A qualitative study of the review and verification process of the Safety Management System within companies servicing the Norwegian Continental Shelf

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SUMMARY

The international shipping industry accounts for about 90% of world trade and is vital part of the global economy. Shipping operates in a volatile environment where the primary goal of companies is to make a profit by delivering goods and services. Commercial priority of the ship-owners historically has been to minimize liability and exposure through insurance.

SUMMARY (contin.)

In the late 1980 and start of 90s the maritime community witnessed an increase in high profile accidents. These were analyzed and the cause was found to be the human element. The ISM Code was introduced to remedy the situation and subsequently shifted the maritime industry to a regulated self-regulation industry putting greater requirements on the ship management. Requirements for a safety management system were introduced; the ship owner is responsible for documenting that the ships are in compliance with statutory requirements and laws.

The ISM code is based on the principles of continuous improvement and total quality management. This thesis was carried out a qualitative study of the continuous improvement element of the SMS with a specific focus on how the shipboard personnel are included. Including the shipboard personnel in the SMS in an efficient manner and creating a sense of ownership that encourages reporting is a prerequisite for a successful SMS.

Abstract

The aim of this thesis is to investigate the practice of the ISM code within companies operating vessels that service the Norwegian continental shelf. The ISM code is a statutory requirement that demands ship operating companies to structure and run a SMS for each vessel with an aim to improve safety in the maritime industry by regulated self-regulation. The freedom of design inherent in the SMS makes it important to study how the system is used in practice within companies.

Designing and running an SMS in compliance with the ISM code can and should be a demanding task which requires involvement from the very top of the management. The design freedom of the SMS leaves much room for discussion and alterations. This thesis is focused on how the ship operating companies have structured their SMS and their practice of the continuous improvement element of the ISM Code by interviewing the Designated Person in a select group of companies.

I was positively encouraged by the level of involvement of the senior shipboard personnel in the SMS in the 4 participating companies. Answers to the questioner suggest that the companies are actively working with safety management and involving the shipboard personnel. Larger distinctions were found in the way the companies handles accident reporting and the requirements to report.

Contents

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FOC	Flag Of Convenience
IMO	International Maritime Organization
ISM Code	International Safety Management Code
SMS	Safety Management System
STCW	Standards of Training Certification and Watchkeeping for Seafarers
SOLAS	Safety Of Life At Sea
TQM	Total Quality Management

Definitions

The Following definitions are from the ISM code and used in this thesis

‘‘1.1.1 *International Safety Management (ISM) Code* means the International Management Code for the Safe Operation of Ships and for Pollution Prevention as adopted by the Assembly, as may be amended by the Organization.

1.1.2 *Company* means the owner of the ship or any other organization or person such as the manager, or the bareboat charterer, who has assumed the responsibility for operation of the ship from the shipowner and who, on assuming such responsibility, has agreed to take over all duties and responsibility imposed by the Code.

1.1.3 *Administration* means the Government of the State whose flag the ship is entitled to fly.

1.1.4 *Safety management system* means a structured and documented system enabling Company personnel to implement effectively the Company safety and environmental protection policy.

1.1.5 *Document of Compliance* means a document issued to a Company which complies with the requirements of this Code.

1.1.6 *Safety Management Certificate* means a document issued to a ship which signifies that the Company and its shipboard management operate in accordance with the approved safety management system.

1.1.7 *Objective evidence* means quantitative or qualitative information, records or statements of fact pertaining to safety or to the existence and implementation of a safety management system element, which is based on observation, measurement or test and which can be verified.

1.1.8 *Observation* means a statement of fact made during a safety management audit and substantiated by objective evidence.

1.1.9 *Non-conformity* means an observed situation where objective evidence indicates the non-fulfilment of a specified requirement.

1.1.10 *Major non-conformity* means an identifiable deviation that poses a serious threat to the safety of personnel or the ship or a serious risk to the environment that requires immediate corrective action or the lack of effective and systematic implementation of a requirement of this Code.

1.1.11 *Anniversary date* means the day and month of each year that corresponds to the date of expiry of the relevant document or certificate.

1.1.12 *Convention* means the International Convention for the Safety of Life at Sea, 1974, as amended.’’ (*ISM Code*, 2010)

Acknowledgements

I would like to express appreciation to my guidance counselor Assistant Professor Tor Erik Jensen, who has provided invaluable feedback and guidance. He continually and convincingly expressed a positive spirit in regard to the thesis and an excitement for the subject matter. Without his keen insight and guidance this thesis would not have been possible.

I would like to thank my wonderful girlfriend who have stood by me supported me and tolerated all my absence with a smile.

1. Introduction

The international shipping industry accounts for about 90% of world trade and is vital part of the global economy. Shipping operates in a volatile environment where the primary goal of companies is to make a profit by delivering goods and services. Commercial priority of ship-owners historically has been to minimize liability and exposure through insurance (Anderson, 2003, pp. 1-5). A study carried out on ships registered in Brittan between 1976 and 2002 show a fatality rate between 13 and 28 times greater than the general Brittan workforce (Roberts & Marlow, 2005).

The International Safety Management Code (ISM Code) was introduced by the UN maritime agency The International Maritime Organization (IMO) as a response to an increasing number of high profile maritime accidents. The ISM Code provides ship management companies and mariners with a set of provisions and requirements for a safety management system.

Freedom of design is an important factor in the ISM Code the ship management is tasked with creating an SMS that documents compliance with the code. This thesis is carried out to uncover the practices of the audit, review and verification process with a focus the continuous reporting cycle is handled within companies servicing the Norwegian continental shelf. My research questions are: How are the shipboard personnel included in the continuous improvement cycle of the SMS? How do the companies archive a positive reporting culture from the shipboard personnel?

The United Nations special agency IMO is tasked with the responsibility for the safety, security and pollution prevention by shipping. IMO can be categorized as a technical oriented organization and has historically focused most of its resources on the technical aspects of shipping. As Secretary-General to IMO Mr. O'Neil put it 28.06.2002 ''Previously, IMO's attempts to improve shipping safety and to prevent pollution from ships had been largely directed at improving the hardware of shipping – for example the construction of ships and their equipment. The ISM Code, by comparison, concentrates on the way shipping companies are run. This is important, because we know that human factors account for most accidents at sea – and that many of them can ultimately be traced to management.'' (Anderson, 2003, p. 18)

1.1. Background of the ISM Code

In the late 1980 to the start of 90s the maritime community witnessed an increase in the number of high profile accidents with a significant loss of life. This is reflected by the cost P&I insurance witch rose on average by 200-400 percent in the same period. (Anderson, 2003, p. 15).

There are several elements that contributed to this development. Ship sizes increased significantly posing increased risks. Increased cost pressure caused several ship operators to use FOC's and crews from emerging economies. Modern ships with greatly improved efficiency caused ship owners to decrease the minimum crewing levels. The global fleet size increased both in numbers and tons. Overall the safety increased in the industry. In 1919 the UK fatality rate was 358 per 100,000 seafarer-years, 1976-1985 improved the rate to 53 per 100,000, 1986-1995 down to 39 per 100,000 showing an improved safety for seafarers (Sven, 2012).

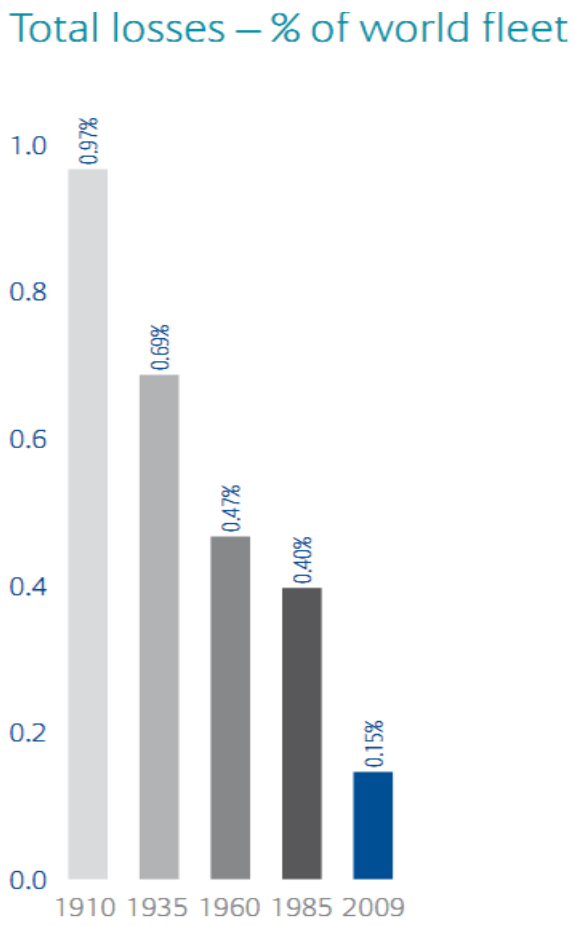

Figure 1 Total losses- % of world fleet (Sven, 2012)

As shown in figure 1 total losses as a % of the world fleet decreased overall throughout the period but. The fleet increased in both size 36,311 (1960) to 76,395 (1985) and in tonnage 129,769,500 tons (1960) to 416,268,534 tons (1985) (Sven, 2012). The total losses in % decreased in the period while the number of ships lost and tonnage lost increased due to the increased global fleet size.

The fatality record and decrease in loss of ships can undoubtedly be attributed to the improvements in structural integrity and seaworthiness (Sven, 2012). The next step in safety management was the human element.

1.2 Herald of Free Enterprise

In order to understand the aims of the International Safety Management Code (ISM code) it is important to emphasize the impact of the high profile accidents on the maritime industry.

On 6th of march 1987 the Roll on/Roll off passenger ferry Herald of Free Enterprise capsized off Zeebrugge with a loss of 188 lives. The ferry had left port in good weather with an open bow visor which caused the ferry to flood and capsize. The following investigation revealed gross negligence and recklessness from both the crew and all the members concerned with management from the Board of Directors down to the junior superintendents. The Report from the department of transport described the company: ‘‘*From top to bottom the body corporate was infected with the disease of sloppiness’’* (Corlett, 1987). Failure of the shore management to give proper and clear directions was considered a contributing force to the disaster and is considered a serious finding (Corlett, 1987).

In July 1986 the Department of Transport issued Merchant Shipping Notice No M.1188 entitled ‘‘Good Ship Management’’.

