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THE IMPACT OF SHIP CREWS ON MARITIME SAFETY

Nora Berg
Jenni Storgård
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Leverage from
the EU
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FOREWORD

Modern shipping is a highly international, multicultural and technological industry with strong demands on economic efficiency and profitability. This is manifested in ship crews, which are often multinational, with a large number of seafarers coming from countries such as the Philippines and China. At the same time, it is commonly repeated that human factor causes some 80 % of all sea accidents. The aim of this report is to look at how the role of crew issues in maritime safety has been studied so far, and to identify needs and possibilities for future research on the topic. On the basis of this literature review, intercultural cooperation, communication, fatigue and the language skills of a seafarer are the most important issues that contribute to maritime safety on the individual level. The results show that more training in understanding other cultures is needed. Also improvements in teaching English to seafarers are suggested.

Although the human factor and maritime safety have been studied from several perspectives, there are clearly some issues which need special attention in the future. Factors such as fatigue of crews due to tight schedules, possible undermanning of ships, bad management, unequal or low salaries, old or otherwise insufficient equipment or technology, the safety culture of the company and its recruitment policy are, among others, factors that affect the maritime safety from the crew point of view, but that a single crew member can hardly, or at all, change or influence. These organizational factors are often expressed but rarely actually studied in depth. The aspect of multiculturalism in ship operations and how possible problems caused by multinational crews could be avoided in the future are also important subjects to study.

This report has been produced as part of the “Competitive Advantage by SaFEty” (CAFE) project. The CAFE project is financed by the European Regional Development Fund, the City of Kotka, Varustamosäätiö, Kotka Maritime Research Centre corporate group: Aker Arctic Technology Inc., the Port of Helsinki, the Port of HaminaKotka, Kristina Cruises Ltd and Meriaura Ltd. Project partners include the Kotka Maritime Research Centre, Aalto University, Kymenlaakso University of Applied Sciences, Turku University of Applied Sciences and Centre for Maritime Studies at the University of Turku.

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Kotka, 13.2.2013

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ABSTRACT

Modern shipping is a highly international, multicultural and technological industry with strong demands on economic efficiency and profitability. The ship crews are multinational and a growing number of crewmembers come from emerging seafaring nations, such as the Philippines and China. Despite advances in technology, some 80 % of all accidents are, according to studies, caused by human error. This literature review focuses on safety issues related to the crews and gives examples of what kinds of errors are the most common to happen. Intercultural cooperation, communication, fatigue and the language skills of a seafarer are the most important issues that contribute to maritime safety on the individual level. The results show that more training in understanding other cultures is needed. Also improvements in teaching English to seafarers are suggested. The final chapter presents possible information sources for studying crew competences in the Baltic Sea, which is a field of study not yet covered at all.

TIIVISTELMÄ

Nykyajan merenkulku on kansainvälinen, monikulttuurinen sekä teknisesti kehittynyt teollisuuden ala, johon kohdistuvat suuret tehokkuus- ja kannattavuusvaatimukset. Alusten miehistöt ovat monikansallisia ja monet lähtöisin uusista merenkulkumaista kuten Filippiineiltä ja Kiinasta. Vaikka tekniikka aluksilla on kehittynyt, eivät onnettomuudet ole vähentyneet samassa suhteessa ja jopa 80 % merenkulkuonnettomuuksista johtuu inhimillisistä syistä. Tässä kirjallisuuskatsauksessa perehdytään miehistöistä johtuviin turvallisuuskysymyksiin ja pohditaan, millaisia onnettomuuksia inhimillinen virhe yleisimmin aiheuttaa. Kulttuurienvälinen vuorovaikutus, väsymys, kommunikaatio sekä kielitaito ovat tärkeimmät miehistöistä johtuvat turvallisuustekijät. Tutkimukset osoittavat, että tarvitaan lisäkoulutusta liittyen monikulttuurisuuden ymmärtämiseen. Myös miehistöjen kielitaidon, erityisesti englannin, parantamista ehdotetaan. Viimeisessä kappaleessa esitellään mahdollisia tietolähteitä aiheen tutkimiseksi Itämeren alueella, josta tutkimustietoa miehistöjen pätevyyksistä ei ole lainkaan.

