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POSSIBILITIES TO INCREASE QUANTITY OF REPORTS FROM CREWS ON BOARD TO AVOID ACCIDENTS AND TO IMPROVE MARITIME SAFETY

Master's Thesis

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Tallinn 2016

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ABBREVIATIONS

IMO – International Maritime Organization

ISM – International Management Code for the Safe Operation of Ships and for Pollution Prevention

SMS – Safety Management System

DP – Designated Person

EMDE – Electronic Maritime Information System, Electronic Maritime Document Exchange

SOLA – The International Convention for the Safety of Life at Sea

VDR – Voyage Date Recorder

PSC – Port State Control

ECDIS – Electronic Chart Display & Information System

TRAFI – Finnish Transport Agency

EMDE – Estonian Maritime Documents Exchange

HSE – Health Safety Environmental

OOW – Officer in Charge Of a Navigational Watch

EMA – Estonian Maritime Administration

IMISS – The International Maritime Incident and Near Miss Reporting Conference

KMRC – Kotka Maritime Research Centre

IACS – International association of classification societies

HSE – Health, Safety, Environment

EU – European Union

HELCOM – Baltic Marine Environment Protection Commission

DEFINITIONS

ISM Code – 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

Near-miss – a sequence of events and/or conditions that could have resulted in loss. This loss was prevented only by a fortuitous break in the chain of events and/or conditions. The potential loss could be human injury, environmental damage, or negative business impact (e.g., repair or replacement costs, scheduling delays, contract violations, loss of reputation).

Safety Management System – an organized system planned and implemented by the shipping companies to ensure safety of the ship and marine environment.

Non-Conformity – when objective evidence indicates non fulfilment of a specific requirement stated by the safety management system, a situation of non-conformity is considered to have occurred.

Major Non-Conformity – an extremely serious situation which poses serious threat to the safety of personnel, ship, or the environment. It indicates a major lapse in effective and systematic implementation of the ISM code. Major non conformity would require immediate corrective action to be taken by the ship's management.

Observation – a statement of fact made during a Safety Management Audit and sustained by objective evidence.

IMO – the International Maritime Organization – is the United Nations specialized agency with responsibility for the safety and security of shipping and the prevention of marine pollution by ships.

Nautical Institute – an international representative body for maritime professionals involved in the control of sea-going ships

BIMCO – the world's largest international shipping association, with more than 2,200 members globally. We provide a wide range of services to our global membership – which includes ship owners, operators, managers, brokers and agents.

Kotka Maritime Research Centre – a research centre in Kotka formed by combining the expertise of leading Finnish universities and research institutes in the fields of maritime transport and logistics, maritime safety and the marine environment. KMRC operates in close collaboration with the maritime industry, universities, institutes, authorities and organisations both nationally and internationally.

IACS is dedicated to safe ships and clean seas, IACS makes a unique contribution to maritime safety and regulation through technical support, compliance verification and research and development.

ABSTRACT

The primary purpose of the present thesis was to give advice and make recommendations about increasing the quantity of reports from crews on board for avoiding accidents, improving maritime safety and reporting systems. Reporting systems in maritime industry are used to analyse and prevent accidents, and to minimise human casualties, injuries and environmental impact. The author believes that the key for a good reporting system is the feedback and the number of reports from crews on board to the management ashore. The global problem in the merchant business is the lack of reports from the crews on board.

The research methods used by the author are comparative and statistical analysis, interviews, and questionnaires. In the first part of this thesis the author examines IMO recommendations and revised guidelines for reporting systems and expresses his point of view about these recommendations. The author then gives an overview of the present reporting systems used in Finland, Sweden, Denmark and Estonia and in the offshore sector. Afterwards, the author analyses and compares the basic theories of the reporting systems. The author also gives an overview of the reporting systems expert assessments, analyses the benefits and obstacles of incident reporting systems.

In the research section of the thesis a survey was conducted among professionals, responsible for maritime safety. Conclusions in the research section were made based on results of the received questionnaires, the author's point of view and personal experience in the field.

The author reached a conclusion that the main possibilities to increase the reports form crews on board are:

- Simplification of reporting systems by upgrading software;
- Supporting a "no blame" culture in the shipping companies and on board of the vessels;
- Simplification of reporting process;
- Decreasing the paperwork;
- New amendments to ISM code from IMO based on reporting practical experiences;
- Improving the qualification and training of DPs;
- Improving the safety feedback process from offices;
- Implementing time limitations for preparing safety feedback for fleet;
- Considering safety related experience of the offshore industry.

- Creation of a common incident reporting system of European Union waters

Key words: reports, incidents, safety culture, ISM, designated person, feedback.

INTRODUCTION

The number of incidents in the Baltic Sea region has been steadily increasing within the last five years. This tendency was evidenced by the Baltic Marine Environment Protection Commission (HELCOM), its Contracting States and Ministry of Economic Affairs and Communications of Estonia. Compared to 2010 the total number of accidents increased by 15% in 2014. That is why the Estonian Government has highlighted the improvement of safety at sea as one of its priorities in the „Estonian Maritime policy 2012-2020" development program. Therefore, the issue of incidents and safety at sea is essential and is of immediate interest to the shipping companies and the environment, so the author has decided to study it in the present master's thesis.

After assessing different documents in search of the causes of the incidents, the author has come to the conclusion that the main cause of the incident is the lack of information on the incidents themselves, i.e., the reports coming from the vessels are faulty, are not submitted in time or are not submitted at all. It is plausible, the global problem in the merchant business is the lack of reports from the crews on-board, which fundamentally invites all the maritime report system to failure from the beginning. Thus, the author's hypothesis is that "it is possible to improve the maritime safety and avoid incidents with lethal outcomes by increasing the number of reports from crew". Since this issue has not yet been thoroughly assessed in Estonia, the author will focus on the Estonian maritime sector.

In order to confirm or disprove within named hypothesis the author has stipulated a research problem and research questions. The research problem of the master's thesis is a situation where the number of reports is small, thus it is not possible to give a good safety feedback to the vessels and create good safety databases. The research questions that the author will try to give an answer to in the present master's thesis are as follows:

1. What are ISM code recommendations and revised guidelines for reporting systems?
2. How do the companies in the Baltic Sea region implement the ISM code recommendations and revised guidelines?
3. What reporting systems are used in the Baltic Sea region?
4. How reports are done in the Estonian maritime sector?
5. What is the opinion of the professionals dealing with the safety culture at sea regarding incident reports?

The purpose of the present master's thesis is to give advice and recommendations on increasing the quality and quantity of reports from the crews on board to improve maritime safety. In order to attain the purpose, the author is going to analyse existing reporting systems in Europe in order to understand their quality and working process as well as the best practises, assess different documentation and legal acts connected to the area, examine the Estonian maritime policy, and conduct a series of interviews with persons dealing with safety at sea and working in the maritime sector.

The research methods used by the author are comparative and statistical analysis, interviews, and questionnaires.

In the first part of this thesis the author examines ISM Code recommendations and revised guidelines for reporting systems and expresses his point of view about these recommendations.

The author then gives an overview of the present reporting systems used in Finland, Sweden, Denmark, and Estonia and in the offshore sector. Afterwards, the author analyses and compares the basic theories of the reporting systems. The author also gives an overview of the reporting systems expert assessments, analyses the benefits and obstacles of incident reporting. In research part of this thesis the author describes research methods used in obtaining the research purposes and conducts a survey among professionals, responsible for maritime safety. In the end, the author makes conclusions based on results of the received questionnaires, the author's point of view and personal experience in the field.

1. THE ISM CODE

1.1 Revised guidelines for the operational implementation of the international safety management (ISM) code by companies

(MSC-MEPC.7/Circ.8 Annex, page 1)

The ISM Code requires that company must be informed about each dangerous or hazardous situation happened in high risk working areas so it can be analysed, investigated to prevent future happenings. Most important part in this system stands for near-miss reporting, because it is believed according past and present experiences that near-misses are helpful in gaining and sharing information to prevent bigger accidents it the future. *Author believes that it is highly important to understand the systemisation of ISM Code itself to go deeper with investigation and research of near-misses themselves, since near-miss reports are the part of ISM Code.*[1]

The ISM Code was adopted by the Organization by resolution A.741 (18) and became mandatory by virtue of the entry into force on 1 July 1998 or 1 July 2002 (depending on ship type) of SOLAS chapter IX on Management for the Safe Operation of Ships. The ISM Code provides an international standard for the safe management and operation of ships and for pollution prevention. The ISM Code requires that Companies establish safety of the ISM Code, and in addition that the Companies develop, implement and maintain a safety management system. The application of the ISM Code should support and encourage the development of a safety culture in shipping. Success factors for the development of a culture that promotes safety and environmental protection are, inter alia, commitment, values and beliefs and clarity of the Safety Management System. *Author agrees with the guidelines for the operational implementation of ISM code and thinks that the most important of them is using gained experience in order to improve ISM and SMS of ships and develop a more advanced and safer system.*

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[1] The author's opinions, conclusions and recommendations are given in italic type.