‘‘The efficiency and safe operations of ships requires the exercise of good management both sea and ashore. The overall responsibility of the shipping company requires the need for close involvement by management ashore. To this end it is recommended that every company operating ships should designate a person ashore with responsibility for monitoring the technical and safety aspects of the operation of its ships and for providing appropriate shore based back up. Stress is placed upon the importance of providing the Master with clear instructions to him and his officers. There should be close co-operation and regular and effective communication in both directions between ship and shore.’’ (Corlett, 1987)

Good sound advice which builds on some of the same foundation as found in the ISM Code but it’s important to note that this was not a statutory requirement. The Merchant Shipping Notice was discussed by the senior Masters and management in 1986. One of the topics were the definitions of clear roles for the Master and the Officers on board. This was refused with an explanation that it would be better to allow the roles to evolve naturally. Clear instructions and procedures are one of the foundations of safe operations. (Corlett, 1987)

1.3 A human Problem

As a response to the Herald of Free Enterprise disaster the UK Department of Transport funded research in 1988 which led to the report "The Human Element in Shipping Casualties". Conclusions of the report stated that the human element was found to be a major cause in 90 per cent of groundings and collisions and over 75 per cent of fire explosions and contacts (*The Human element in shipping casualties*, 1991).

Several reports issued by different researchers pointed to human failings as the main cause of accidents and incidents (Clifford C. Baker, 2004; *The Human element in shipping casualties*, 1991). This was by no means groundbreaking or shocking to the maritime industry but built on theories presented by Charles Perrow in his influential book from 1984, Normal Accidents: Living with High-Risk Technologies (Perrow, 1984). The problem was the increase in frequency in terms of claims and accidents, many accidents with extensive loss of life and environmental damages constituted a reaction. The technical challenges was to a large degree solved what now remained was the human element.

2 ISM Introduction of the Code

As a direct result of the Herald of Free Enterprise disaster the UK introduced the Merchant Shipping operation book in 1988 which lay the foundation for the ISM code. The idea of a designated person to oversees the operation of the ships and control that the ship is in compliance with the code. The conclusions of the reports and the national legislations of the UK were brought to the IMO which adopted an assembly resolution (A675.16) in 1989 a forerunner to the ISM code.

Regulations are often driven by the outcomes of disasters and the regulators use the knowledge of hindsight to prevent future accidents. The ISM code is no exclusion to this rule and the MV Scandinavian Star fire in 1991 which claimed 158 lives accelerated the work with the implementation of the ISM code (Anderson, 2005, p. 19).

At the 18th session of IMO in November 1993, resolution A.741(18) was adopted or as it's formally known: the International Management Code for the Safe Operation of Ships and for Pollution Prevention (ISM code). The code was incorporated into SOLAS the following year as Chapter IX entitled 'Management for the Safe Operation of Ships'. The goal of the code is

to tie the shore management with the shipboard management and it calls for a system to ensure the ships are in compliance with all regulations and rules.

The ISM code is designed to promote a regulated self-regulation to the maritime industry. Ship managers have to assume responsibility for the efficiency of the occupational health and safety (OHS) within their organizations. The ISM Code consists of a framework of general provisions, requiring the ship manager to establish a Safety Management System (SMS) to comply with the code (*ISM Code*, 2010).

2.1 Preamble of the ISM Code

Implementation of the Code did not add any new operational or technical requirements to the ship managing companies but required shipping companies to abide by existing rules and regulations and to document compliance or rather lack of compliance. The purpose of the code is stated in the Preamble.

P1. ‘‘The purpose of this Code is to provide an international standard for the safe management and operation of ships and for pollution prevention.’’ (*ISM Code*, 2010)

The ISM Code is designed to act as a broad infrastructure with specific requirements to the quality and function of the company specific Safety Management System. The ISM Code requires ship manager to develop a set of operational procedures and policies based on operational requirements. The Preamble is important for the practical understanding of the code.

P4. ‘‘Recognizing that no two shipping companies or ship-owners are the same, and that ships operate under a wide range of different conditions, the Code is based on general principles and objectives.’’
P5 ‘‘The Code is expressed in broad terms so that it can have a widespread application. Clearly, different levels of management, whether shore-based or at sea, will require varying levels of knowledge and awareness of the items outlined.’’ (*ISM Code*, 2010)

As stated in P4 and P5, the ISM Code provides freedom and flexibility to the design of the SMS. The Code was deliberately created with general principles in order to be flexible and applicable for all sorts of shipping companies and to all types of ships. In this regard the ISM Code is unique and unlike other IMO conventions in way of giving shipping companies freedom to design an SMS solutions that covers the functional requirements of the Code.

(Sagen, 1999, p. 16) Ship type, cargo, trading patterns and seasonal challenges related to ship types are examples of factors that play an important role in the process of developing a functional SMS.

P6. ‘‘The cornerstone of good safety management is commitment from the top. In matters of safety and pollution prevention it is the commitment, competence, attitudes and motivation of individuals at all levels that determines the end result.’’ (*ISM Code*, 2010)

Compliance with the ISM Code requires a commitment to safety management from all the shipboard employees and the shore based management. Creating a safety culture requires commitment, competence and motivation of all employees at all levels.

2.2 Objectives of the code

The general objective of the ISM Code ‘‘1.2.1 The objectives of the Code are to ensure safety at sea, prevention of human injury or loss of life, and avoidance of damage to the environment, in particular to the marine environment and to property’’(*ISM Code*, 2010). The ISM code promotes safety through legislated requirements and non-compliance with the code will have legal ramifications. These ramifications will depend on the level of non-compliance and on national laws.

The objectives of the code are achieved with the safety management system which form and function are determined by the preamble of the code.

2.3 Benefits of Safety Management

A survey carried out by the Swedish Club in 2001 showed a 30% decrease in claims measured by 274 ships insured by the club (Hernqvist, 2001). The study measured the efficiency of the ISM Code by the number of insurance claims as a link between safety levels and insurance premiums. These numbers are by no means representative for the efficiency of the ISM code and the lack of similar results by other insurance companies makes them of little significance. However the survey had some interesting findings on elements that determine the efficiency of the ISM code.

The three most important factors for a properly functioning safety management system:

- Commitment from the top management ashore
- Increased safety awareness onboard
- Checklist/Procedures for key shipboard operations.

The reasons for a non-functioning safety management system, according to the responses:

- Too much paperwork/documentation
- People do not know how they are expected to use the system
- People do not believe in ISM

The respondents top four proposals on how to convert a poorly functioning system into a functioning one:

- More ISM training and education
- Reduce paperwork/documentation.
- Provide seafarers with good examples of ISM in practice.
- Make sure that the accident reporting procedures work and increase feedback from accident reports to the seafarers.
  (Hernqvist, 2001)

The findings highlight some important aspects of the ISM code and seem to be in step with the intentions of the writers. An efficient SMS does not require an overload of paperwork but it does require the system to be tailor made for the specific ship type. Companies devoted to a safety culture at all levels of management experience less problems implementing and maintaining the SMS. A study carried out in Finland in 2008 concluded that the ISM Code has brought a significant contribution to maritime safety in recent years (Lappalainen, 2008).

Knapp, Bijwaard and Heij Evaluated the monetary cost savings that can be attributed to port state control inspections and industry vetting inspections, based on more than half a million arrivals between 2002 and 2007 in USA and Australia. The model translated risk reduction into cost savings and found a benefit on average of 70 to 190 thousand dollars per ship. These results show the cost savings that can be achieved with increased safety (Knapp, Bijwaard, & Heij, 2011).

Heij and Knapp evaluated detention risk and accident risk based on 100,000 ship arrivals from 2006 to 2010 in order to develop performance indicators for safety risk. Measurable risk factors included in the study are ship arrivals, inspections, detentions and accidents. The results of the study was a proposed heat plot which may be used to identify companies and ships which are operating unsafe ships (Heij & Knapp, 2011).

A study carried out at the University of Plymouth on the subject of the effectiveness of the ISM Code highlighted several interesting findings. The qualitative study was carried out on 4

tankers from two companies in England operating tankers worldwide for several major oil companies. One of the findings pointed to a low thrust environment between the seafarers and the shore management. The result was that seafarers neglected to report important failings of the ISM code under fear of punishment by the shore management. The companies was in fact compliant with the writing of the ISM code but not with the spirit of the code (Bhattacharya, 2012). In the conclusion part of the paper the author argues for company and flag state auditors to measure the participation of the seafarers in the implementation and operation for the SMS.

These studies and reports are included to explain how the ISM Code is functioning on a worldwide basis since implementation. Reports both positive and negative to the ISM Code function within the industry are important in order to understand which topics to focus on. These studies are carried out within differing segments worldwide which negate their results applicability to the oil service shipping segment covered in this thesis. However the conclusions made are of great value to this thesis and especially the recommendations for improvements.

3 Methodology

3.1 Introduction

The purpose of this thesis is to address how the shipboard personnel are included in the continuous improvement element of the SMS and how a positive reporting culture is achieved. Continuous improvement is handled with an audit, review and verification process described in chapter 3. This thesis will focus on the management side of the ISM code with interviews of Designated Persons in sample companies.

In this chapter the focus is on the research process in this thesis. The goal is to justify and explain how the thesis was carried out and identify potential benefits and drawbacks of using this type of study.

3.2 Data Collection

The data used in the thesis were collected by interviews and literary review. The key points in the survey are elements pinpointed as potential problem areas by research covered in chapter 4. Managing the Risks of Organizational Accidents (Reason, 1997), Cracking the Code (Anderson, 2003), The Impact of the ISM Code on the Management of Occupational Health and Safety in the Maritime Industry (Bhattacharya, 2009), Normal accidents (Perrow, 1984) and various other relevant studies carried out on the subject (Anderson, 2005; Hernqvist, 2001; Lappalainen, 2008).

The data has been collected by interview over the telephone. Due to the highly sensitivity of the data all participants are anonymous and should not suffer any negative effects as a result of their participation.

3.2.1 Mapping Participants

The companies were selected from a list of Norwegian companies operating specialized service vessels on the Norwegian continental shelf. Companies were contacted and selected based on a list of 8 contacts provided by Tine Viveka Westerberg Project Manager for Bachelor of Shipping and Logistics and Master of Science in Maritime Management at Vestfold University College.

4 Companies were selected at random from the list of contacts provided. Each of these companies is certified with the ISM Code, ISO 9001 and ISO 14001. The added quality standard certificates should constitute a high focus on safety management. I therefore expect

the SMS in these companies to be functioning properly. All 4 companies operate what should be considered modern fleets.

Participants in this research were limited to Designated Persons (DP) in their respected companies. Due to the nature of this study with a limited number of aspects, I believe the DP in the respected companies is most qualified to answer the questions. Several studies have been carried out on the efficiency of the ISM Code with questions directed at specific functions. I have opted for a solution where I rather question the design and function of the SMS instead of a measurement of efficiency.

3.2.2 External Validity

Random sampling of 4 companies from a selection of 8 companies was carried out in this thesis. The companies selected represent medium to large players in the market operating a wide range of vessel with an industry average fleet size. Each selected participant was contacted by company email with the attached questioner to schedule a telephone interview all 4 participants chose to participate.