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1 INTRODUCTION

World trade is dependent on shipping (Manuel 2011). Shipping is one of the most globalised industries in the world economy and the leading means of transport (Ljung 2010; Gekara 2008). In total, about 80 percent of foreign trade is made by marine transport (e.g. European Union 2009). Shipping is a highly international, multicultural and technological industry and it faces strong demands on economic efficiency and profitability (Hanzu-Pazara et al 2010; Ljung 2010). This has led to a globalized labor market of seafarers and to ship crews that are more and more multinational (Picture 1). The change in the labor market has been particularly dramatic for Japanese and European seafarers. They have been used to steady and regulated work conditions, which is not the case anymore (Lane 1997).

Multiculturalism is a general feature of crews of today and in this languages play a crucial role (Silos et al 2012). About 70-80 % of world's merchant fleet has multicultural crews (Magramo & Cellada 2009; Pyne & Koester 2005). Multicultural crews and a possible lack of a common language have produced a rising worry of the competence of ship crews. Globalization has also led to major changes in ownerships as shipping companies grow internationally. Ideally this could further lead to a more organized training of professional crews in all ranks and nationalities (Lane 1999). The question remains if this is the case. Do more agents cause a more diverse culture of different degrees and qualifications? This is of crucial interest especially when technological advances have cut down the number of crewmembers, from what used to be 40-50 to about 20-25 even on large carriers (Ljung 2010).



Figure 1.1. An example of the international character of shipping. Applied after Sampson, 2003a in Gekara (2008). Base map from <http://www.starlighttours.fi/slt/>.

The image (Fig. 1.1) shows clearly how globally distributed the industry is. It is an example of how a ship can be owned in one country, have the crew from another, have the cargo owned by a third one etc. (Gekara 2008). Usually the ship is owned by a company in a highly developed low cost labor country and the crew is from a third world nation, as the picture clearly shows.

The worry of maritime safety has caused a growing demand for research in what kinds of competences the crews operating the seas have. The question is inevitable especially when it concerns areas with a high risk of accidents. The Baltic Sea is an area with a lot of traffic and shallow waters. The concern for competent crews able to handle their ships in the difficult conditions characteristic to the area is evident. When discussing the emerging heteronomy of mariners, Wu & Sampson (2005) suggest some structural factors that need to be taken into account. Firstly, there is a strong demand from the global labor market, a rising number of crew recruitment agencies and also a growth of seafaring salaries in recent years. The research of the advantages and disadvantages of international crews is of growing interest (Pyne & Koester 2005).

1.1 Aim of study

This report has been written as a part of the research project CAFE (Competitive Advantage by Safety). The aim of the CAFE project is to examine whether the maritime sector can achieve a competitive advantage by focusing on safety aspects. The major focus is on operational safety, which is expected to both directly and indirectly influence the opportunities in the competitive European surface transport sector.

The CAFE- project is a three year study that started in October 2010 and will end in 2013. The CAFE project is funded by the European Union European Regional Development Fund, the ERDF program for Southern Finland, the City of Kotka, Varustamosäätö, Kotka Maritime Research Centre corporate group: Aker Arctic Technology Inc., the Port of HaminaKotka, the Port of Helsinki, Kristina Cruises Ltd, Meriaura Ltd. and done in collaboration with project partners being the Kotka Maritime Research Centre, the Centre for Maritime Studies at the University of Turku, Kymenlaakso University of Applied Sciences, Turku University of Applied Sciences and Aalto University. This report has been written by Nora Berg, a trainee in the Centre for Maritime Studies of the University of Turku under the supervision of project manager Jenni Storgård and researcher Jouni Lappalainen.