1.2 Development of the safety management system

(MSC-MEPC.7/Circ.8)

As has already been mentioned above, the ISM Code requires that Companies establish a safety ISM Code and develop, implement and maintain a safety management system (SMS). Given the self-regulatory principles of the ISM Code, the internal verification and review processes are key elements in the implementation of each SMS. The Company should consider the outcome of internal audits, internal SMS reviews and analysis of non-conformities, accidents and hazardous occurrences to enhance the effectiveness of operations and procedures within their SMS.

In order to comply with the Code, the company should:

- Designate a person or persons with direct access to the highest level of management who should monitor the safe operation of each ship (section 4);

- Ensure that adequate resources and shore-based support are provided to enable the designated person or persons to carry out their functions (section 3.3);

- Define and document the master's responsibility with regard to reviewing the safety management system and reporting its deficiencies to the shore-based management (section 5.1);

- Establish procedures for reporting and analysis of non-conformities, accidents and hazardous occurrences (section 9.1);

- Periodically evaluate the effectiveness of, and when needed, review of the safety management system (section 12.2); and

- Perform internal audits to verify whether safety management activities comply with the requirements of the safety management system (section 12.1).

1.3 Designated person

(MSC-MEPC.7/Circ.8)

A key role, as identified by the ISM Code, in the effective implementation of a safety management system is that of the Designated Person. This is the person based ashore whose influence and responsibilities should significantly affect the development and implementation

of a safety culture within the Company. The designated person should verify and monitor all safety and pollution prevention activities in the operation of each ship. This monitoring should include, at least, the following internal processes:

- Communication and implementation of the safety and environmental protection policy;

- Evaluation and review of the effectiveness of the safety management system;

- Reporting and analysis of non-conformities, accidents and hazardous occurrences;

- Organizing and monitoring of internal audits including verification of independence and training of internal auditors;

- Appropriate revisions to the SMS;

- Ensuring that adequate resources and shore-based support

To enable the designated person to carry out this role effectively, the Company should provide adequate resources and shore-based support. These include:

- Personnel resources;

- Material resources;

- Any training required;

- Clearly defined and documented responsibility and authority; and

- Authority for reporting non-conformities and observations to the highest level of management.

Designated Person(s) should have at least the qualifications, training and experience as set out in MSC-MEPC.7/Circ.6, to effectively verify and monitor the implementation of the safety management system in compliance with the ISM Code.

The author believes that DP is a very important role in developing successful and safe SMS system. In order to maintain and improve the system, DP must have enough experience and knowledge to share with the most experienced person on board who is the Master of the vessel, otherwise there is no use in DP, because he cannot provide the vessel with any advice regarding the safety matters. Moreover, the DP should be the person to control all the information flow and all the communication between the vessel and the office in case of incidents. The Figure 1 shows the present information flow in case of accident. As it is seen, the information goes from the vessel to DP and from DP to the Company and then back to the

vessel. The author believes that this information flow is not correct and the information concerning the incident from the company must go back to DP as shown in the Figure 2.
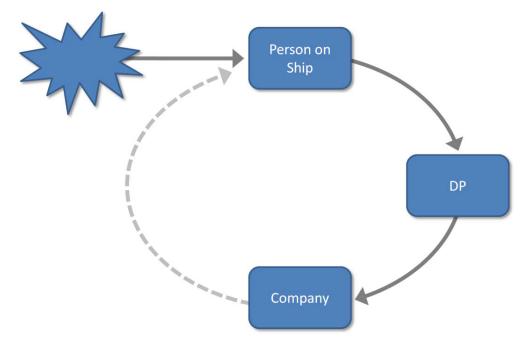

Figure 1 Information flow of fatal workplace accidents, Source: Vepsäläinen, Lappalainen 2010
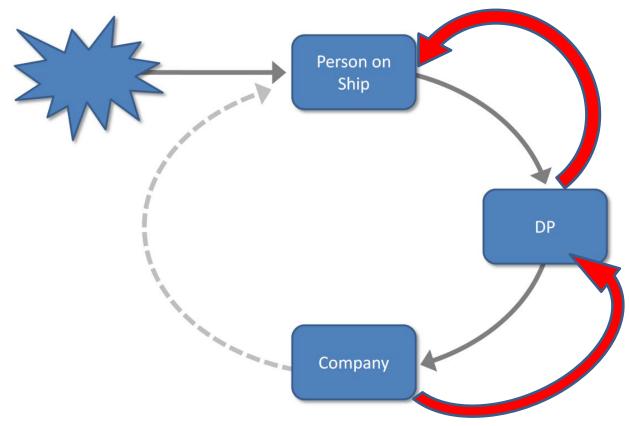

Figure 2 Information flow of fatal workplace accidents as seen by the author

1.4 Review of the safety management system

(MSC-MEPC.7/Circ.8)

The Company should periodically review and evaluate the effectiveness of the SMS in accordance with procedures established by the Company. Furthermore, it is one of the master's responsibilities to periodically review the safety management system and to report its deficiencies to the shore-based management. Management reviews support Companies efforts in achieving the general safety management objectives as defined in section 1.2.2 of the ISM Code. Based on the results of such reviews, the Company should implement measures to improve further the effectiveness of the system. The review should be performed on a periodical basis as defined by the Company or when needed, e.g. in case of serious system failures. Any deficiencies found during the management review should be provided with appropriate corrective action taking into account the Company's objectives. The results of such reviews should be brought to the attention of all involved personnel in a formal way. The management review should take into account the results of the internal audits, any non-conformities reported by the personnel, the master's reviews, analysis of non-conformities, accidents and hazardous occurrences and any other evidence of possible failure of the SMS, like non-conformities by external parties, PSC inspection reports, etc.

Authors believes that electronic software based reviews of reporting systems must be present in review schedule as well. Nowadays, more and more reporting systems are completely transferred into electronic format, however, during the use of electronic reporting system, some errors and software based issues may occur. Author had personal experience working with electronic reporting systems, and it is very important to have IT support at hand. This kind of issues may put entire reporting process at danger, because the crew often do not have authorisation or computer skills to solve serious IT problems.

1.5 Reporting and analysing of non-conformities, observations, accidents and hazardous occurrences

(MSC-MEPC.7/Circ.8)

The SMS should contain procedures to ensure that non-conformities, observations and hazardous occurrences are reported to the responsible person of the management. The Company should have a system in place for recording, investigating, evaluating, reviewing and analysing such reports, and to take action as appropriate. The system should ensure that such reports are reviewed and evaluated by the responsible person(s) in order to determine appropriate corrective action and to ensure that recurrences are avoided. The evaluation of reports may result in:

- Appropriate corrective and preventive actions;

- Amendments to existing documents (procedures, instructions, check- lists, etc.)

- Development of new documents (procedures, instructions, check- lists, etc.)

The responsible person should properly monitor the follow-up and closing-out of the non-conformities/deficiency reports. The receipt of reports should be acknowledged to those persons who have raised the reports. This should include the status of the report and any decisions made.

The ISM Code states that company should encourage the reporting of near-misses to maintain and improve safety awareness. The reporting and analysis of such incidents are essential for an effective risk assessment by the Company, especially where accident information is not available. *The keyword in this circular is "encouragement". Companies should not put any pressure on its workers by "encouraging to report near-misses or non-conformities". Often "encouragement" means that crewmembers must report the fixed amount of near-miss reports in a limited time. This kind of a negative approach forces the crewmembers to make up unreal near-miss situations, which will not be helpful in improving the safety, it would only deprive crewmembers' of their free time, disturbs them and develop a blame culture between vessel and office.*

2 INCIDENT REPORTING THEORIES AND SYSTEMS

2.1 Incident reporting theories

In this chapter author will describe and review the most important and basic theories which are used in today's most common incident reporting systems. It is important to know this basic concept because it will help to do a better research and get better results in improving and measuring state of safety. Here the H. W. Heinrich's accident pyramid is often used. Author will examine the pyramid more closely, and will assess its use in improvement and measuring of safety.

Author can underline three theories based on the accident pyramid:

- Iceberg model - Amount of accidents increases from fatal to serious casualties, less serious casualties to near- miss cases. (Heinrich 1959)

- Domino theory – Chain of events, where various reasons unavoidably follow each other. (Heinrich 1959)

- Identical causation hypothesis – Less serious and serious incidents are caused by the same reasons. (Heinrich 1959)

2.1.1 Iceberg model

The model for accident rations was presented in 1931 in Herbert William Heinrich's book of Industrial Accident Prevention. He studied many accident reports of various American companies. His conclusion was that for every serious accident there are 29 less serious accidents and 300 near-miss cases. According Heinrich's definitions:

- Serious accident - incident, where an insurance company or a federal bureau was informed

- Less serious accident – case, where first aid was needed

- Near- miss case – injury was avoided, but the probability for an injury or property damage was high.

Heinrich's accident ratio model is often mentioned as Heinrich's iceberg model (Figure 3).

Serious accident/
Fatal injury

Less serious
accident/
Serious injury

Near-miss case / Less
Serious injury

Figure 3 Heinrich's iceberg model, the drawing prepared by the author

According to the author's review, many have tested the iceberg model and it is widely accepted (for example Vepsäläinen 2010). Author believes that the results of iceberg model would be more precise if there was a bigger amount of reports. Yet the precision depends on how one defines serious, near-miss or less serious accident. By increasing the incident reports from crews on board, the amount of near-miss cases/ less serious injuries, less serious accidents/ serious injuries and fatal injuries/ serious accidents can be minimized.