External validity is difficult to establish in this thesis due to the freedom of design inherent in the ISM Code. Even though the participating companies represent an industry average, the data presented in this thesis can only explain the differences in management style within the selected companies.

Validity of this thesis is established by giving an insight into management practices within 4 companies servicing the Norwegian continental shelf. The value of this thesis depends to a large degree on the answers given by the DP's. I perceive it as important to understand and review how the continuous improvement element of the safety management system is handled within these companies.

3.3 Design

I have opted for the use of a questioner consisting of 17 questions which is presented in Appendix I. Each question is structured to uncover elements of the review and verification process of the Safety Management System. Question 1 and 2 are structured to uncover the nature of the ship operator and the SMS practice. Questions 3-5 are about the position of the DP within the company, his experience and his active role within the SMS. Each of these questions is semi structured and allows the interview subject to elaborate. Questions 6-11 are regarding the practices of the internal audits and how the review process is handled by the

management. Question 12-17 are included to uncover reporting practices and how the shipboard personnel are included in the management system as active members.

The questioner is structured as a semi structured interview with both questions with fixed answers and open question in order to create a relevant discussion. Use of open ended questions have two major advantages but also several drawbacks. Open ended questions may reveal the beliefs behind the respondent's answers and the opinions. The freedom of design of the SMS will yield many differing systems it is therefore more interesting to uncover the management practices in an open question than using a fixed question with set answers (Mitchell & Jolley, 2009, p. 276).

Open ended questions poses several drawbacks, open ended questions are generally harder for the participants to answer and there is a risk that they might skip them. Furthermore answers to open ended questions are hard to score and creates additional problems when trying to draw conclusions (Denzin & Lincoln, 2000, p. 276). Since the goal of this thesis is to uncover the management practices in the review and verification process I feel the benefits of open ended questions greatly outweigh the drawbacks.

The most important results from the questioner are discussed in chapter 5 with a conclusion in chapter 6.

3.3.1 Qualitative Method

I have chosen to use a qualitative method for this thesis (Mitchison & Papadakis, 1999) argue that a qualitative system such as the SMS must be evaluated both qualitatively and quantitatively. This thesis is structured to answer how the continuous improvement of the Safety Management System is handled by the management. Due to the freedom of design of the SMS I argue that a qualitative questioner will provide the best understanding of management practices.

I have chosen a semi structured interview with both framed questions with a set of answers and open questions which provide the subject to elaborate on the topic. An interview is the best tool to uncover opinions, feelings, emotions and experiences. It may yield additional important information that is external to the questioner but provides a deeper explanation of management practices. The SMS handles potentially incriminating evidence and the questioner may touch on privileged information. An interview provides a high level of contact

with the subject and may persuade them to offer an insight into privileged information (Denscombe, 2007, p. 175).

3.3.2 Use of interview

Using the interview structure yield several benefits but also cause several drawbacks to the study. The added interaction from an interview enables clarification of the questions and opens for an in depth understanding and explanations from the subjects. This is important in my study in order to evaluate current practices against relevant theories. The personal nature of the interview structure may create interviewer bias, where the interviewer responses verbally or nonverbally signals approval of the ‘‘correct’’ answers. I have structured several of the questions to allow the subject to elaborate and explain current practices in order to reduce the probability of interviewer bias (Mitchell & Jolley, 2009, p. 268).

Participants may try to impress the interviewer and not providing accurate an honest answers about the management of the SMS within the company. I am interviewing the Designated Persons within their respected companies about their management of the ISM Code. This thesis is based on theories in order to evaluate the answers. There is a real risk that the subjects may review the same literature and create responses that does not portray the reality. Psychologists have found that telephone interviews is less likely to be affected by social desirability bias and interviewer bias I have therefore chosen to conduct telephone interviews (Mitchell & Jolley, 2009, p. 268). Although I take precautions to minimize bias it may still be a problem in my thesis, I have therefore evaluated the answers up against the theories outlined in chapter 3.

3.4 Ethical Considerations

This thesis is conducted in compliance with a the code of ethics described in the good research guide (Denscombe, 2007, pp. 140-151). No contact information of the participants is kept digitally and all interview subjects are anonymous in the thesis. Participating companies are identified by A, B, C, D and no digital record identifying the companies is created and the physical record was destroyed after the discussion section was completed. The following ethical considerations were made.

- All participants in this thesis are anonymous and should not suffer any consequence due to their participation.

- The participation is voluntary and based on consent. Each subject has been contacted by company email mail address that does not identify the subject. Each has been informed of the ethical considerations in this thesis with appropriate information about the questioner.
- The interview process has been carried out in an open and honest manner. Participant misinterpretations have been avoided by elaboration of the question material. All participations have been well informed about the subject material and have given verbal consent to the use of data provided.
- The study is structured to comply with Norwegian laws and general business ethics. Intellectual property rights and copy rights are respected giving appropriate acknowledgement to the creator (Denscombe, 2007, pp. 140-151).

4 Safety Management Audit, Review and Verification

The purpose of this section is to offer context to the thesis by giving an overview of different theories about management systems. Various management systems for different purposes are described and evaluated against the ISM Code. The process of continuous improvement is described and tied up to relevant theories. Management Systems provide a framework for the organization to improve performance. Organizational culture is described and important subjects such as blame culture and safety culture are explained in the context of safety management.

4.1 Self-regulation

The implementation of the ISM Code shifted the maritime industry to a regulated self-regulation industry. Regulated self-regulation puts a greater responsibility on the shore based management tasking them to take necessary measures to protect workers. Effective participation by the shipboard personnel is critical to the effective implementation of a self-regulated management system (Bhattacharya, 2009).

The introduction of the ISM Code required ship managers to develop a safety management system. The ISM Code provides a wide framework of general provisions and tasks the ship manager to establish written policies and procedures to document compliance with the code. In order to document compliance the ship manager must focus on: risk assessment, incident reporting, audit and review (Bhattacharya, 2009).

4.2 Management Systems

The ISM code tasks ship-owners with creating a SMS that: 1.2.2 ‘‘Assess all identified risks to its ships, personnel and the environment and establish appropriate safeguards.’’ (*ISM Code*, 2010). The Code requires safeguards against identified risks and tasks the ship management to document these safeguards.

The ISM Code tasks shipping companies to develop a dynamic Safety Management System which should ensure continuous improvement of safety management. In essence the system should be under continuous development and all parts of the system subject to regular scrutinizing. Built in dynamic requirements in the Code are regular internal audit, master’s review, management review etc. It’s important to note that the ISM Code is based on the principles of Total Quality Management which requires an over-all long-time revision

program strategy. The Total Safety Management System is a performance oriented approach to safety focusing on Risk, Safety, Audit and Learning, presented as a long-time revision strategy divided into safety management modules (*ISM Code*, 2010; Sagen, 1999, p. 146).

The 4 companies participation in this thesis are all certified with ISO 9001 and ISO 14001 which is a common practice for shipping companies that service the Norwegian continental shelf. It's therefore important to point out the main differences ISO certification of a quality management system is on a volunteer basis while the ISM Code is a legislated requirement.

ISO 9001 is a part of the ISO 9000 family of standards related to quality management. It's designed to help organizations ensure a quality that meets the needs of customers and stakeholders. ISO 14001 is a part of the ISO 14000 family related to environmental protection set to help companies comply with applicable laws, regulations and other environmental requirements (DNV, 2013). The 4 participating companies reported that these standards where implemented with the SMS as part of a Total Quality Management System.

4.2.1 Kaizen Continuous improvement

Kaizen is a Japanese word meaning change for the better or continuous improvement. It was originally designed to improve quality, cost and delivery through incremental improvements to work processes. The SMS implements the same principles in safety management through audit/review cycles. The system is designed to be dynamic and change of the system is incremental and evolutionary-not revolutionary. Kaizen in practice can be achieved in many forms but the important factors for safety management are:

- High level of trust between employees and management with no-blame culture.
- Recognition and acceptance that no system is perfect and problems do exist.
- Participating management who take input on decisions from the individuals most affected by the change.
- An Audit, Review and Verification process driven by facts and data and not by opinions. (Van Scyoc, 2008)

Kaizen was further improved by Dr. William E. Deming who advocated a continuous improvement process for quality management. This process is known as Deming's wheel and widely used for risk management purposes. (Van Scyoc, 2008)

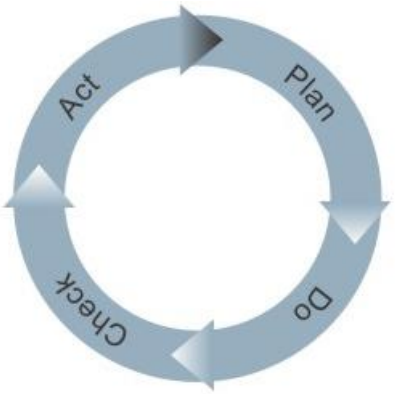

Figure 2 Deming's Wheel of continuous improvement (Tools, 2013)

The SMS is based on the principles of continuous improvement and shares several elements with Deming's Wheel. The wheel consists of four elements for continual improvement Plan-Do-Check-Act. Plan: identify and analyze potential problems. Internal Audits should be used as a tool to uncover non-conformities. Do: developing potential solutions which are then introduced on a small scale. Potential solutions are developed and presented in a Management review. Check: measure how effective the solution was, and analyzing whether it could be improved upon. A follow up audit after the implementation of a solution would be a good tool for measuring the effectiveness of the solution. Act: implement the solution fully. Corrective actions approved in the management review are implemented (Tools, 2013).