This literature review is closely related to the working package 2 of the CAFE-project, where the aim is to create a conceptual safety management model for the maritime field. In the model the most crucial factors in safety management are evaluated and a model for efficiently improving these factors is created. The report focuses on the competences of crews of ships operating in the Baltic Sea. The research question for this review is:

How does the composition of the crew affect the safety on board a merchant ship according to literature? Does the growing amount of multinational crews affect the communication on board and so the maritime safety?

The aim of this study is to give an overview of the literature and studies so far published about the subject of how crews affect maritime safety. The main question will be to which extent the crew affects maritime safety, and it will be used as a basis for further studies. The knowledge of crews is crucial as it contributes to a more accurate picture about shipping and human factor related deficiencies in the Baltic Sea. A large number of studies were covered, with the main emphasis on journal articles and reviews published after year 2000.

2 GENERAL BACKGROUNDS

There are several reasons for why the seafarers of today appear to be among the pawns of globalization. One reason is that the demand for logistics is global due to markets that do not care about borders. That crews have become part of a global market is inevitably a question of money. A study published in *Marine Policy* (Silos et al 2012) states that it is hard for the owner to regulate fuel, insurance and port dues among others whereas crew costs are regarded as “variable costs” and can therefore be reduced by the owner. Also a new philosophy arising in the sector states that vessel maintenance has become a lower priority.

According to Silos et al., the cost of the crew is about 15 % of the total costs of handling a ship. According to Stopford (2009), the crew cost can be up to 42 % of the ships operating costs. The operating cost of a ship varies according to the ship’s age and size and the nationality of the crew. It can vary between about 20 and 40 % of the total operating costs depending on the age of the ship. Other operating costs consist of maintenance, insurance, stores and other general costs. These operating costs are about 14-16 % (depending on the age of the vessel) of the total costs for running a vessel. Crew costs also vary according to the Flag of the ship. Stopford (2009) states that a crew member sailing on a vessel under the European flag can cost twice as much as a vessel registered under an “open” flag such as Liberia, Panama or Singapore.

Another reason for the growing numbers of international crews is the social aspect. The rising standard of living in the industrialized countries, such as Western Europe, the US and Japan causes changes in the global maritime market for seafarers. When a country undergoes economic growth, it will require migrant labor. This is because its citizens have more possibilities for education and therefore a chance for advancement in careers. This results in a shortage of labor doing certain types of jobs, the so called 3-D: dirty, dangerous and difficult (Galam 2011).

The recruitment of seafarers has become a major problem for shipping (Ljung 2011). A study made by Tsamourgelis (2009) states that even if seafarers from OECD¹ countries are better examples of employees in terms of efficiency and loyalty, the companies prefer seafarers from other countries because they want to maximize profits in terms of wages.

¹ OECD countries: Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States

Also the fact that the time that vessels spend in port is cut to minimum, the decreasing sizes of crews and a growing list of responsibilities has made the profession of seaman less and less attractive for OECD country citizens (Silos et al 2012). In any case, OECD seafarers are still employed as officers and are highly appreciated in those positions. Some reasons for OECD seafarers to stay in the industry in spite of all are the salary and job satisfaction (Ljung 2011).

In recent years, the shipping industry has encountered major changes. Internationalization and the increase of technological instruments on board the ships have changed the industry a great deal. To maintain the level of safety, the crew needs to be trained, which requires a training system capable of adapting to the ongoing, rapid changes. This creates challenges for the education system. For example, the levels of teaching English are not developed well enough yet (Hanzu-Pazara & Arsenie 2010).

2.1 International crew markets

Ship operators have largely outsourced the recruiting of crews into crewing agencies in the third world countries. This is problematic due to the fact that so called paper mill educators that issue certificates without training exists. There is also a developed market of faked certificates. This creates a growing challenge in the inspections of maritime educators and a struggle to achieve effective governance in the training of mariners (Bloor & Sampson 2009).

Migrant workers often encounter work conditions that are monotonous and physically demanding, working longer hours with lower wages. Immigrant workers may have poor language skills and worse training which leads to less skilled workers. Discrimination and poorer socioeconomic conditions are a reality (Grøn & Knudsen 2011).