2.1.2   Domino theory

Domino theory (Figure 4) is proposed on the grounds of the accident pyramid and one of the most referred to as mostly used accident causation model. According to the domino theory, four accident chain parts can be found for every injury or accident occurrence, which all need to take the place for injury or accident to occur. The injury itself is a last piece of domino, the processes last stage, which comes out from wrong guidance of social environment, fault of a person, unsafe act or mechanical, physical hazard and then accident and injury. Same idea is in Reason's "Swiss-cheese" accident model (Figure 5).
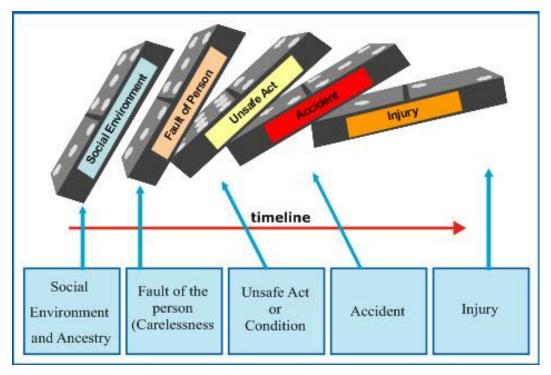
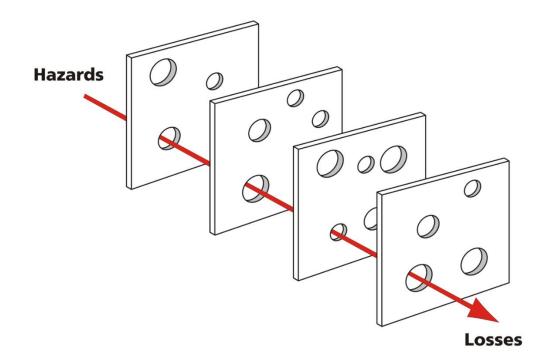*Figure 4 Heinrich's Domino Theory. Source: Disaster Management Institute, 2016.*

Figure 5 Reason's "Swiss cheese" accident model. Source: S. Bøen, 2016

Together there are eleven different accident models. Therefore, the Domino Theory is just one of many. The fact that the theory was developed more than hundred years ago, and is still used, suggests that it is still relevant to the marine sector.

2.1.3   Identical causation hypothesis

Third hypothesis of Heinrich's accident pyramid described serious and less serious accidents, which are caused by the same underlying reasons (Heinrich 1959). Identical causation hypothesis says that serious and less serious accidents have an identical chain of causes, the fall of dominos is in the background. According to this idea, the conclusion has been made that by studying less serious accident and near-miss reports, the serious accidents and fatal injuries can be prevented. IMO's opinion about identical reasons theory on near-misses and already occurred accidents is mentioned in its reporting guideline: "Learning the lessons from near-misses should help to improve safety performance since near-misses can **share the same underlying causes as losses**." (MSC-MEPC.7/Circ.7, 2008)

Improvement of safety in different sectors has begun to focus on near-misses because of their relatively higher amount compared to actual incidents, so their data is more informative. It was done according to the similarity between all three accident types (serious casualties, less serious casualties and near-miss cases).

Despite its broad usage, identical causation theory has been criticized as well. Theory has been criticized by Petersen (1971), who states that there are too many different reasons in effect of the origin serious of less serious and serious casualties. This point of view is called the different accident causation hypothesis.

2.1.4   Summary

As it is seen from the author's examination, the clear switch can be seen from accident investigation to near-miss reporting, which depends on the amount and quality of incident reports. If there is a lack of reports, the near-misses and incident reporting systems become questionable.

2.2 Incident reporting for improving safety

The number of incidents in the Baltic Sea region has been steadily increasing within the last five years. This tendency was evidenced by the Baltic Marine Environment Protection Commission (HELCOM) and its Contracting States (Figure 6). Compared to 2010 the total number of accidents increased by 15% in 2014.

Figure 6 Number of reported accidents in the Baltic Sea. Source: HELCOM's annual report, 2014

As for the causes of the incidents, the author has analysed the HELCOM's annual reports for the last five years and has established that in 1/3 of cases there was no information about the incident. If in 2010 and 2012 the cause of the accidents was reported as unknown for 36% of the accidents, then in 2013 it accounted for 43% (see Annex 1). It was not possible to identify the cause of the incident, thus it was not possible to improve the safety culture, which has led to the increase of incidents. It is also plausible that the reports coming from the vessels were faulty, were not submitted in time or were not submitted at all.

Since the incidents are increasing and the causes are often unknown it is crucial to develop and implement a good reporting system. The key for a good reporting system is the feedback and the number of reports from crews on board to the management level ashore. The global problem in the merchant business is the lack of reports from the crews on-board, which

fundamentally invites all the maritime report system to failure from the beginning. Without a sufficient number of reports, it is impossible to analyse, review or assess dangerous situations, which may be harmful to working personnel in the future or even cause deaths. Furthermore, it is impossible to implement and improve company's safe working policy, since without incident reports it is completely unreliable and formal.

Next, the author assesses some national and international incident report systems and also Estonian requirements for incident reporting.

2.3 National incident reporting systems

2.3.1 Sweden "Insjö"

The project "Insjö" started in 1997, after some major upgrades and tests, launched in 2002 (Brafelt 2010). With the support of Swedish Ship owners Association and Swedish Transport agency in 2002 Insjo was voluntary usable electronic internet web based application. All the incidents and possible near-misses where reported by the ISM (International Safety Management) responsible officer of any individual shipping company. The specialized administrators monitored the flow of the accident and near-miss reports to the system. After receiving report information, the administrator of the system deletes any contact details of repots, the information that may become personal further on.

All together the electronical filled internet reporting form of Insjo is only one A4 page long. It consists of information of the type of ship, the type of event, contact information. There are only 4 questions in the application reporting form of Insjo which in my opinion simplifies the reporting procedure. All the reports and the database of other reports can be used form same webpage. All the information is reachable for anyone who can access the web. The languages of the reports can be in English or in Swedish, it is possible to choose the language from the webpage and also it depends from the language, on which the reports where done.

2.3.2 Finland "Foresea"

Using the experience of Swedish reporting system "Insjo" (next subchapter), the Foresea, designed reporting system for maritime personnel, was started in operation in 2010

summer with help of ship owners and the TRAFI. The monitoring company is the same which monitors the Swedish "Insjo", the ICC (IPSO CLASSIFICATION AND CONTROL AB). Due to this fact, Foresea has a rich database of incidents already from the launching date. The database contains all the English version near-misses from the Swedish system. Other Swedish reports are being translated into Finnish and added into the system (Finnish National Reference Group 2014).

Electronic application of the system's incident reporting includes in itself the type of ship, type and description of event (Foresea 2014). All the contact information is being monitored only for feedback porpoises. When the reporter registers all the information about the incident, the link to the reporter itself is being deleted automatically. Same as the in "Insjo" system, only designated persons of the shipping companies are eligible to send various reports, but after they are registered as users of the Foresea system.

2.3.3 Denmark "Nearmiss.dk"

Similar with Swedish Insjo, the Nearmiss.dk was introduced in 2007 (Brafelt 2014). It has been also created with assistance of Association of Danish Ship-owners. The Private consulting company is administrator of Nearmiss.dk. All the users of this system can be seen on its official webpage.

Similarly with Insjo, Nearmiss.dk is anonymously working reporting system and also all the reports are going through the company's designated person. The list of users (companies) can be found on webpage. In Nearmiss.dk near-misses and non-conformities are the only types near-miss is collecting, excluding other incident reports. To get access to the reports database, user must be registered and logged in into the system. The porpoise of logging in operation is that to restrict the access to the data, which may be used in inappropriate studies or comparisons. This explains the fact that the reporting system is only an experience database and therefore can't be used as a source for statistical study. (Nearmiss.dk 2014)

2.3.4 Estonia "EMDE"

EMDE application was designed for simplifying such working processes with maritime documents as:
- Preparation

- Submission

- Simplification of Inspection

Documents are prepared by the companies dealing with ship management or by their representatives such as captains and agents. Some shore-based companies also deal with these documents in EMDE environment. The chief processor of the Electronic Maritime Document Exchange is the Ministry of Economic Affairs and Communications.

Pursuant to § 75[1] (3) of the Maritime Safety Act of Estonia, the following shall be entered in the Electronic Maritime Document Exchange in the cases specified in international agreements, legislation of the European Union, laws or legislation enacted on the basis thereof:

1) Information and documents regarding entry of ships into ports;

2) Information regarding dangerous goods;

3) Security information;

4) Information regarding ship-generated waste and cargo residues;

5) Information regarding ordering of an icebreaker;

6) Notification of pollution;

7) Notification of a marine casualty or marine incident;

8) Information regarding goods;

9) Information regarding the pilotage of a ship;

10) Other information regarding maritime transport.

EMDE environment is open to the public portion. Anyone can log in by Estonian ID card and access it without previous registration. **User rights** for the system can be obtained by EMDE support persons. It is also possible to obtain a user name and password to log in easier without ID card. The standard way to obtain the rights is to send a digitally signed application to EMDE help desk, it should be signed by an authorized signatory. The respective addresses and forms are on EMDE login page.