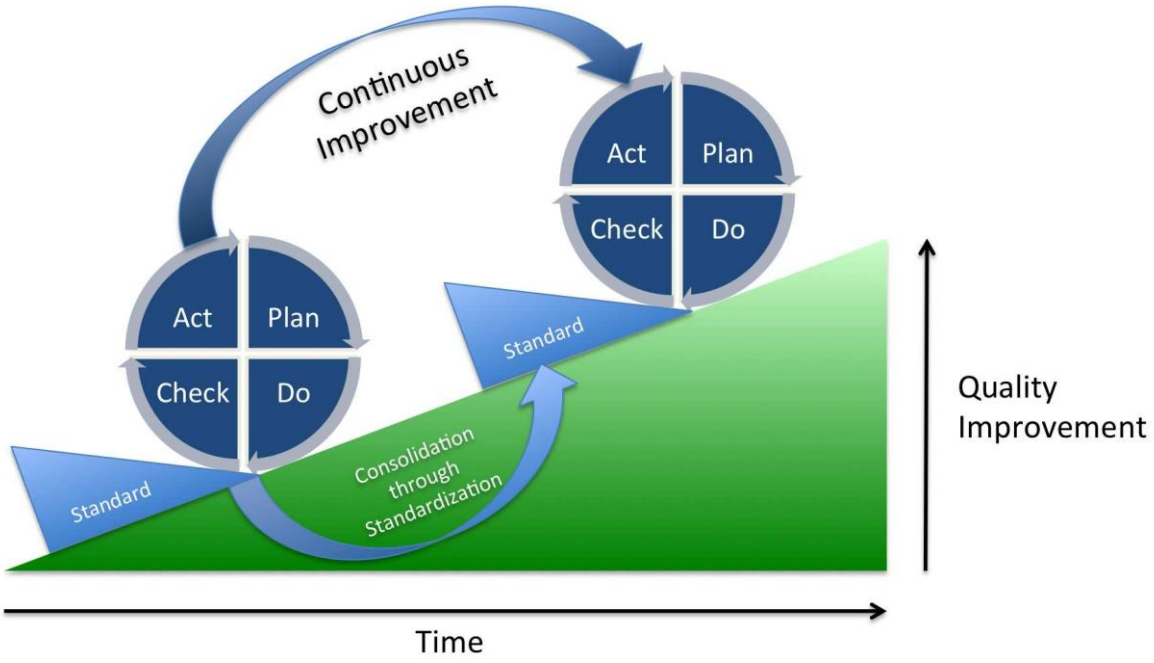

Figure 3 Concept of continuous improvement (Smartway, 2013)

Figure 3 illustrates the concept of continuous improvement, for each full revolution of Deming's wheel the quality standard is increased setting a new standard of quality. This concept is adopted in the ISM Code as continuous improvement of safety. Section 1 of the ISM safety management objectives, the company should ''.3 continuously improve safety management skills of personnel ashore and aboard ships''(*ISM Code*, 2010). The cycle of Audit, Review and Implementation are based on Deeming's principles and should lead to a safety improvement and an improvement of environmental protection.

''The whole intention of the internal audits is to verify that the SMS is functioning adequately and as intended.'' (Anderson, 2005, p. 220) If non-conformities issues are uncovered during an internal audit appropriate corrective actions will be proposed. Such corrective actions may include allocation of resources, changing procedures, training or motivation of personnel. The results of the audit should be completely documented with proposed corrective actions to be presented for management review where corrective actions will be approved for implementation. (Anderson, 2005, p. 220)

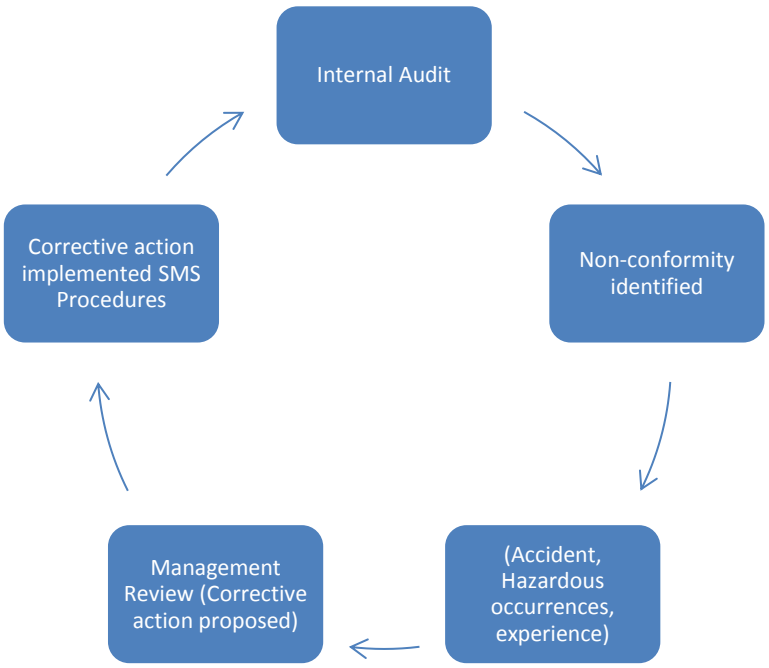

Figure 4 based on (Anderson, 2005, p. 221)

If the corrective action procedure remedies the non-conformity then the wheel should be complete and the identified problem will be solved. This should be the subject of further investigation to truly verify that the corrective action had the desired effect. An Internal Audit carried out after the corrective action would be a good method for verifying the effect.

Creating such an audit trail shows a commitment to safety and evidence of a properly managed SMS. (Anderson, 2005, p. 220)

4.2.2 Quality Assurance

A problem with Deming's wheel is that in action-oriented societies the focus tend to be on the doing part of the cycle while skimping on the planning and checking phases. Deming's wheel of continuous improvement was improved upon in the 1970's with quality gurus, like Joseph Juran, Armand Feigenbaum and Kaoro Ishikawa. The result was the Total Quality Management (TQM). Quality is not something to be controlled by inspections at the end of the line but rather assured through the entire work process. Every employee in the company shares responsible for quality (Reason, 1997, p. 47).

The ISM Code is largely based on the same principles and every employee shares a responsibility for safety and should be actively encouraged to report unsafe practices and hazardous occurrences to the shore based management. Safety should be engineered into tasks and not inspected into it. The key fundamentals adopted from Total Quality Management to the ISM Code Include:

- ''Management commitment
- Personal empowerment
- Continuous improvement'' (Lappalainen, 2008)

In the maritime industry the shore based management is removed geographically from the ship based personnel. The involvement of the ship based personnel is a prerequisite for a successful Safety Management System. Employees should have a sense of ownership of the management system. Such an ownership is established by providing the shipboard personnel with an opportunity to participate in establishing and implementing new procedures and formulating corrective actions (Lappalainen, 2008).

One enduring finding in psychology is that people are tempted to take operational short-cuts when such are presented (Reason, 1997, p. 48). As workload increases employees will feel pressed to meet the requirements and may take unsafe safe-cuts. The likeliness of such short-cuts is further increased if employees are missing a sense of ownership of SMS and are missing an understanding of the procedures.

4.2.3 Accidents caused by procedures

Natural variability of human behavior in systems with a need for high degree of regulations of activities form tensions in organizations. The managers must try to restrict the pathways of human behavior in such a way that they are both efficient and safe. Corrective actions are often in the form of a new procedure, safe operating procedures are continually being amended to prohibit unsafe actions that have been the cause of near misses, hazardous occurrences or accidents (Reason, 1997, p. 49).

Over time these new amendments may become increasingly restrictive and reducing the range of permitted actions. The scope of allowable actions to the operator on the sharp end of the process shrinks to a range that is less than what is required in order to perform all the necessary tasks. The operator is then forced to violate the procedures in order to get the job done. A violation of the procedures will not necessarily cause an accident, but an error committed during a violation is a frequent formula for disasters in hazardous work. (Reason, 1997, pp. 49-50).

Managers need to be aware of the consequence of continually narrowing the scope of permitted actions when they structure corrective action plans. The corrective actions must be structured in such a way that it will remedy the problem, without narrowing the scope of permitted actions in such a way that the operator is required to break procedures to get the job done. The shipboard personnel are at the sharp end of the operation and are in constant proximity to hazards. Utilizing the experience of the shipboard personnel and consulting them on corrective actions may produce valuable opinions and solutions.

4.3 Organizational Safety Culture

The culture of an organization is the product of individual and shared group values (what is important) and beliefs (how things work) and their interaction with the organizational structure and management systems to create behavioral norms. Values, attitudes, competencies and behavioral patterns all determine the style and proficiency of the management systems (Reason, 1997, pp. 192-194). ‘‘A company with a good safety culture aims for transparency of management and operational practices, and the minimization of all possible risks that are due to the human element.’’ (Mandaraka-Sheppard, 2009, p. 1020)

Generating a safety culture is of the upmost importance in order to achieve continuous improvement of the Safety Management System. American industrial sociologist Ron

Westrum has created a method of distinguishing organizational cultures by the way they handle safety information figure 5 (Westrum, 1993, p. 402).

PATHOLOGICAL	BUREAUCRATIC	GENERATIVE
Don't want to know	May not find out	Actively seek information
Messengers are shot	Listened if they arrive	Messengers are trained
Responsibility is shirked	Responsibility is compartmentalized	Responsibility is shared
Bridging is discouraged	Allowed but neglected	Bridging is rewarded
Failure is punished or covered up	Organization is just and merciful	Inquiry and redirection
New ideas are actively crushed	New ideas present problems	New ideas are welcomed

Figure 5 (Westrum, 1993, p. 402)

A Pathological culture and Bureaucratic culture can both be detrimental to the process of safety management. In the context of the ISM Code a Generative culture is a prerequisite for the successful operation of the Safety Management System. Information is actively sought after through internal audits and actively encouraging employees to report near accidents. The shipboard employees are trained in the use of the SMS and the reporting scheme. Responsibility is shared by the organization, the shore based management are tied with the shipboard personnel through the Designated Person who acts as a conduit to the highest levels of management. New ideas on the management system should be welcome and supported by the organization.

4.3.1 Safety Culture characteristics

IMO has characterized safety culture as:

‘‘An organization with a "safety culture" is one that gives appropriate priority to safety and realises that safety has to be managed like other areas of the business. For the shipping industry, it is in the *professionalism* of seafarers that the safety culture must take root.’’ (IMO, 2013)

It's important to note that IMO emphasizes the professionalism of seafarers. Management systems impose regulations and limits the scope of regulated actions. Written procedures are a common remedy to create defenses but also serve to limit the actions available to get the job done. IMO recognizes this point and focus on the skill of the seafarers which can be achieved through training and education. This apparent gap between the perceptions of the management focusing on regulations and the seafarers focusing on skills and professionalism is evident in the study (Bhattacharya, 2012).

Organizations with a positive safety culture are characterized by the following attributes: open communications founded on mutual trust, shared perceptions on the importance of preventive measures and safety (Reason, 1997, p. 194). James Reason describes the safety culture as ''Something that is striven for but rarely attained. The process is more important than the product. The virtue and the reward lie in the struggle rather than the outcome.'' (Reason, 1997, p. 220).

4.3.2 Reporting Culture, Blame Culture

Persuading the shipboard employees to file critical incidents and near miss reports is not an easy task. They are geographically removed from the shore based management and may not be attracted to create potential self-incriminating evidence. Potential informants do not always understand the value in reporting and this is increased if they believe that the management does not act on the information. Furthermore an evident blame culture within an organization will discourage reporting through the fear of reprisals (Reason, 1997, p. 196).

James Reason defined five factors that are important for a reporting culture, these findings are based on experience from the aviation industry but should be applicable for the maritime industry.