Failure to report accidents has proven to make accident rates among foreign workers lower. It is possible that ships captains are not that keen to report accidents of foreigners in fear of losing personal economic benefits and also because foreigners may not have interest in having an accident reported, since it might lead to negative consequences (Hansen et al 2008). Immigrant workers suffer from a lack of knowledge of issues in health and safety. This is also due to the fact that immigrant workers work under less favorable conditions (Grøn & Knudsen 2011).

2.2 Definitions

The next chapters presents some essential terms used in this review and their common definitions:

2.2.1 Registers and Flags of convenience

A *register* is the ship's recording of ownership under the authorities and taxation of a certain country, often referred to the *Flag State*. The so called *Open Registers* are registers of countries with more liberal financial and corporate legislation. These are often referred to as *Flags of Convenience* (OECD 2003).

The use of Flags of convenience dates back to the 1970s and was at that time a new way of cutting costs. A flag of convenience is a state that does not care about nationality requirements of crews and usually has much lower taxation, such as Panama or Liberia. Flags of convenience also have lower safety requirements (Couper 1999).

Since the rules for e.g. crewing and their rights, the flags of convenience are considered to be a problem in the industry. It is notable that great deals of ships registered under the flags of convenience are anyhow owned by residents of OECD nations that are flag states themselves (Mansell 2009). The biggest Flags of convenience fleets belong to Panama, Liberia and The Marshall Islands (Shipping Statistics yearbook 2009).

2.2.2 Classification of flag states

The Paris Memorandum of Understanding on Port State Control (MoU) is an organization of 27 Maritime Authorities participating countries that carries a system of Port State Control. It keeps a listing of flag states based on inspections done by its certified inspectors to see that they follow international rules of safety, pollution prevention and seafarers' living and working conditions. If a flag state continuously fails to fulfill the requirements, it is possible to ban its access to the MoU region (Paris MoU 2011).

Based on the inspections, countries are listed and classified as white, grey and black. In 2011 a majority of OECD countries, China, Bahamas, Panama, Bermuda, Liberia, Philippines, Russia and Iraq are among others listed as white flag states, whereas the poorest performing flags are Democratic People's Republic of Korea, Libya, Togo, Bolivia Albania and Sierra Leone. Altogether a total number of 80 flags were listed in the 2011 inspections: 43 on the White list, 20 on the Grey list, and 17 on the Black list (Paris MoU 2012).

2.2.2 Crew Competence

Competence is generally defined as skills, qualifications and knowledge that gives a person ability to work as a part of a professional team or, when it comes to maritime activities, a crew. According to a study conducted by the Seafarer's International Research Centre (SIRC) at the end of the 90's, a lack of crew competence is a growing problem. Proficiency in English is one clear example. This was apparent from the frequency of pilots using sign language when communicating with the crew. The use of sign language in the pilot-crew communication was high in both single national crews where English was not spoken and in multi-national crews where English skills were not very good (Lane 1999).

The Seafarer's International Research Centre defines crew competence as “uniform standard of the provision of high quality training and education opportunities and to be as least as important as professional training”. It emphasizes the importance of so called “silent knowledge comprising unwritten roles and attitudes of the seafaring culture. Further, competence is a mixture of technical and social skill and a place where terminology and vocabulary are taken for granted” (Lane 1999). As a conclusion, one could say that competence is a sum of education and experience. . According to Ding & Liang (2005), competence includes knowledge, skills and understanding in terms of communication, with emphasis on issues such as fluency in English. Competence also includes physical and psychological attitudes, including attitudes towards seagoing safety and health standards.

Competence and cost are the two most important factors in the recruitment of seafarers. Very often the shipowners want labor that is as cheap as possible, with the risk that they are not sufficiently educated and trained (Ding & Liang 2005).