Author has personal experience working with EMDE system. His point of view is that EMDE is complicated, non-intuitive system to work with. Mostly, it is focused on working with maritime documents as mentioned in topic 4.1. However, according the same 4.1 topic, the notification of a marine casualty or marine incident shall be entered in EMDE. It is very complicated to do that. First of all, user rights must be obtained which in reality takes too much time in case of real near-miss or incident. Also incident report can be done only after reading

and understanding the complicated environment of EMDE. Additional instructions from colleagues might be required.

Author's research shows that at present, there is no reporting system in Estonia similar to "Insjo", "Foresea" or "NearMiss.DK". The procedure of reporting in case of marine casualty and marine incident is regulated by the Maritime Safety Act of Estonia, § 72, 72[1]. Notification of marine casualty and marine incident. According to circular 5-1-7/7384[2], issued by Estonian Maritime Administration, there are cases, when incident report reaches the Estonian Maritime Administration not directly from Master or Owner. In addition, the descriptions of incidents are often not meeting the requirements of § 72, 72[1] of the Maritime Safety Act. The reports are often made hours in some cases even days after the incidents took place. Author suggests that Estonia must implement its own national reporting system based on examples of Scandinavian countries who are successfully using national reporting systems. It would improve overall safety in maritime sector and simplified, open access to the digital reporting system could increase the amount of reports.

2.4   International incident reporting systems

2.4.1   CHIRP

For the maritime sector the CHIRP reporting system was launched in 2003 it has diversified into maritime sector from aviation industry at the invitation of the UK Department of the environment, Transport and the regions(CHIRP 2014), where it has been working since 1982. It is being used by global aviation and maritime industry. Systems are funded by the UK Department of Transport and the Civil Aviation Authority. The CHIRP acronym means Confidential Hazardous Incident Reporting Program. Leisure users, fishing industry and of course anyone from the maritime sector can sent reports to the CHIRP. The CHIRP administrators are confirming every report manually so the reporting itself is not completely anonymous, although 100% confidentiality is guaranteed during the reporting process. Information collected from the CHIRP can be found in newsletter Maritime Feedback, which

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[2] http://www.vta.ee/public/ringkirjad/Ringkiri_3784.pdf

is published quarterly. Maritime Feedback is free and can be electronical founded on CHIRP web site www.chirp.co.uk. It is also available in printed version as well.

The review of CHIRP (2014), including representatives was performed by the Fishermen's Organizations, Marine Accident Investigation Branch, Maritime and Coastguard Agency. Their unite conclusion was that there is a continuous need of CHIRP system so the continuous improvement will be performed further on to get more precise reports and quality from the CHIRP system.

2.4.2 MARS

Together with the CHIRP system, there is one more international reporting system made by Nautical Institute (MARS 2014). Acronym of MARS is Mariners Alerting and Reporting Scheme. Nautical Institute is an international representative boy for maritime professionals involved in the control of sea-going ships. NI provides a wide range of services to enhance the professional standing and knowledge of members who are drawn from all sectors of the maritime world (Nautical Institute 2015). There is two possibilities for reporting to the system, it can be done through the internet, or by printing out the form and sending to the Nautical Institute directly. The person who reports the incident can be anyone involved in the maritime industry, including commercial, naval and fishing industry and as well pleasure users (MARS 2014). Comparing to other systems reporting forms, the MARS reporting form is quite detailed. It includes some questions about reporter's information, type of ship, amount of crew members and officers on board, some details about the present or past voyage. Also the incident details like weather conditions, time and place must be informed in the report. There is a special open question field for the accident description or near miss report which must be filled during the reporting. Full confidentiality is guaranteed to the reporter. All useful reports of incidents, are being published in the monthly journal of NI called Seaways. Seaways is free for Institution members, others must pay additional fee for the journal.

2.5 Offshore reporting systems

Author had chance to work in Offshore Windfarm construction project. Offshore wind development is raising a different access challenge comparing to merchant fleet operations,

involving frequent transfer of small work parties between access vessels and wind farm structures; a worker undertaking routine offshore operations, potentially on a daily basis over the life of an offshore wind farm, is likely to undertake many thousands of transfers during their career. Marine energy development presents different challenges, particularly in relation to operation in strong tidal currents. Every transfer exposes the people involved to a number of significant hazards; given the expected frequency of transfers, extremely robust and repeatable systems are required in order to ensure that the overall risk remains at a tolerable level. Author thinks that safety matters must be improved on daily basis in this kind of project due to routine operations performed by workers, which involve a high risk to safety. Therefore different approaches to incident reports should be developed.

2.5.1 KRIMA

KRIMA enables all incidents and near misses to be shared on a global platform with all corrective measures also detailed. The vessels will report any incidents or near misses to SMC who will relate this information to the EHS Officer for consideration of input to the KRIMA system .The vessel will also if the near miss or incident merits create their own reports as per their ISM system guidelines and send this to SMC to again be attached as part of the evidence to the KRIMA report. The EHS Officer due to his qualifications and experience is the person who compiles the reports to ensure they are fit for purpose. A KRIMA is raised if merited and published on the Vessel Safety notice board .All on signing technicians receive an update on KRIMA reports that have been submitted whilst they have been off rotation at their back to work safety briefing . Each technician is provided by its personal email, where he can see the safety updates. Each technician must confirm the familiarization of updated safety announcements by replying through the personal email to EHS leader.

Author sees potential in offshore reporting systems. Such operations as simple safety updates, which are provided to project newcomers based on crews working rotations are very usable and easy to use. Also the reporting operation is simplified by the presents of independent EHS Officer who is responsible for preparing reports on standardized basis for importing into the KRIMA. Thus, there is minimum paperwork for the reporters.

2.6   Summary

After comparing different reporting systems, it became clear that in their essence all the systems are similar, they use similar reporting forms, and form an information flow starting from a person (reporter) on vessel to DP, then to the international system. It is also important, that the reporter does not have to register to fill in the form, the form itself is intuitive and easy to fill (Figure 7).

Figure 7. Foresea reporting system. Source: Foresea official site

Therefore, the author believes that Estonia must create its own national reporting system based on successful examples of Scandinavian countries.

The importance of reports was also highlighted by the specialists working with incident reporting system. The International Maritime Incident and Near Miss Reporting Conference (IMISS) is organized annually and brings together scientists working on maritime safety, corporate representatives, authorities and experts from maritime sector. Therefore, the author considers their findings on the conference as important and relevant to the research and will assess and analyse them in the following chapter.

3 EXPERT ASSESMENTS OF REPORTING PRACTISES

The 2011 IMISS was organized in Helsinki. Expert group sessions were arranged as part of the conference program, and in this chapter author will review, analyse the results of the conference, and compare different points of view of the group members.

Expert groups were planned so that the participants of the conference were divided into four teams of ten participants. Two moderators from each group were chosen to lead the discussion. In each group, there were many representatives from different sectors of maritime industry so that each group would have different points of view and various experience to bring out various perspectives in every group: Maritime authorities, maritime organizations, shipping companies, researches and other stakeholders. In addition to Estonian participants, there were also participants from Sweden, Denmark, Norway, Finland and Great Britain. The groups discussed two main topics:

1. Benefits and obstacles of incident reporting,
2. Future development of incident reporting in the shipping industry.

3.1 Benefits and obstacles of incident reporting

According to the task, the following questions were made for the groups 1 and 2:

- What benefits can shipping companies have from near miss and incident reporting?
- What benefits can the shipping industry have from a shared system?
- What practical obstacles and other obstacles there are to near miss and incident reporting inside the company or to a shared reporting system (such as ForeSea or Insjö)?
- How could these obstacles be overcome?

All members of group 1 saw benefits in improving safety by not repeating the same mistakes and also in learning from others. The reporting is affected by the safety culture, but the relation between them also works in opposite direction. The safety culture at sea can be improved through reporting on board. Various costs can be reduced thanks to the reporting (less accidents and sick leave days, less insurance cases, etc.) The advantage of having databases for incidents is particularly clear for small companies, which can benefit from a larger and more diverse data set. Trends can be discovered and Statistical analyses can be performed.

Compliance with regulations and company politics can be easily followed if company has built in reporting system. Database of incident reports can be used for safety briefings and sharing experience and avoiding serious accidents and injuries.

One of the main restrictions inside a company is that people are being blamed or feel unconfident in reporting, or they are not aware in the value of reporting or even not aware of it. Most crew members have periodical contracts, and they may fear that if they will report, they can be considered as incompetent, and they working contract can be cancelled. The companies can also be incompetent. One issue is that company's paper work management have problems and there is not enough resources to deal with it. The time needed for reporting is identified as one of the most important obstacle to reporting to a database. Owner's perspectives were discussed also. Does owner agrees to share information about safety issues to other companies? The question regarding justification of investment cost in incident reporting was also reviewed. During the discussion, it was also suggested that some crew members should be instructed and then returned to their positions to share, train and teach other crew members about importance of incident reporting. Some suggestions were about improvement and simplification of reporting process itself and reporting systems/procedures as well.