- *''Indemnity against disciplinary proceedings as far as practicable*
- *Confidentiality or de-identification*
- *The separation of the department collecting and analyzing the reports from those bodies with the authority to institute disciplinary proceedings and impose sanctions*
- *Rapid, useful, accessible and intelligible feedback to the reporting community*
- *Ease of making the report''* (Reason, 1997, p. 197)

James Reason argues that it is far more important for the management system to receive credible and valid feedback than assigning blame to individuals. To this end it's important to

protect and indemnify individuals from disciplinary actions. But the limit must not create an incentive for the employees to practice unsafe work habits (Reason, 1997, p. 198).

Shore based management may only monitor the ship operations remotely emphasizing the need for mutual respect and trust between the shipboard and shore personnel. An evident blame culture is detrimental to the safety culture. The SMS depends crucially on the willing participation of the shipboard personnel, because of their direct contact with the hazards. In order to achieve this reporting culture the company should engineer a climate where the shipboard personnel are prepared to report their accidents and near misses (Reason, 1997, pp. 191-221).

4.4 Safety observations, near misses and accident reporting

In the previous chapter I established the importance of reports filed by the shipboard personnel and the potential reporting barriers. This chapter is included to give a theoretical overview on the number of reports that can be expected in a SMS.

The accident pyramid is a recognized principle in risk management. It shows a clear relationship in the form of a ration between near misses, minor and major incidents. The pyramid was first suggested by H.W.Heinrich in the 1931 book Industrial Accident Prevention and since been used to explain the distribution of incidents in different industries (H.W.Heinrich, 1941). While the slope of the pyramid may wary depending on the industry segment or even between different companies within the segment, the theory is well established in the industry.

Hazardous occurrences, near misses and safety observations are far more frequent than more serious accidents and constitute the bottom of the pyramid. They are smaller in scale, easier to resolve and analyze than more serious accidents. Major accidents can often be explained by previous smaller accidents and near misses. Resolving hazardous occurrences and minor incidents may prevent future major incidents that are far more costly (Anderson, 2003, pp. 160-163).

Serious accidents occur when all the relevant defenses are either breached or fail, investigation of accidents often show latent conditions that allow the accident to occur. Dealing with these latent conditions e.g. hazardous occurrences, non-conformities, near misses and minor damages will create additional barriers for the serious accidents. In order to

achieve this land based management is heavily reliant on accurate accident reporting from the shipboard personnel. Correct and accurate reporting is also important in order to administer an efficient corrective action (Anderson, 2003, pp. 160-163).

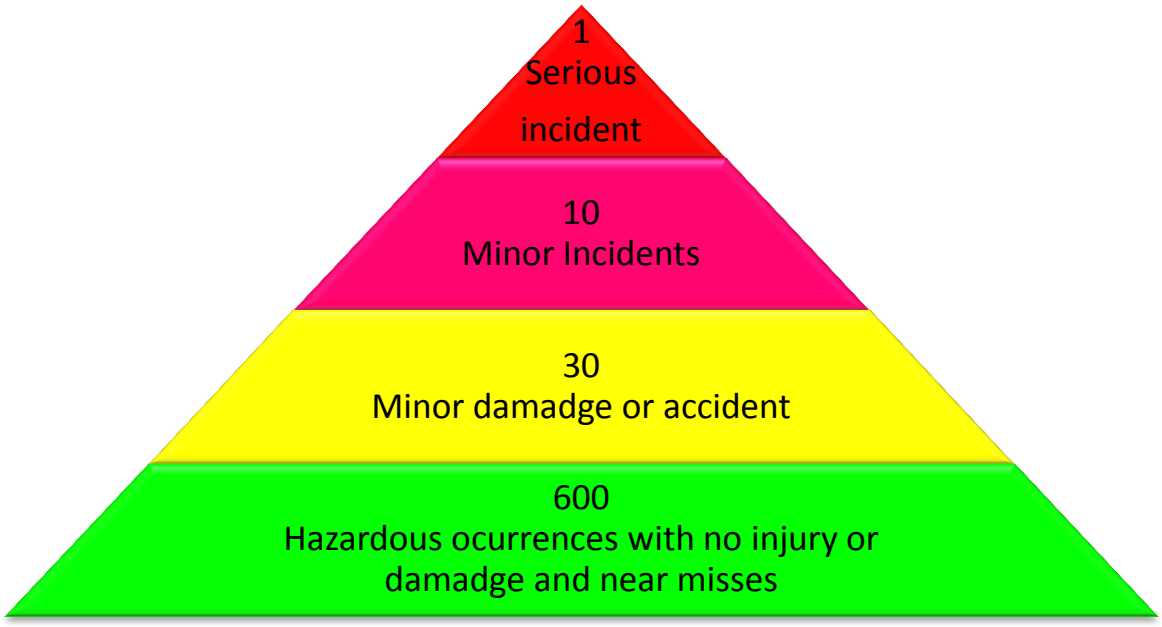

Figure 6 Typical Accident Pyramid (Anderson, 2003, p. 161)

A historical barrier for reporting near misses and hazardous occurrences is the blame culture evident in the maritime industry. Traditionally when an accident involving a ship occurs, all the blame is directed at the shipboard personnel and not the circumstances and procedures within the company. This has created a blame culture in many companies where the shipboard personnel are hesitant to report near misses and hazardous occurrences under fear of reprisals from the shore based management. Phil Andersons survey in cracking the code uncovered reporting numbers that would constitute an accident column rather than a pyramid. The reporting of hazardous occurrences and near misses was far too low according to the theory and could be explained by under reporting (Anderson, 2003, pp. 156-161).

One of the primary functions of the ISM code is to tie the shore based management to the safe operation of the ship. The code is designed to be transparent and the shore based management should encourage the shipboard personnel to report. In order to achieve the necessary reporting for such a system, the shipboard personnel need to see the benefits and be actively encouraged. There is probably an inherent reluctance in humans to report if there is a risk of punishment, reprisal or blame. But if accidents are to be fully understood and prevented

before they occur it is crucial that safety observations, near misses and hazardous occurrences are reported.

5. Discussion

In this section I will present and discuss the most interesting findings in this thesis from the interview section. The questioner used to produce these answers is provided in Appendix I and the results of the interview are provided in Appendix II along with an argument to include each question based on theory. The participating companies are anonymous due to the ethical considerations of this thesis chapter 3.4. The companies are identified as company A, B, C and D.

5.1 Organizational culture

In Q9. I posed the question ‘‘How does your company verify a corrective action plan? Are the shipboard personnel consulted on this issue?’’ This question touches on two important factors mainly how does the company ensure an active participation of the shipboard personnel in the SMS, and how does the company ensure that the corrective action proposed will have the desired effect? I will start by outlining the theories of active participation in order to provide a theoretical framework to discuss the answers.

In chapter (4.2.2 Quality Assurance) I outlined how the active participation of the shipboard personnel is a prerequisite for a successful SMS. I further emphasized this point in chapter (4.3 Organizational Safety Culture) explaining the importance of a generative culture.

Company A, B and D appoint members of the senior shipboard personnel as responsible for proposing corrective actions when non-conformities are discovered. The crewmember appointed will then evaluate the non-conformity and create a corrective action plan. The corrective action plan is then evaluated by the shore based management and if approved implemented. In company A, B and D the DP is responsible for verifying the plan and closing the finding. Company C answered that the crew are consulted but did not elaborate on active participation.

It’s interesting that the systems are structured in such a way to require an active participation from the ship based personnel. Phil Anderson proposed a cycle of continuous improvement in his book cracking the code, where the shore based management was responsible for analyzing non-conformities and implementing corrective actions (Anderson, 2003, pp. 174-175). Using the shipboard personnel to perform this function may yield several benefits. Firstly the shipboard personnel are actively included in the SMS process giving them personal empowerment. This practice is consistent with Lappalainen recommendation to provide the

shipboard personnel an opportunity to participate with formulating corrective actions (4.2.2 Quality Assurance)(Lappalainen, 2008) IMO emphasized that ‘‘it is in the professionalism of seafarers that the safety culture must take root’’ (IMO, 2013). I view this solution as a vote of confidence to the shipboard personnel and a sign of generative culture where responsibility is shared and bridging is rewarded.

Giving the shipboard personnel responsibility to propose corrective actions may yield several benefits if implemented correctly, but it’s important to be aware of the potential drawbacks. If a corrective action is to be effective it must address the correct factors, analyzing the casual factors that contributed to the finding will achieve this goal. The shipboard personnel should receive training in route cause analysis in order to understand the underlying factors that lead to a non-conformity. Overall company A, B and D all reported that the corrective action is evaluated by the shore based management and the DP before implementation I believe this to be a positive procedure that shows the companies giving appropriate priority to safety.

5.1.2 Paper exercise

Another encouraging finding was on Q14. ‘‘The ISM code compels seafarers to fill an array of forms and checklists. How do you keep your system from becoming merely a paper exercise?’’ All 4 companies responded that they use a digital system and actively invite members of the shipboard personnel to suggest amendments to procedures and checklists. The goal is to cut down on superfluous checklist points and procedures in order to encourage more active use. Company B and D both acknowledge occurrences where crew have signed checklist without fully understanding the contents. This further emphasizes the importance of creating realistic procedures that portray the actual situation.

The companies seem to be fully aware of the paper exercise dilemma and take it seriously. Furthermore they are all actively working on including the shipboard personnel in the SMS process. Bhattacharya uncovered an apparent gap between the perceptions of the management focusing on regulations while the seafarers focus on professionalism (Bhattacharya, 2012)(4.3.1 Safety Culture characteristics). The shipboard personnel are at the sharp end of the operation and are in constant proximity to hazards. Utilizing the experience of the shipboard personnel and consulting them on corrective actions may produce valuable opinions and solutions. This will also produce a sense of ownership of the Safety Management System and actively encourage the shipboard personnel to use it. (4.2.3 Accidents caused by procedures).

5.2 Reporting Culture

A prerequisite for successful Safety Management System is the feedback in form of reporting by the shipboard personnel. In order to achieve an active reporting culture, the company should establish a climate where the shipboard personnel report all near misses, safety occurrences and accidents (4.3.2 Reporting Culture, Blame Culture, 4.4 Safety observations, near misses and accident reporting). Q12, 13, 16 and 17 were asked to uncover what type of reporting culture the participating companies achieved (Appendix I Questioner).

A major finding in Phil Anderson's survey in Cracking the Code was an culture of under reporting of near accidents and hazardous occurrences. One solution proposed was to indemnify the person reporting by use of anonymous reporting ''No Names=No Blame'' (Anderson, 2003, pp. 277-305). In Q13 I asked the question ''What kind of procedures are in place for reporting near misses and hazardous occurrences?'' All 4 companies permitted the personnel to report safety observations anonymously. Company A and B requires names on the near misses reports while company C and D has an open system that permits anonymous reporting.