2.2.3 The human factor

When discussing maritime safety, the term *human element* or *human factor* plays a crucial role. There is no established international definition of the term, but according to IMO (2004a), it is defined as a “complex issue affecting marine safety and security”. It involves activities done by the ships' crews, port operators and authorities among others. This also makes the human element an important factor in ship design and operation. For example, a poorly designed ship or a system where the crew is tired or unaware of cultural differences contributes to the safety of the operation of the ship (IMO 2010). Rothblum (2000) describes human error to be an incorrect decision, improperly performed action, or an improper lack of action.

2.3 Ownership of the world fleet

The OECD countries have the largest share of ownership of the world fleet in tonnage (figure 2.1), but out of that, 73 % are registered in foreign, mostly open register countries. This is why the new flag states don't want to effectively regulate the economic activities of shipping companies. Due to the globalization of the global markets, companies have adopted an ability to move labor across national borders using crew management agencies. There are still some obstacles for the movement of international labor. These are, among others, cultural and language barriers, variations in education, training and qualification systems, as well as restrictions to immigration across border (Lauder et al 2006).

The search for cheaper labor has lowered the crew nationality requirements due to the pressure of finding cheaper seafarers. This can be viewed as a threat for the maritime skills of crews. Gekara (2008) states that the tightening international regulations force the companies to be more careful on how they operate their vessels. This means greater efforts to ensure that crews on ships are well trained and qualified. This and the development since the 1990s are termed as enforced self regulation in the industry (Bloor et al 2006).

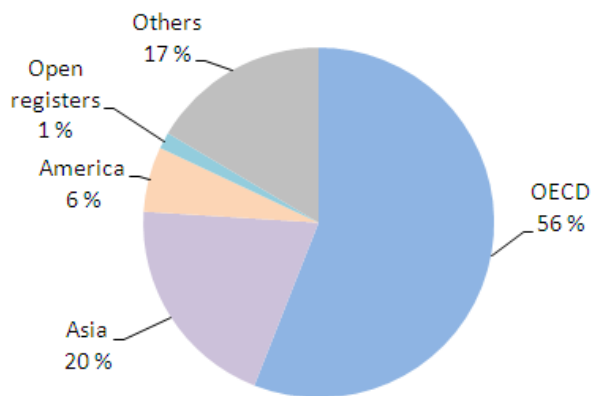


Figure 2.1. World total merchant fleet by country of domicile (ships over 1000 GT). Source: Shipping statistics yearbook 2009.

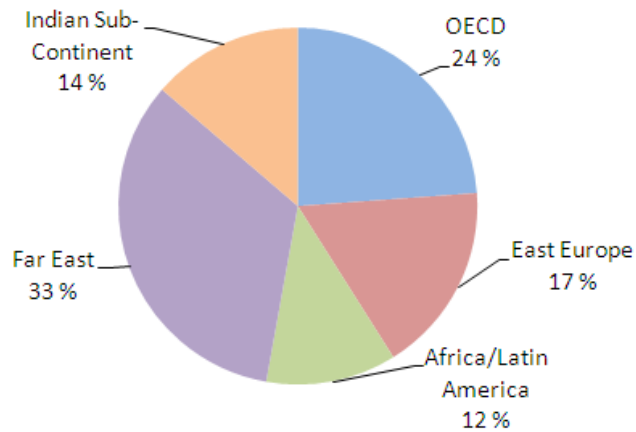


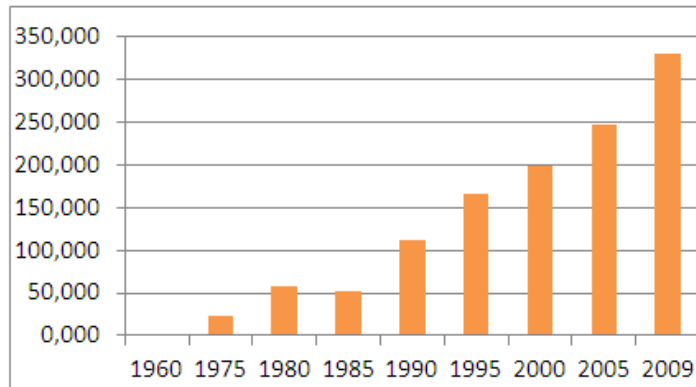
Figure 2.2. World supply of seafarers by region. Source: BIMCO & ISF 2010 Manpower update.