Group two had a different approach and point of view of the problem. Group two divided benefits into two: benefits to shipping companies and benefits for the all shipping industry. They highlighted the positive effect of reporting, for example, on the openness and functionality of the work environment, on job satisfaction, on the development of procedures and on the safety level and safety culture on board. At the shipping industry level, the image of shipping is improved by reporting and it enables more systematic analyses and actions to avoid and decrease risks. According to the group two, the main reporting obstacles are management and safety culture related issues, for example, the lack of top management commitment or the existence of a blame culture in the company or on vessels, but other reasons were reported also. If there is high turnover of employees in the company or employees have a large amount of work to do then it is very hard to keep stable reporting practise. It's difficult to measure finance investments of a reporting system. Near misses might not be considered as near misses, but as normal routine. Some psychological reasons were identified also, for example, admit faults and reluctance to written procedures (see Annex 2 for the answers). The both groups gave advice for overcoming the obstacles: improving top management commitment (e.g., feedback of

communication and reporting, allocation of recourses), the developing reporting practises and other general advice, such as manning strategies.

Author absolutely agrees with the answers of both groups which have stated that incident reporting is not only the main key to safety improvement, but it also brings other benefits, such as better job satisfaction, better working environment and improved work procedures. There were disagreements on whether reporting increases or reduces costs. Many concluded that if accidents and incidents can be avoided, it reduces costs, but some group members also stressed the maintenance costs of running a reporting system. It is hard to assess the system's benefits financially, because generally it's impossible to know what would have been without the system.

3.2   Future development of incident reporting in shipping

The groups also discussed the future development of incident reporting in shipping and four questions were represented to the groups for the discussion:

- What should be done to increase near miss and incident reporting in shipping companies/in the shipping industry?
- Who should be responsible for different tasks, e.g. what is the role of authorities?
- Does the shipping industry need more near miss and incident reporting?
- How could the co-operation between stakeholders be developed?

The first group claimed that the first priority is the development of a no-blame culture, for the creation of which the company should have enough power and resources. This group characterized the promotion of incident reporting as the "circle of good reporting".

1. Management commitment. The management should promote reporting by setting targets for reporting and motivating personnel to submit reports.
2. Feedback and rewards. Management mast be ready to give feedback as soon as possible and could consider some rewards for reporting, which do not necessarily have to be monetary rewards. Feedback should be given by interacting with personnel and the results and conclusions of reports should be published regularly e. g. as graphics or statistics.

3. Corrective actions. The company must be confident that corrective actions are made and all employees are informed about them

4. Training. It is required in order to point out the importance of reporting and to implement corrective actions properly

5. A no blame culture must be implemented and promoted with exemplary behaviour of the management

The second group gave more attention to the issues that possibly will have an effect on future development of incident reporting. The group created a rating of the issues according to the importance, first 5 issues have high importance and following three were identified as less important issues.

1. **Creating a no-blame culture**. The group members were confident in that a blame culture is a main issue that restricts reporting

2. **Feedback**. Reports should be closely reviewed by company and safety related issues as well and good feedback must be given to the employees after review of reports

3. **Training**. New crew trainings and refresh training for present workers were specified to creating a safe reporting culture. Improved procedures should be applied for crew selection. Education system for seafarers should also be updated all the time, such as bringing up issues like incident reporting during the courses in which the seafarers participate.

4. **Sharing information and cooperation**. Communication between the ship an the company is important factory according to the group's point of view. Companies should inform about the benefits or reporting to their employees to encourage them to make more reports

5. Sharing experiences and benefits of reporting

6. Anonymous reporting

7. Mandatory reporting. Mandatory reporting was mentioned in terms of both having a standardize reporting system and creating a more serious approach to reporting

8. The definition of incident and near miss

3.3 Summary

Author agrees with the conclusions of the groups one and two. Author believes that all issues mentioned above are important for implementing and developing good reporting system and especially increasing the amount of reports. These issues serve to reinforce each other. After reviewing the issues presented by two groups in the scientific work, the author made a conclusion that all members of the crew should have an easy access to reporting system and it should be allowed for them to make reports. This is possible if a no-blame culture is developed in the company and on board of the vessels as well. Moreover, the author agrees that reporting program and system itself should be easy to use and simple. Author does not agree that anonymous reporting has an importance, especially on board of small vessels. Reasoning from author's personal experience, the crewmembers work in a limited space and with given personnel during long periods of time, thus, it is quite easy to understand who made a report from its date and content. Author believes that anonymous reporting only makes the situation worse and diminishes the number of reports, stimulating the spread of blame culture on-board.

After assessing the opinions of the specialists on international level, in the next chapter the author is going to continue the research by conducting local interviews and survey.

4 INTERVIEW AND SURVEY

In this part of the master's thesis the author provides the results of the interviews conducted with the author's colleagues on board and the results of survey conducted among Estonian professionals working with the safety culture at sea. The author also describes the data collection types used in the research.

Previous studies of interview and questionnaire model state that two types of questions can be used in interviews, which are *close* and *open* questions (Rugg, 2007). If author needs more opinion about the issue or a more detailed answer to the question, then he/she uses questions "Why", "How", and "What", which are stated as open type questions. In contrary to open questions, close type of questions will be used to give short answers without any additional point of views. This information was taken into account while creating the questions and the author prepared open questions for the interviews. Moreover, other issues were discussed with the interviewees, such as no blame culture, anonymity in reporting, and a rewarding system to motivate reporting from the support level.

Author's current rank is OOW on merchant and passenger vessels, so author had an opportunity to analyse and question his own colleagues. The interviewees were the employees at management, operational and support levels of passenger ferry and one general cargo vessel, and one offshore project HSE advisor from author's previous work place. Before the interview a small briefing was conducted with the interviewees in order to avoid the spread of interview out of frame. They were informed about author's research, point of view and scope of the research as well. The author sees briefing as important part of the research and the difficulty in providing a sufficient briefing is dependent on the balance between the information that people want and that of they need, especially when the interviewee is an expert (Rugg, 2007).

4.1 Interviews on board

Management level officers stated that nowadays reporting systems are computerized and really easy to use. Reporting of incident into the system takes about ten minutes. However, the first thing after an incident is a telephone communication with DPs. In bigger companies, the management and operational level officers stated that incident reports are done even without

telephone conversations with DPs. All crewmembers stated that their companies' reporting systems provide the access to the other incident reports within the companies. In passenger ferry company, the DP sends the newest updates about near-misses and incidents weekly, which in author's opinion is a very good practice. Further on, the support level ratings receive information in safety meetings or reading about incidents and feedbacks from safety booklets prepared by the management level, or they can find and read it from the information boards on the vessels. Masters mentioned that there is a very good communication process between vessel and the office regarding improvement of reporting systems, which more and more depend on computer software optimized according to newest specifications.

When it comes to receiving of feedback from the office, everybody agrees that it is very important and that is the main reason for sending any kind of information about the reports to the shore. However, one master stated, that he was not pleased with his office feedback because it came weeks after the incident. Regarding technical issues, chief engineer stated that he had received only general advices as a feedback from the office, which were not the actual solutions to vessel's technical issues. When it comes to external reporting systems, then generally, the bigger companies that deal with passenger transportation, do not use external reporting systems, because they have their own internal systems all over the fleet. At this point it is to the office to decide whether to import incidents and near misses to the external reporting systems or not. However, the smaller cargo operational vessel companies prefer to use external reporting systems like "Insjö" or „Foresea".

When asking the interviewees about the quantity of reports, the crewmembers of the merchant fleet do not see any links between the amount of reports and quality of the feedback and safety. One Chief Officer stated that his company forced its vessels to report certain amount of near misses monthly. This forced crewmembers to make up non-existent situations to report about, which certainly has not improved the feedback and safety advices from the office.

Most of the interviewees believe that there should be a mixed approach. The crew must send the incident reports, the office must promptly give their feedback and it would be good to have a DP on board for discussion of safety issues. The DP however should be aware of the incidents and near-misses reported by the crew via the reporting system. Author completely agrees with the interviewees and believes that this kind of mixed approach would increase the number of reports and improve the safety at sea.

One issue that the author would like to highlight is a language barrier, which can represent as obstacle in the quantity and quality of incident reporting. Unfortunately, not all of the management level officers in merchant fleet are fluent in maritime English. These people have an extensive maritime experience and are valued by the firm, but it is extremely difficult to create an incident report without knowing the maritime English on a good level.

4.2 Questionnaire

One of the ways of collecting qualitative data is questionnaire. A questionnaire often uses both open and closed questions to collect data. This is beneficial as it means both quantitative and qualitative data can be obtained. (McLeod, S. A. 2014). As stated in Glenn (2010) research, the first step which must be determined to characterize research method is the questions need to be answered. His assumption about qualitative research method is that it tries to determine solutions by asking questions like why, how besides where, what, when. By author's assumption, the qualitative method is more human centred research method. The qualitative method as a research method has been in use for a long time, it can be determined as an old method, which is still widely used. According to many previous studies (Havold 2010, Schaaf & Kanse 2004, Lee 1998, Vepsäläinen 2010) about safety policy, bias in incident reporting and reporting practises, in various industries, quantitative research method were implemented as structured questionnaires, studies of diaries, and eventually, they were analysed by creating graphs and applying maths as Glenn (2010) notes that it is not the point with the qualitative research. Questions and identical methods can be practical to gain extra information in a precise matter in reverse to common subject including people of different ranks with various experiences.