It's interesting to find these differences in management practice. James Reason argues that it's far more important for a management system to receive credible and valid feedback than assigning blame to individuals (Reason, 1997, p. 198)(4.3.2 Reporting Culture, Blame Culture). All 4 companies emphasized that the goal of the reports was to improve safety and not to assign blame. Company B revealed an apparent under reporting with skewed accident to near misses ration that did not match the theoretical accident pyramid (4.4 Safety observations, near misses and accident reporting). Company A revealed a similar situation with ships that are apparently under reporting. This could be attributed to the requirement of reporting with full name.

5.2.3 Reporting requirements

Investigation into accidents usually reveals latent conditions that breached the defenses and allowed the accident to occur. By addressing these latent conditions effectively future costly accidents may be averted (Anderson, 2003, p. 162). In chapter 4.4 I addressed the theoretical accident pyramid and reinforced the importance of reporting emphasizing the number of reports received by the shore based management.

Q17 was asked to uncover the requirements for reporting in the participating companies ‘‘Does your company require a minimum of near accidents reports per ship on a monthly basis?’’ Company A and D both enforce minimum requirements for reporting while company B have discussed enforcing minimum reporting requirements for a short time. Company A requires a minimum of 100 safety observations per ship each month witch can be delivered anonymous but no requirement on near accident reporting. Company D has the most rigid requirements with a minimum near accident reporting of 21 per month and minimum 250 safety observations each month per vessel.

Anderson uncovered an accident pyramid that resembled a column in the industry his conclusion was an apparent under reporting by the shipboard personnel (Anderson, 2003, pp. 152-170). The result of this questioner does not cover the number of reports received by the shore based management but the requirements to report are an important factor. It’s understandable from a management point of view when reviewing the accident pyramid to enforce a required reporting scheme. To actively seek information can be viewed as a trait of a generative culture 4.3 Organizational Safety Culture. However it’s important to receive credible and accurate reports. If the shipboard personnel perceive the reporting requirements as a chore the value of the feedback will most probably suffer.

Requiring a set number of reports can be a good practice if the shipboard personnel are fully aware of the value. The management can encourage the shipboard personnel by providing rapid useful feedback on the reports, Making it easy to report, open for anonymous reporting, training the shipboard personnel on reporting and the importance 4.3.2 Reporting Culture, Blame Culture. All 4 companies reported use of a digital system which is easy to write reports.

Company D acknowledged that the safety observation reporting was on average above the requirements but the near accident reporting was way below. Quite alarmingly the DP explained that some of the oil companies that hired their vessels viewed near accident reports as a sign of unsafe ships. This deterred the shipboard personnel from reporting near accidents. I would argue that it’s safer to hire ships with a good reporting culture; it’s the ones which are under reporting you should be skeptical to. It would be an interesting subject to expand on in a follow up survey to uncover if this is a common problem in the industry.

6. Conclusion

I was positive encouraged by the practice of using the senior shipboard personnel to propose corrective actions. Corrective actions are a vital part of the continuous improvement cycle of the SMS. This thesis is limited to interviews carried out with the designated persons in 4 companies. The views and perspectives from the senior shipboard personnel would provide a broader picture and uncover if this truly is a good practice for safety management this could be achieved in a follow up study.

The use of a digital SMS where the shipboard personnel are encouraged to provide feedback and propose amendments is a sign that the companies are actively working on safety management. I cannot however conclude that the shipboard personnel are an active part of the continuous improvement cycle of the SMS due to the limitations of this study. I would argue that based on the answers received all 4 companies are actively working on giving the shipboard personnel a sense of ownership of the SMS.

Surprisingly two of the companies required the shipboard personnel to submit near accident reports with full name. This may form an extra barrier to reporting and may deter reporting. It's interesting to note that all 4 companies strongly advocated a no blame culture where the focus was on the contents of the reports rather than the person reporting. This should imply that an anonymous report would provide the same valuable information as an identifiable report. It would be interesting to get feedback from the shipboard personnel on this subject on whether they prefer to report with name, anonymous or were oblivious to the subject.

The questioner uncovered requirements to reporting in two of the companies. Due to the inputs from the shipboard personnel missing in this thesis it's I cannot draw a conclusion on whether this is a good practice for safety management.

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Appendix I Questioner

1. Does the company operate more than one type of vessel e.g. PSV, AHTS?

A. Yes

B. No

C. Other Please specify

2. (If yes on question 1) Does the company use one SMS for all ships?

A. Yes

B. No

C. Other Please Specify

3. What is the position of the Designated Person in your company?
4. Who conducts your internal audits?
5. What type of competence and experience does your DP possess?
6. What is the frequency of your scheduled internal audits?

A. Every 12 months

B. Every 6 months

C. Every 3 months

D. Other please specify

7. Is it established practice in your company to carry out a management review after each internal audit?

A. Yes

B. No

C. Only if the audit uncovers major non-conformities

D. Only if the audit uncovers non-conformities

E. Other please specify

8. What type of finding during an internal audit would constitute an extraordinary management review for an individual vessel?

9. How does your company verify a corrective action plan? Are the shipboard personnel consulted on this issue?

10. Who is responsible for overseeing the results of an internal audit?

11. Would a non-conformity discovered during an internal audit warrant a follow up audit after a corrective action?

12. How does your company actively encourage reporting of near misses and hazardous occurrences even with self-incriminating evidence?

13. What kind of procedures are in place for reporting near misses and hazardous occurrences?
    A. Reporting with full name
    B. Anonymously reporting
    C. Reporting with title
    D. Other please specify

14. The ISM code compels seafarers to fill an array of forms and checklists. How do you keep your system from becoming merely a paper exercise?

15. By which performance criteria does the company measure the efficiency of the ISM code?

16. Does the company use a visual diagram to measure the amount of reports and the severity of the implications of each report? E.g. An accident pyramid.

17. Does your company require a minimum of near accidents reports per ship on a monthly basis?

Appendix II Answers on Questioner

1. Does the company operate more than one type of vessel e.g. PSV, AHTS?
    - Yes No
    - Other Please specify

The goal of question 1 is to establish the nature of ship operator. It's important to differentiate between different types of ships. A Platform Supply Vessel PSV performs a different set of tasks than an Anchor Handling Tug Supply Vessel AHTS which needs to be reflected by the procedures and checklist in the SMS. Many companies operate a variety of ships

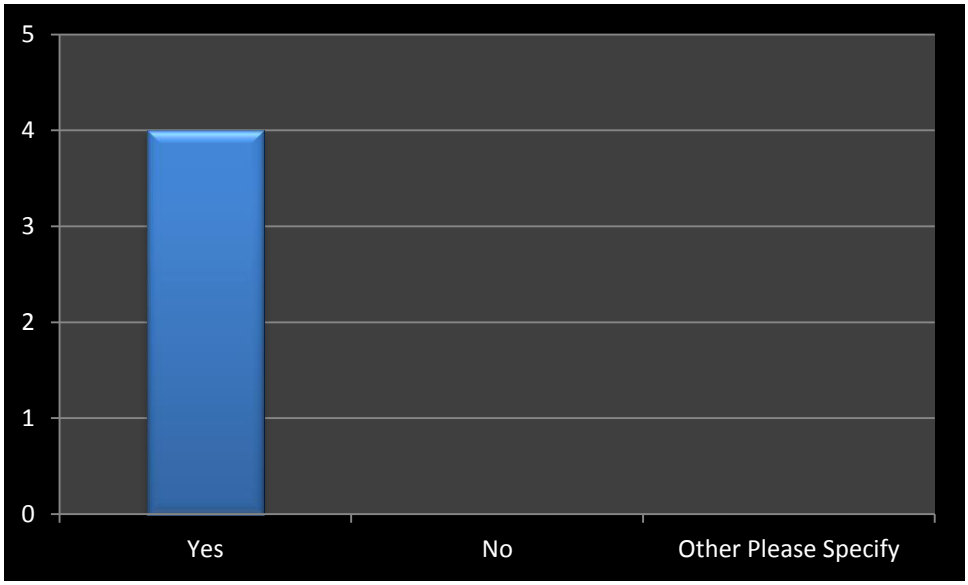

Figure 7 Does your company operate more than one type of vessel?

All 4 companies I have interviewed are operating more than one type of vessel. It is therefore interesting to uncover use of ship specific or a generic SMS.

2. (If yes on question 1) Does the company use one SMS for all ships?
    - Yes No
    - Other Please Specify

The inherent differences of the ship operations should constitute a differentiation in the Safety Management Systems. The systems may share several core elements but should be tailored to specific operating demands and special equipment. A goal of the company should be to use the SMS as a manual for several key elements of the ship operation and create checklist for different events.

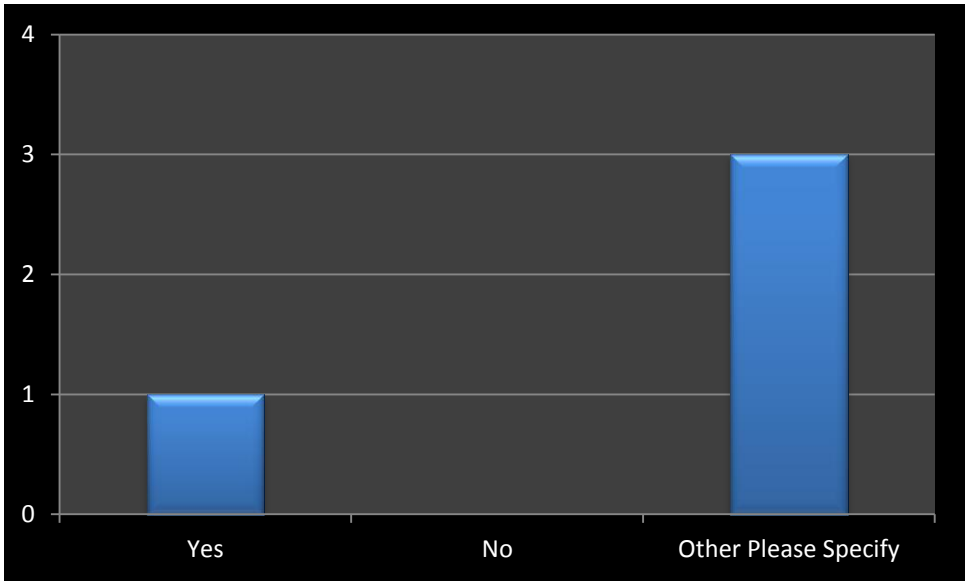

Figure 8 Does the company use the same SMS for all ships?

Company A, B and D answered that they use a generic SMS for the entire fleet as a platform with specialized manuals, procedures and checklists for each vessel type. Company C use one SMS for all ships in the fleet the company use a digital system. The companies all run what should be considered a generic SMS where most of the procedures are standardized with some specialized procedures and checklists. Benefits of such a system are the reduced manpower required for renewing and updating the system. A drawback may be procedures that do not portray the actual conditions onboard.

