability of the guidelines, it is necessary for each business to modify the applicable regulations according to the specifics of their operations in order to ensure that they are followed correctly.

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