4.3 Questionnaire to offshore project HSE leader

According to the author's point of view and personal experience, there are major differences in offshore and merchant fleet safety environment, therefore special questions were designed for offshore project.

Question 1. How many vessels (CTVs) are operated in your project?
During the project we have a jack up vessel for installation and approximately 4 CTV's taking out up to 12 technicians at one time.
Question 2. Please give an overview of the incident and near-miss reporting system used in your company.
We utilise a system called „Krima" .This enables all incidents and near misses to be shared on a global platform with all corrective measures also detailed.
Question 3. How does the reporting process from vessels to the office works?
The vessels will report any incidents or near misses to SMC who will relate this information to the EHS Officer for consideration of input to the „Krima" system .The vessel will also if the near miss or incident merits create their own reports as per their ISM system guidelines and send this to SMC to again be attached as part of the evidence to the „Krima" report.
Question 4. Who has the authority to do incident and near miss reports to the office?
The EHS Officer due to his qualifications and experience is the person who compiles the reports to ensure they are fit for purpose
Question 5. Approximately how many reports are received per month/per year?
On average when the project is at peak production I would estimate at least 20 per month
Question 6. How does the feedback process work based on received reports?
A „Krima" is raised if merited and published on the Vessel Safety notice board .All on signing technicians receive an update on „Krima" reports that have been submitted whilst they have been off rotation at their back to work safety briefing . The individual that submitted the safety observation
Question 7. What are the weaknesses of reporting systems?
The available drop down boxes to categorize the incident or near miss can sometimes not be appropriate for the incident
Question 8. What are the main obstacles to reporting?
Making technicians' understand that they will not be judged on their observations which will be digested from a neutral context .Ensuring that when an observation is received it is acted upon with feedback given personally to the technician who has raised the observation
Question 9. What can be done and how can the number of reports be increased?
In order to increase the reporting culture a number of criteria helps:

1) There must be a no blame policy in force so technicians do not hide incidents and consequently no corrective measures can be developed or implemented.

2) Setting up a safety committee vastly helps the integration and ownership of a fit for purpose Health and Safety culture.

Figure 8. Results of interview with the Offshore project HSE Advisor. Answers to questions in Annex 4

According to the Offshore project HSE leader, the main obstacles for getting more reports is making technicians understand that they will not be judged on their observations which will be digested from a neutral context. Ensuring that when an observation is received it is acted upon with feedback given personally to the technician who has raised the observation. Also HSE leader stated the criteria for improving the safety culture:

- There must be a no blame policy in force so technicians do not hide incidents and consequently no corrective measures can be developed or implemented.
- Setting up a safety committee vastly helps the integration and ownership of a fit for purpose Health and Safety culture.
- Rewards based incentive schemes were the top observation receives a prize leads to technicians going about their daily work tasks with safety in the fore thoughts as they would like to win the monthly prize.

4.3.1 Analysis of answers in offshore project questionnaire

Author also worked on a project described in paragraph 4.3. According to received questionnaire from offshore safety manager, the general problem which may restrict incident reporting is a blame culture and lack of time. This kind of problems are also found in merchant fleet. However main advantage of offshore reporting system is simplicity and mobility. As author observed, the safety advice which were based on received reports, can be found on safety boards, as well as each project participant receives the safety advice directly to his own personal email. Author thinks that it is a very good approach. Not all crewmembers have time to go to a specific place to have a look on a safety board or take a part from a safety meeting. Most of the time this applies to the night shift workers. We must consider, that we are living in electronic era and human beings are being more and more integrated with internet. This is the reason, why the personal safety announcement verification via email is very handy. Most of us have the

access to personal email boxes nowadays and it takes seconds to be aware about serious incidents or near-misses on the project.

HSE mentioned the implementation of rewarding system for better reporting practises from project workers. Authors disagrees with the rewarding system role in safety improvement. Author believes that the reporting should be natural, otherwise most of the reports based on rewarding approach would have been faked, or wouldn't include the required information. Related to incidents. However, author asked the project's operational level workers. The workers stated that the reward for incident or near miss reports is too little, therefore the workers won't share there brilliant ideas about safety improvement for such a small reward. However, the worker stated that this kind of approach still can motivate for reporting, there can be many unnecessary reports, but possibility of receiving serious safety issues also rises. Other worker stated, that this kind of system will motive workers to be aware about safety and reporting system in general, which would be an also result.

After interviewing of project workers, author stated that still the rewarding system can reach the safety improvement target, not through received reports but through general awareness of workers about the reporting system and safety culture.

4.4   Survey among the Estonian shipping companies' designated persons

In this paragraph there are answers to the questionnaires (see Annex 3) given by the Designated Persons in Estonian shipping companies. Questionnaires were prepared and reviewed together with the author's supervisor and sent out to nine out of nine Estonian companies that have DPs, thus 100% of all Estonian DPs were invited to participate in the interview (see Annex 3). Three of nine questioned DPs, i.e., 30% have replied to the questionnaire. Moreover, the author has conducted a personal interview with a HSE leader working in the offshore sector (for the questions see Annex 4).

Question 1. What type and what vessels are there in your company (under your technical management)?

Company 1

1 multipurpose icebreaking and offshore support vessel.

Company 2

1 ro-ro Vessel and 3 Oil Tankers.

Company 3

10 passenger ferries and 1 HSC.

Question 2. Describe the reporting system in use at your company *(technical issues, incidents, emergencies, non-compliance etc.)*

Company 1

Paper report system combined with digital forwarding via standard email.

Company 2

According standard reporting form of ISM code.

Company 3

Reports are made according companies procedures, which are part of SMS. All crew members must report about any incidents or near misses according to SMS procedures.

Question 3. Does your company's reporting system cover also the near-miss reporting? If not, then how and whether are these situations reported?

Company 1

Yes, near miss reporting system is in place.

Company 2

According standard reporting form of ISM code.

Company 3

Yes, near misses are the part of our reporting system.

Question 4. How and to whom do the crew members report about incidents from ship to shore?

Company 1

By means of email sending signed reports with detailed description on paper.

Company 2

During technical issues, first of all, vessel contacts technical superintendent by phone, then the DP. During all other incidents, the DP is contacted first of all. During non-urgent incidents, non-conformity reports are sent to office email.

Company 3

All crew members have possibility to report about any kind of incidents through the DP or Master/ Chief Officer.

Question 5. Who from the crew members has the authority to report to shore and via whom does it occur?

Company 1

Captain, Chief Engineer and Safety Officer (Chief Officer). Other ranks report through their department heads, who is by any means either Chief Engineer or Chief Officer. Reports normally sent by Captain.

Company 2

Every crew member has access to do an incident report. But it is masters' responsibility to inform the office about any kind of incidents.

Company 3

All crew members have possibility to report about any kind of incidents.

Question 6. How many reports were there in the last years (2014 and 2015)?

Company 1

24 near miss reports and 40 technical damage reports.

Company 2

15

Company 3

About 70 incident reports annually.

Question 7. How many near-miss reports were there in the years 2014 and 2015?

Company 1

24 near miss reports.

Company 2

2-3 near miss reports.

Company 3

9 near miss reports.

Question 8. How is the feedback given from the shore to the reporter?

Company 1

Initial confirmation of receipt by email, with enquiry for detailed feedback if any needed.

Company 2

Case details are being reviewed and studied by the office safety responsible persons (DP included).As a result, feedback sent to company vessels with safety advices to prevent any further accidents.

Company 3

Email

Question 9. What happens to the reports afterwards - who analyses them, who makes the decisions and for how long are the reports archived?

Company 1

Responsible persons determined by DPA and SQM in the consequent section of the report. Reports are stored for 3 years.

Company 2

DP deals with incident reports. Reports are stored for 5 years.

Company 3

Proceedings are conducted according to procedures. Decisions are made based on case type and cost of solution. Reports are archived for 1 to 55 years, depending on the case type.

Question 10. Does the top management analyse the reports during safety meetings?

Company 1

Yes, they are analysed by top management with also analysing feedback and suggestions of root causes by department heads (technical, safety, crew).

Company 2

All reports are being analysed and discussed annually.

Company 3

Reports analysed ashore during management and crisis meetings.

Question 11. What in your opinion are disadvantages and/or obstacles for reporting/ reporting system?

Company 1

It is hard to track paper system and currently there is a definite idea to shift to electronic handling of all reporting via dedicated software.

Company 2

1) Mental issues- for most crew members writing a report to the office equals to complaining. 2) After sending an incident report by the vessel, in most companies the big investigation process is started with additional paperwork to the crew which seriously complicates and interrupts crews every day duties.

2) Laziness – everything will sort itself out.

3) Belief that this incident won't happen again.

Company 3

Usually process does work; however, it is mandatory for the company's staff for coordination and functioning of internal activities. When resolving a situation, often the third parties (external parties) may be an obstacle, since they put off necessary activities (generally, due to financial issues) in terms of introduction of preventive measures, as well as resolving emergency cases.

Question 12. How do you think it would be possible to increase the number of reports?

Company 1

Increase in number of reporting should not be the „ideal" target, whereas target should be promoting of informing reportable defined near misses, incidents and damages. Generally this can only be done by training crew members in awareness of safety culture and policies.