3. What is the position of the Designated Person in your company?

The goal of this question is to establish the role of the Designated Person in the company. One of the key roles of the DP is to act as a conduit between the seaborne personnel and the company ashore on all matters regarding the SMS. He should also check and verify that the SMS is functioning properly, and have direct access to the highest levels of management. The DP will be responsible for the day to day work with the ISM code and allocation of resources to fix non-conformity issues.

Company A: Safety Manager and Senior Vice President
Company B: Multiple DP's with the HSEQ Manager role within different offices
Company C: Dedicated DP
Company D: Director of the HSEQ department and a member of the senior management

Company A and D both use a designated person that is a member of the senior management and have a job that is predominantly concerned with safety. Company B use multiple DP's all

in the QHSE department with the head DP at the main office in the role of HSEQ Manager. Company C use a dedicated DP who is responsible for managing the SMS. All of these configurations are in compliance with paragraph 4 in the ISM code.

An audit of an SMS is set to verify the existence of procedures, objectives and standards and verify compliance with the ISM code. The results may then be used to validate the reliability and efficiency of the management system. An audit system should include a rating of a certain number of SMS items and elements identified in the documents. The goal of the audit is both to uncover non conformities and evaluate the progress of the SMS (or lack of) and identifying potential weaknesses within the system.

4. Who conducts your internal audits?

- Company A: QHSE Department within the company is responsible for handling the internal audits which are carried out by: Designated Person, Company trained auditors, Superintendents and third party auditors. All auditors are trained for the role and check the total quality management system, ISO 9001, 14001, ISPS, MLC
- Company B: QHSE department are responsible for the internal audits. The audits are carried out by QHSE managers and company safety coach, the DP performs some of the internal audits.
- Company C: Use the QHSE manager to conduct all of the internal audits.
- Company D: HSEQ department is responsible for conducting the internal audits. Designated Person and 3 coordinators in the department conduct all the internal audits. The audits cover both the ISM system, ISO 9001, 14001, MLC and ISPSS.

All 4 companies interview in this thesis are certified with both ISO 9001 and 14001. These quality management systems are audited with the SMS as a total quality management system. Inherent differences is the practice of who conducts the internal audits all 4 companies use trained auditors and only differ on the position within the company. None of the companies use the shipboard personnel to audit the SMS, this is probably due to paragraph 12.4 of the ISM Code stating that the personnel carrying out the audit should be independent from the areas being audited (*ISM Code*, 2010).

5. What type of competence or experience does your DP possess?

IMO has created guidelines for the position of DP in terms of qualifications, training and experience in ("MSC_MEPC_7/Circ.6," 2007) and ("MSC-MEPC.7-Circ.8 ", 2013).

Minimum education can be attained by: qualification from a tertiary institution within the field of management, engineering or physical science or qualification and seagoing experience as a certified ship officer or by other formal education combined with not less than three years practical senior position in ship management operation. The DP should undergo training in elements of safety management to ensure compliance with the requirements of the ISM Code.

- Company A: Answered that the company follow the guidelines provided by IMO when assigning the DP.
- Company B: The DP has a bachelor in nautical science, experience as a 1st officer and 7 years management practice in HSE department.
- Company C: PhD degree, sailing experience as a master and 5 years as QHSE Manager
- Company D: Education to officer and sailing experience as a master, 6 years as senior surveyor in DNV, HSEQ manager in a competing firm, and leadership experience from the Norwegian Maritime Directorate.

The audits are a crucial part of the continual improvement cycle. Say what you do! Do what you say you do! Show that you do what you say you do!

6. What is the frequency of your scheduled internal audits?
    - Every 12 months Every 6 months
    - Every 3 months Other please specify

The requirements of the code are once every 12 months. The frequency of the audits planned by the company gives an indication of the day to day operation of the ISM Code.

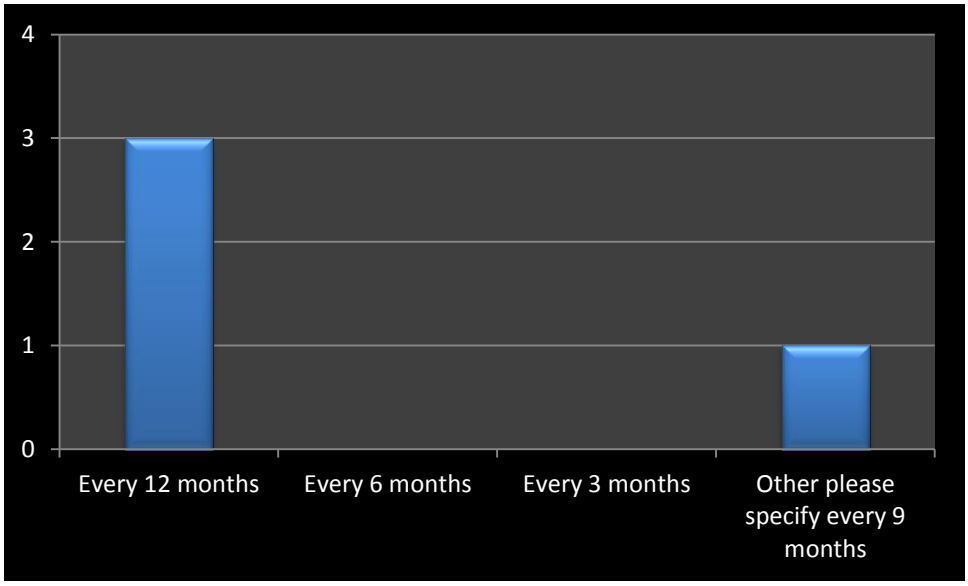

Figure 9 What is the frequency of your scheduled internal audits?

Company A, B and D has a frequency of once every 12 months, the DP in company B expressed a wish to increase the frequency of the audits but did not possess the necessary resources. Company C has a frequency 9 months which is higher than the requirement reasons for this can either be a high number of findings during inspections or a dedication to safety management.

Management reviews are one of the functional requirements of the ISM code. Management reviews shall be conducted annually within the company to ensure that the following is carried out: audit findings, evaluation of the Masters review, analysis of accidents and hazardous occurrences with experience reports (Anderson, 2005, pp. 219-223). Severe accidents and major non-conformity findings could warrant a management review in order to analyze the occurrence and apply an appropriate corrective action.

7. Is it established practice in your company to carry out a management review after each internal audit?
    - Yes — Only if the audit uncovers non-conformities
    - No — Only if the audit uncovers major non-conformities
    - Other please specify

The intentions behind the internal audits is for the company to verify that the SMS is functioning properly and that the SMS is in compliance with the ISM Code. Non-conformities discovered during the internal audit should warrant corrective actions. The corrective actions

will depend on the severity of the non-conformities uncovered. A large number of minor non-conformities may constitute a major non-conformity.

- Company A: Yearly management review of the overall safety progress, all safety statistic from the fleet with findings, accidents and near accident reports. All management personnel are present at the review.
- Company B: The Company conducts an annual management review where all the statistics and cases from the audits are discussed. A major non-conformity will not warrant a management review but all the relevant departments including the top management are called in to create a corrective action plan.
- Company C: Management review are carried out annually after the annual company internal audit. In addition as required by the ISM code, all internal audit reports are circulated in the management group.
- Company D: Annual management reviews are carried out but not after each internal audit. The management review analyzes the results of the masters review, internal and external audits to uncover potential weaknesses in the SMS.

All 4 companies fulfill the functional requirement 1.4. In Ism code as expected. None of the companies run the process as a management review if major non-conformities are uncovered but all replied that the top management is informed and consulted.

8. What type of findings during an internal audit would constitute an extraordinary management review for an individual vessel?

I expect management reviews to be common practice if major non-conformities are uncovered. The company should create a well-documented audit trail to show that the non-conformities issue is resolved and the corrective action had worked. A proper audit trail is excellent evidence of a functioning SMS (Anderson, 2005, p. 220).

- Company A: Not defined in the SMS as an extraordinary management review. But procedures in place to inform and consult the highest levels of management on the subject. Normal process after an audit is to bring in the personnel in the departments that are affected by this and feedback from the crew.
- Company B: The process is not defined as a management review in the SMS but a group comprised of the relevant departments will be called in to solve the issue.

- Company C: A major non-conformity posing high risk or a repeating type of non-conformity within the fleet would constitute an extraordinary management review.
- Company D: Major non-conformity issues or a high number of minor non conformity issues may constitute an extraordinary management review. The company conducts two management meetings per month which includes the shore based management to discuss findings and reports and propose corrective action plans.

Each company has different solutions to create corrective action plans for the findings. All 4 companies emphasize the importance of informing the top management and utilizing the competence in the relevant departments to solve the issue. Company C and D answered that a major finding may be solved with a management review on a case to case basis.

9. How does your company verify a corrective action plan? Are the shipboard personnel consulted on this issue?

- Company A: Use an electronic audit system, each finding is recorded as an individual case with a defined employee that is responsible for the case. Members of the senior management in the shipboard personnel are identified and defined as the responsible person and are required to create a corrective action plan. This plan is then verified by the DP and the management ashore and implemented. A case in the system cannot be closed before it is reviewed and a corrective action is implemented. Corrective actions are verified on the next internal audit and checked. QA department are responsible for closing all the findings and verifying the corrective action plans.
- Company B: A summary of the findings discovered during an internal audit is provided to the ship management. The findings are then analyzed by the shore based management who decide which cases that shall be solved by the ship based management. Ship based management is then tasked to create a corrective action plan which is verified by the relevant department on the shore based management and if approved is provided to the DP who is tasked with closing the finding.
- Company C: The corrective action plan is verified by objective evidence. A follow up audit will be considered on a case to case basis. The crew is consulted.
- Company D: If a non-conformity finding is uncovered during an internal audit a file is created in the digital SMS. A member of the ship based management is appointed responsible for proposing a corrective action plan. This corrective action plan is then

reviewed by the shore based management and approved by the DP if the shore based management agrees on the proposed action.

All 4 companies use the shipboard personnel experience and competence to solve non-conformity issues. Company A, B and D specify that the shipboard personnel are responsible for creating a corrective action plan. In chapter 3.2.2 I outlined the importance of creating a sense of ownership to the SMS by the shipboard personnel.

10. Who is responsible for overseeing the results of an internal audit?

The SMS is expected to include written procedures for implementing corrective actions if non-conformities are discovered. A successful operation of the SMS requires a commitment by the company to continual improvement on all levels. The internal audits are an important tool for the company to analyze the efficiency of the SMS and the commitment to the code by the shipboard personnel. The goal of this question is to analyze the established practice in the sector and the resources allocated to the internal audits.

- Company A: DP is responsible overseeing the results of the internal audits.
- Company B: The DP is responsible for overseeing the results and closing all the findings.
- Company C: The QHSE management is responsible for overseeing the results of an internal audit. The information is circulated to the departments and the top management is consulted in particular: Chief Operation Officer, Vice President of Operations, Human Resource Department and the Technical Department.
- Company D: The Designated Person is responsible for overseeing the results of the internal audit and is subsequently the only person with authority to close non-conformity files.

Company A, B and D place the responsibility of overseeing the results of internal audits on the DP. He is responsible for closing the non-conformity findings and defined with both the responsibility and authority to perform these actions in the SMS. In company C the QHSE management is responsible for overseeing and evaluating results of an audit. The DP in company C holds the position of QHSE manager.

11. Would a non-conformity discovered during an internal audit warrant a follow up audit after a corrective action?

The ISM code does not require a follow up audit to check up on the effects of a corrective action of a non-conformity. Such an audit would however become an important part of an audit trail and a good way for the company to evaluate the effect of the corrective action implemented. The need for a follow up audit would depend on the nature of the non-conformity which will be on a case to case basis.

- Company A: In case of a serious non-conformity the use of a follow up audit may be warranted to ensure that the corrective action has worked. This is not a written procedure in the SMS but will be evaluated on a case to case basis.
- Company B: If the audit uncovers serious non-conformity or an extended list of minor non-conformities the company will use a follow up audit to verify that the corrective action has had the desired effect. This however is not a procedure in the SMS and only used in extreme cases. Normal procedure is to check the effects of the corrective action plan on the next annual internal audit.
- Company C: It will depend on the nature of the non-conformity and will be handled on a case to case basis where the objective of a follow up audit is to provide evidence that the corrective action has had the desired effect.
- Company D: Normal procedure is to allow for 3 weeks from the non-conformity is discovered until the corrective action shall be implemented but this varies on the severity of the non -conformity. A serious non-conformity will require an immediate action to remedy the situation with a time span of a week or less. In serious cases a follow up audit may be used to check up on the results on a case to case basis.

A follow up audit to check on the effects of a corrective action can be an important step in the Plan-Do-Check-Act cycle described in chapter 3.2.1. It's surprising that none of the companies have it described as a procedure in the SMS. However all 4 companies will evaluate the use of a follow up audit on a case to case basis. Company A,B and D all had experienced findings of such a nature that a follow up audit was needed to check up on the results of the corrective actions.

12. How does your company actively encourage reporting of near misses and hazardous occurrences even with self-incriminating evidence?

The benefits of reporting near misses and hazardous occurrences is in creating additional barriers to serious accidents both on the ship in question but also on the rest of the fleet. I

expect that companies operating ships in the offshore sector is aware of this and actively work to encourage reporting. During such reporting the shipboard personnel may uncover several non-conformities which will demand a corrective action but at the same time heightening the level of safety.

- Company A: The SMS is based on an open reporting culture with key performance indicators for the numbers of reports from each vessel. The company actively encourages a no blame culture through a focus on safety and improvement of the system and not on assigning blame. The company acknowledges that lack of reporting is a problem for some crew and try to remedy this by promoting a no blame culture from the top management.
- Company B: Conducts one or two annual meetings with all the captains and chief engineers where they are actively encouraged to report. A safety coach employed by the company actively teaches the shipboard personnel how to report and why it's important to report. When accidents occur the shore based management enforces a no blame culture where the learning experience is important. Accidents caused by gross negligence however will be investigated and the culpable part held responsible.
- Company C: Use of near miss reporting cards that can be filled out anonymously and delivered in a post box onboard, and an advocated no blame culture.
- Company D: Actively enforce a no blame culture, which is a part of the company profile. A large number of reports are sent in on each month. A tendency in the company is that the shipboard personnel report near misses as safety observations. Safety observations are written, handled and closed by the shipboard personnel but the shore based management has full access to these files. All near miss reports are handled by the shore based management and experience reports are provided to the fleet. The purpose is not to assign blame but rather to enhance safety. Gross negligence will not be tolerated and met with disciplinary actions.

Each company expressed a goal of a no blame culture which is a vital objective for a reporting culture. Chapter 3.3 outlines the theories about reporting culture/blame culture, it is far more important to receive credible valid feedback than assigning blame to individuals. The DP's interviewed were well aware of this and were willing to indemnify individuals for their actions. Their main goals were the learning experiences achieved from the reports.

13. What kind of procedures are in place for reporting near misses and hazardous occurrences?
    - Reporting with full name Anonymously reporting
    - Reporting with title Other

One finding of the study performed by Phil Anderson in the book Cracking the Code on the subject was to submit the reports anonymously. No Names = No Blame. (Anderson, 2003, pp. 180-183) If the company requires full names on the reports submitted it may become a barrier to the information flow. A culture of reporting is important for the organization and requires the employees to report safety concerns without fear of blame. The information should be confidential and be acted upon by the company in order to motivate the shipboard personnel to continue reporting. A reporting culture is one of the five elements of James Reasons suggested safety culture (Reason, 1997, pp. 195-205).

- Company A: Employees may either: report with full name, report anonymously or report with title based on the nature of the report. Safety observations are allowed reporting anonymously and delivered in a post box to the chief officer. Near misses however are required to be reported with full name to register in the digital system.
- Company B: Use of a digital reporting system which requires the reporting part to write a name into the system. The reports may specify the persons included in the incident either by name or by title but the purpose is not to direct blame but rather to create learning experiences and ensure that appropriate safeguards are established. Safety observations may be filed anonymously by filling out forms and delivering them in a post box located onboard.
- Company C: All reports may be delivered anonymously
- Company D: Safety observations and near misses can be reported anonymously with the use of cards that are filled out and delivered in a box onboard. The shipboard personnel may also write the report directly into the digital system but this will require them to log on with full name.

All 4 companies have procedures for anonymous reporting of safety observations. Safety observations are defined as minor safety instances; both positive and negative reports are valuable for the companies. Company A and B require name on near accident reports while company C and D enables employees to report anonymously. All 4 companies emphasize the importance of a no blame culture.

14. The ISM code compels seafarers to fill an array of forms and checklists. How do you keep your system from becoming merely a paper exercise?

The SMS should be designed as a dynamic system enabling quick change to new safety information and regulations. A common trap for managers is believing more is better and adding new forms addressing recent problems will improve safety. This may be the case up to a certain point where the paper work load of the shipboard personnel becomes a burden. My point is that the forms and checklist should be designed intelligently and addressing issues specific to the ship type. It is crucial to include the shipboard personnel in the process of creating forms and checklist in order to get their input and make them an active part of the SMS.

- Company A: Focus on internal audit, discussing the safety issues with the crew and encouraging the crew to help refine the checklist with the relevant procedures. Annual meeting with the captains are carried out to encourage use of the digital reporting and checklist system. Active work on attitude creation for an open reporting culture by the shipboard personnel the process is the subject of focus.
- Company B: The seafarers have had an active role in the creation of the checklist and are encouraged to provide proposals for refinement. Superfluous points that are not carried out shall be crossed out before the checklist is signed. The shipboard management are trained in safety assessment and encouraged to provide feedback in order to achieve realistic procedures.
- Company C: Active focus on reducing the number of forms and checklists, the company use a digital platform allowing the shipboard personnel to suggest changes and improvements to the checklists and the system.
- Company D: Active work on creating a fully digital system for the checklists and work permits and an effort to reduce the volume of the SMS by replacing parts of it with flow charts. The checklists are standardized and reduced in size to encourage more active use. The company has experienced cases where crew have filled out and filed check lists without reading and or understanding the points.

It's obvious from the responses that all 4 companies takes this dilemma seriously. They are all working with the shipboard personnel to refine the procedures and checklists. The importance of a sense of ownership of the SMS by the shipboard personnel is argued for in chapter 3.2.2. Giving the Shipboard personnel an active role in defining and creating the checklists and

procedures should give them personal empowerment. Company B emphasize that superfluous points on the checklists may be crossed out before the list is signed, giving the personnel power to decide what is relevant for the job at hand. Company D uncovered occurrences where crew members had signed checklists without understanding the points. This is an alarming discovery which the company should work actively to solve.

15. By which performance criteria does the company measure the efficiency of the ISM code?

- Company A: The performance is measured by: Accident statistics, Number of reports (safety observations, near accidents, hazardous occurrences, accidents), Internal audit finding, disruptions of operations and maintenance.
- Company B: The efficiency of the ISM Code is measured by: Masters review, Management review and internal audit. The statistic of numbers of findings, accidents and safety observations are used.
- Company C: The company use the International Marine Contractors Association leading and lagging key performance indicators (IMCA, 2013).
- Company D: Internal audits are scored with a rating in total and ships in the fleet are rated against each other. This lists consists of 250 points and the focus changes according to previous findings, new requirements and changing areas of focus. Based on this each vessel is rated on a scale from 1 to 6 where everything above 4 is a validation that the ship is in compliance with the ISM Code.

16. Does the company use a visual diagram to measure the amount of reports and the severity of the implications of each report? E.g. An accident pyramid.

- Company A: Active use of HSE analysis to assess the personnel health, the test is designed to pick up on: poor health, well-being concerns, lower productivity and increased sickness absence. Route course analysis of non-conformity findings in order to analyze which areas that are affected. Use of ALARP risk matrix to analyze the severity of the reports.
- Company B: The company uses diagrams to actively check the safety statistics of the fleet. Vessels are checked against each other to uncover abnormal reporting numbers. An accident pyramid is also used to check the reporting culture against the theoretical pyramid. The company acknowledges an evident under reporting of near accidents with a skewed accident ration.

- Company C: Each report in the digital system will be designated according to severity and the statistics are integrated in the digital system.
- Company D: The company use Dashboard Intelliprint an online service which provides a tool to create an update statistics and measure the performance (GBS, 2013). This online system is constantly updated with the latest information; reports are color coded with green, yellow and red according to the severity. The Accident pyramid does not reflect the theoretical pyramid with too few near miss reports.

17. Does your company require a minimum of near accident reports per ship on a monthly basis?

- Company A: No minimum requirement for reporting of near accidents but requirements of reporting of 100 safety observations per ship per year. The goal is to actively encourage a proactive reporting culture where accidents are avoided. Safety observations are both negative with items that can be improved and positive with observations of correct safety actions. The goal is to increase the quality and numbers of reports from ships that are under reporting.
- Company B: There are no minimum requirements for reporting within the company. But the issue has been discussed and proposed as a project for short term in order to increase the number of reports.
- Company C: There are no requirements for reporting.
- Company D: The company has key performance indicators for reporting, each ship must report a minimum 250 near misses and safety observations are minimum 3000 a year. Current figures for the fleet are below the 250 mark on near misses but almost at a 5000 mark for safety observations. Many of the safety observations are analyzed to be more severe and should be reported as near misses.