Company 2

I do not see a need in it. According to my personal 15 years' experience, the most efficient solutions are frequent visit to the vessels, personal observation of working processes, personal conversations with crew members.

Company 3

The objective of working system should be decreasing quantity of reports and improving safety on board of vessels.

Question 13. How do you asses the utility of reports (on scale from 1 to 5) and the benefits received from them?

Company 1

3 or 4

Company 2

3

Company 3

4

Question 14. Does the Flag state of your vessel(s) want to receive information about the incident including near-incidents and how does it want to receive it?

Company 1

We have not heard of such request from Estonian Maritime Administration. At least not concerning near misses, of course there are criteria for reporting occurred incidents to the Flag State.

Company 2

We have incident report form, which is being used during incidents, often visits to the vessels and nothing more. Simplicity is the key to safety. If crew sees that there is a possibility for safety improvements, then there are many ways to contact the office, not only through an incident report form.

Company 3

The flag state will receive the information about all emergency cases in accordance with the established procedure. The flag state has also sought to obtain information about the pre-emergency situations, where there is public interest, and this is what we do. We use e-mail.

4.4.1 Analysis of respondents' answers

Author has made a comparative analysis of the respondents' answers (Companies 1, 2, 3) in order to make own conclusions.

Question 1

Designated persons work in companies with different type of vessels and of different size. The biggest company operates eleven vessels, the smallest - one. All DP answered questions professionally and showed interest. Author stated that the competency of DPs does not depend on a company size.

Question 2

Most companies use paper based reporting system combined with forwarding via standard emails. Standard reporting forms from ISM code are used. None of the companies has their own internal reporting system. The author believes that it is too expensive to create company's own reporting system and only the companies with bigger fleet may allow to create one.

Question 3

Generally, near-misses are implemented and received in all of the companies. In some of them near-misses are done according to ISM code recommendations, in others completely opposite and badly. Author believes that the reason it is the qualification of DP or weak commitment of company itself in this question.

Question 4

Standard e-mail conversations were used for reporting incidents and near misses. There were no internal systems used in any of the companies. Author believes that within named practise is not an efficient one, it is hard to conserve all the reports in this kind of format for future incident analysis. These reports can be lost in hundreds of other e-mails that office receives during the day. Moreover, it is very hard to create a database of reports which is needed for improving safety at sea.

Question 5

Each crew member can make an incident or near-miss report directly via the DP by phone or e-mail or via their department heads. An open reporting opportunity indicates that no blame culture is welcomed in Estonian companies. However, after interviewing some crewmembers of support and catering level of some of the companies, author stated that some of the questioned crewmembers were not aware of the possibility to do a report personally. Author

believes that this situation can be improved on safety meetings on board, by the management level of the vessels' crew or by the office.

Questions 6 and 7

Author stated that the quantity of incident reports does not depend of the amount of vessels operated by the company (author compared Company 1 and Company 2).

Question 8

Mainly, the feedback with safety advice from the companies is received by the vessels by e-mail after the case has been reviewed and analysed by the office safety representatives. However, author would like to highlight than none of the companies uses pre-feedback safety advice, which could be sent to vessels in the first 24 hours after the incident or near-miss report from vessels. In author's opinion, this would be a good practise, since the case study and analyse time may vary.

Question 9

In all of the companies the reports are analysed by DPs and are stored for 1-55 years depending on the company. Author agrees with companies procedures regarding closed incident reports. Incident archives may be used for safety advices databases, for example for importing them into national or international reporting systems in the future.

Question 10

Safety meetings are organised in all of the companies and all the reports are discussed and analysed by the management level and the crew. Author's advice would be to cargo vessel operators to implement the safety meeting strategy in their companies more frequently.

Question 11

Main obstacles to reporting are fear of being blamed by the office, crewmembers receive additional paperwork from the office instead of pre-safety advice. Company 1 and company 2 stated that it is hard to track paper reporting system, therefore the author believes that the incident reporting process should be simplified because.

Question 12

All questioned DPs stated that the safety of crewmembers does not depend on the quantity of reports. The respondents' answers differed and the author believes that a mixed approach should be implemented. Personal safety representatives' visits and incident reporting database are both equally important for safety improvement at sea.

Question 13

On a scale 1-5, the DPs gave reports and the benefits received from them high points (3 and 4), however, the author sees that there is space for improvement of incident and near-miss reporting system.

Question 14

The incident and near miss reporting to the Flag State are only informative and there is nothing related to safety of working personnel on board of vessels.

To sum up, all respondents stated, that increasing the amount of reports is not the main goal/priority in the maritime safety improvement, one respondent even stated the opposite - he said that the objective of reporting system should be decreasing quantity of reports. This respondent has in operation 10 ferries and 1 HSC, annually he receives approximately 70 incident reports. Therefore the company has good database and good working reporting system in their SMS, so this company has the next target to achieve - to decrease the quantity of incident reports with help of company's safety advices. Another respondent stated the same.

CONCLUSION

The development of good safety culture and environmental protection at sea has always been one of the main maritime goals. Considering the fact that the number of incidents in the Baltic Sea region has been steadily increasing over the last years, which is also connected to the lack of relevant information, i.e., feedback from the vessels, the research purpose of this master's thesis was to give advice and recommendations on increasing the quality and quantity of reports from the crews on board to improve maritime safety.

To attain the research purpose, the author has analysed ISM Code, different incident reporting theories, the implementation of ISM code recommendations by companies in the Baltic Sea region, compared the existing reporting national systems, and examined the Estonian maritime policy. Moreover, the author has conducted a survey among professionals dealing with maritime safety and conducted a series of interviews with persons working in the maritime sector. The research methods used by the author were comparative and statistical analysis, interviews, and questionnaires.

In the course of the research, the author observed that there is no "pre-feedback" practise in shipping companies. Often crewmembers receive first safety advice weeks or even months after the incident date. Author believes that office DPs and safety coordinators should provide temporary safety notices immediately after the incident, before the incident investigation process. This can only be done with good cooperation between vessel, DP and the office and it also depends on safety experience and qualification level of DP and company. Therefore, a good examination of feedback process done by office could improve maritime safety.

Moreover, the results of this study stated that in order to improve the safety DPs should visit operated vessels more frequently, since not all incident cases are reported into the system and written on paper. This kind of visits may develop a better no-blame culture and can motivate crewmembers, especially ratings, to report and inform more about dangerous incident or near-misses over the vessel.

Due to the fact that author's research focused on Estonia, the existing Estonian reporting process was thoroughly examined, and the author has come to a conclusion that there is a possibility to increase the quantity and quality of reports from crews on board by implementing a national easy-to-use reporting system by successful example of other Scandinavian countries. The author believes, that implementation of Estonian own national reporting system would

improve maritime safety in Estonia. Moreover, the author recommends developing a global EU based reporting system with approved reporting software by ISM code.

The authors' hypothesis stating that "it is possible to improve the maritime safety and avoid incidents with lethal outcomes by increasing the number of reports from crew" was partially confirmed. Some theories of incident reporting, such as the Heimlich's Iceberg model, assessed by the author confirmed that indeed by increasing the number of the reports one can improve the safety at sea. Moreover, by analysing the expert assessments of incident reporting the author once again found that benefits come from improving the report systems by decreasing the costs related to incidents and their insurance cases. Moreover, the professionals dealing with safety questioned in the practical part highly rated the importance of incident reporting system in improvement of safety at sea. However, it should be said that within named professionals claimed that the number of reports is not as crucial as for instance personal visits to the vessels.

Based on the conducted research, the author would suggest that the main possibilities to increase safety related reports from crews on board are:

- Simplification and upgrade of reporting systems by upgrading software
- Supporting a no blame culture in shipping companies and on board of the vessels
- Simplification of reporting process
- Decreasing of the paperwork
- New amendments to ISM code from IMO based on reporting practical experiences
- Improving the qualification and training of DPs
- Improving the safety feedback process from offices
- Implementing time limitations for preparing safety feedback for fleet
- Considering safety related experience of offshore industry
- Creating a common incident reporting system in European Union waters

Previous ISM studies came to similar conclusions and advice.

RESUMÉE

Antud magistritöö eesmärgiks oli uurida Eesti laevadelt tulevat raporteerimist ning leida võimalikke lahendusi raportite kvaliteedi ja arvu suurendamiseks, mis aitaks ennetada õnnetusi ja parendada meresõidu ohutust, tagaks keskkonnakaitset; töös samuti antakse soovitusi raporteerimissüsteemide parendamiseks.

Vastavalt autori seisukohale, hea raporteerimissüsteemi olulisimad aspektid on: tagasiside saadetud raportite kohta kaldalt ja raportite kogus raporteerimissüsteemis. Mida rohkem raporteid on saadetud, seda kvaliteetsemad on soovitused ohutuse parendamiseks.

Antud magistritöös tehakse ülevaadet ja antakse hinnangut Rahvusvahelise Mereorganisatsiooni poolt koostatud soovitustele raporteerimissüsteemide koostamise kohta. Siis tehakse ülevaadet tänapäevastest raporteerimissüsteemidest, mis on kasutusel Soomes, Rootsis, Taanis, Eestis ja offshore sektoris.

Järgmiseks analüüsitakse ja võrreldakse raporteerimissüsteemide alusel olevaid põhiteooriaid ning tehakse ülevaadet nimetatud teooriate eksperdihinnangutest.
Magistritöö uurimisosas on läbi viidud küsitlus ning intervjuu, mille raames oma vastuseid andsid mereohutusega seotud määratud isikud ja mereohvitserid. Järeldused tehti täidetud küsimustike alusel ning lähtudes autori seisukohast. Autori hüpotees, mis väidab, et meresõiduohutuse parendamist ning mereõnnetuste vähenemist võib saavutada laevapere liikmete raportite arvu suurendamisega, leidis osalise kinnituse magistritöö teoreetilises osas. Meresõiduohutusega tegelevad spetsialistid andsid kõrge hinnangu raporteerimissüsteemidele meresõiduohutuse parendamises ja andsid oma soovitusi mereõnnetuste raportite arvu suurendamiseks. Samas ei ole küsitletud ohutusspetsialistide arvates raportite suur kogus kõige tähtsam aspekt mereohutuse parendamisel. Rohkem mõjuvad laevade ohutusele ohutusspetsialistide personaalsed visiidid laevadele, mis autori arvates oleks võimalik ainult väiksemates laevafirmades.

Autor jõudis järelduseni, et võimalused raportite arvu suurendamiseks laevapereliikmetelt õnnetuste vältimiseks ja meresõiduohutuse parendamiseks on:

- Maksimaalne raporteerimisüsteemide lihtsustamine ning uue tarkvara loomine ja uuendamine;
- Raporteerimisprotsessi lithtsustamine;
- "No blame" kultuuri toetamine laevadel ning kontorites;

- Paberitöö vähendamine;

- ISM koodeksi uued muudatused ;

- Määratud isikute kvalifikatsiooni tõstmine, koolituste läbiviimine;

- Ajapiirangute rakendamine tagasiside andmiseks kaldalt laevadele;

- Offshore-piirkonna kogemuse arvestamine ohutuses;

- Ühise õnnetuste raporteerimissüsteemi loomine Euroopa Liidu vettes.

Õnnetuste uurimine võib võtta nädalaid või isegi kuid. Üldist ohutuse soovitust paikades, kus juhtus õnnetus, võiks anda otse laevadele, et minimiseerida ohtu õnnetuse kordamiseks. Sellist praktikat ei ole autor märganud nendes firmades, kus küsitlus oli läbi viidud.
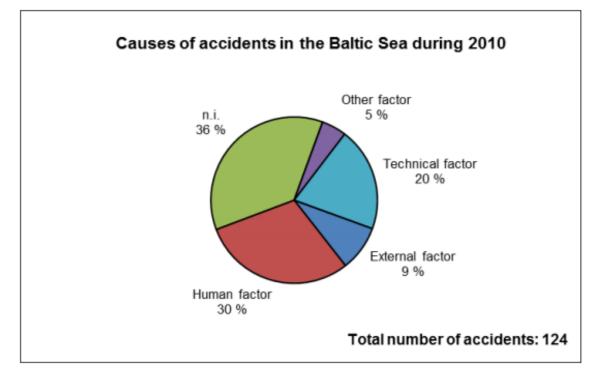
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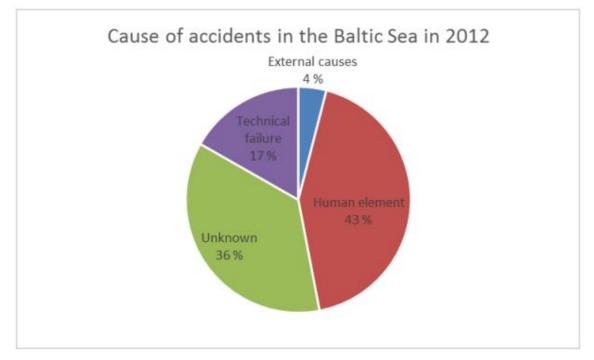
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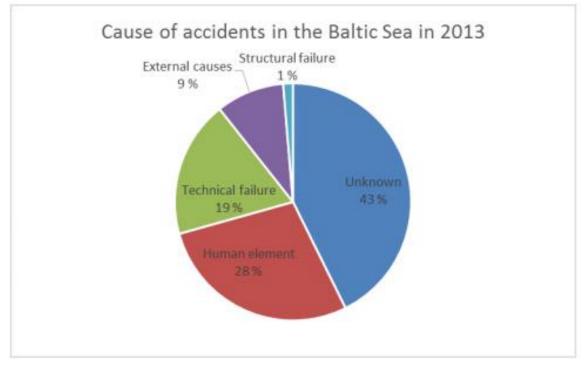
ANNEXES

Annex 1. Cause of accidents in the Baltic Sea, HELCOM Annual Reports

Causes of accidents in the Baltic Sea during 2010

n.i.
36 %

Other factor
5 %

Technical factor
20 %

External factor
9 %

Human factor
30 %

Total number of accidents: 124

Cause of accidents in the Baltic Sea in 2010. Source: HELCOM's annual report, 2011

Cause of accidents in the Baltic Sea in 2012

External causes
4 %

Technical failure
17 %

Human element
43 %

Unknown
36 %

Cause of accidents in the Baltic Sea in 2012. Source: HELCOM's annual report, 2013

Cause of accidents in the Baltic Sea in 2013. Source: HELCOM's annual report, 2014

Annex 2. IMISS groups answers

GROUP 1: Benefits and obstacles of incident reporting		
Benefits	*Obstacles*	*Advices*
Learning from others and not repeating the same mistakes.	Psychological reasons (e.g. people fear that their competency is questioned).	Training
Positive effect on safety culture	Inadequate resources to compile reports and to utilize the reporting system in a company.	Positive and effective communication
Reduction of costs (less incidents and accidents).	Companies do not want to share the information for competitiveness reasons.	Improvement and facilitation of reporting procedures
Particularly small companies would benefit from common database which would have more diverse data and a greater quantity of it than they can collect by themselves.	A good safety level can also be reached by using other methods.	Risk mitigation services
Reporting systems enable statistical and other analyses.		
Reporting can monitor if a company is complying with regulations.		

GROUP 2: Benefits and obstacles of incident reporting			
Benefits for the company/ships	*Benefits in the shipping industry*	*Obstacles*	*Advices to improve top management level*
Job satisfaction increases.	Image of shipping improves.	Loss of management level.	Allocate resources to incident reporting.
Supports open and functional working condition on board and ashore (through Trust also the efficiency).	Reporting enables the studying/learning about events, and the information can be used by regulators and other stakeholders.	Culture does not support reporting (on the ship or in the company).	Increase training, both for the top management and crews.
More information about the on board processes.	Information benefits for the investors when buying new	A no blame policy does not exist and it takes time to adapt the culture.	Effective communication between the ship and shore.

		technologies or ships.		
Enables the development of new, better procedures.	Fewer serious and potential incidents.	Crew-related issues (high turnover of employees on ships, fatigue, excessive amount of work to do).	Fast responses to reports.
Makes people more self-confident.	Learning from each other, e.g. to identify risks.	Additional costs.	Proper feedback from the management.
Increased commitment on safety issues.		Some near misses are not considered as near misses, but as normal routine.	*Other Advices*
"Bottlenecks" can be discovered (e.g. education, man-machine interface etc.).		Reluctance to written procedures.	Focus on the company's manning strategies (e.g. length of contracts, whether or not to use of crewing companies).
Better communication within the company.		Fear of admitting faults.	Change the way how reports are received.
Companies save money in the long run.		Benefits are difficult to measure (financially).	Improve the distribution of work.
Increases safety and security on board.			

Annex 3. Questionnaire 1

1. What type and what vessels are there in your company (under your technical management)?
2. Describe the reporting system in use at your company (technical issues, incidents, emergencies, non-compliance etc.).
3. Does your company's reporting system cover also the near-miss reporting? If not, then how and whether are these situations reported?
4. How and to whom do the crew members report about incidents (see question 2 and 3) from ship to shore?
5. Who from the crew members has the authority to report to shore and via whom does it occur?
6. How many reports were there in the last years (2014 and 2015)?
7. How many near-miss reports were there in the years 2014 and 2015?
8. How is the feedback given from the shore to the reporter?
9. What happens to the reports afterwards - who analyses them, who makes the decisions and for how long are the reports archived?
10. Does the top management analyse the reports during safety meetings?
11. What in your opinion are disadvantages and/or obstacles for reporting/ reporting system?
12. How do you think it would be possible to increase the number of reports?
13. How do you asses the utility of reports (on scale from 1 to 5) and the benefits received from them?
14. Does the Flag state of your vessel(s) want to receive information about the incident including near-incidents and how does it want to receive it?

Annex 4. Questionnaire 2

1. How many vessels (CTVs) are operated in your project?
2. Please give an overview of the incident and near-miss reporting system used in your company.
3. How does the reporting process from vessels to the office works?
4. Who has the authority to do incident and near miss reports to the office?
5. Approximately how many reports are received per month/per year?
6. How does the feedback process work based on received reports?
7. What are the weaknesses of reporting systems?
8. What are the main obstacles to reporting?
9. What can be done and how can the number of reports be increased? (Your opinion, this one is a very important question)