Comparing the two graphs, it is clear that the crews come from the Far East or India (Fig. 2.1 & 2.2) whereas the ships originate mainly from OECD nations. Only 24 % of crews are from the OECD countries, whereas more half of the ships are OECD based. It is notable that the OECD countries only dominate in bigger ships. When taking into account smaller ships (300 GT and over), the OECD share is much smaller, whereas the amount of open register ships increases a great deal. Open register countries include Panama, Liberia, Marshall Islands, Bahamas, Malta, Cyprus, Antigua & Barbuda, Bermuda, St. Vincent and Cayman Islands (Shipping statistics yearbook 2009).

2.4 Examples of crew supply to the market - the Philippines and China

An interesting feature of international crews is the growing amount of Filipino seafarers in the global market (Table 2.1). According to Philippine authorities in 2009, there were over 330 000 Filipino seafarers employed overseas (POEA 2009). One reason for this is that overseas employment helps the government of the Philippines to handle the growing unemployment rates in the country and it also provides income to a rather poor country (Galam 2011). According to Magramo & Gellada (2009), the amount of Filipinos in the seafaring market is also going to increase in the future, which is not the least of the impacts of globalization.

Table 2.1. The increase of Filipino seafarers from late 1960s to 2009 (after Amante 2005; POEA Overseas Employment Statistics (2009) in Galam 2011).



The table shows a dramatic increase in the Filipino labor force, especially in the time period between 2005 to 2009, which is generally seen as a time of global recession. Significant for Filipinos is that they dominate the lower ranks of crewing. For example, on Japanese and Greek ships Filipinos form about 40 per cent of lower rankings compared to 14 per cent of senior officer positions. This is also a question of politics: the Philippine state has aggressively contributed to maintaining the lower market segment by keeping the basic minimum wage lower than ILO's recommendation (Galam 2011).

Another country supplying large amounts of seafarers into the global market is China. China is one of the emerging providers of global seafarers with a rising amount of crews that want to work in a multinational environment. Many Chinese seafarers prefer to work on western ships (Wu & Sampson 2005).

When taking a closer look at the backgrounds of seafarers originating from China and the Philippines, poverty and rural origin are a common factor in their backgrounds. People from rural areas are considered to have lesser opportunities than those originating from cities. Those who join large crewing agencies in the search of a job abroad are the ones with better command in English and more experience from the field (Zhao & Amante 2003).

According to the Philippine Maritime Training Council, there are almost 100 Maritime Training institutions in the country (Philippine Maritime Training Council 2012). In the Philippines a majority of the facilities are private, whereas in China the maritime education sector is highly state-owned and much smaller. The fact that maritime training facilities in the Philippines are owned by private entrepreneurs and that some of their owners are involved in politics can contribute to the fact they attract other kinds of interest than educational. This is due to a lack of funding of the maritime education in both countries. It takes altogether about 14 years in both countries to get a formal maritime officer degree (in the Philippines, 10 years of compulsory education + 4-5 years of maritime training, in

China the respective numbers are 12 + 1,5 years) (Zhao & Amante 2003). This is a little less compared for example to Finland (table 2.2) where maritime education takes up to 7 years (3 + 4 for those going to high school).

Table 2.2. Years of education required for a maritime officer degree in example countries.

Country	Level of education		
	Compulsory	Maritime	Total
China	12	1,5-2	13-14
The Philippines	10	4-5	14-15
Finland	9	7 (3+4) vocational/lower maritime+ officer	16
The Netherlands	12-14	1-4 years vocational training for lower ranks, 3-5 years university/polytechnic	13-19

The table shows a very small variation in the education of seafarers among countries. The major difference is that in Finland it is possible to have seven years of training if the person chooses to take the lower ranks first before the officer training. Since the education systems vary a great deal, especially in the Netherlands, precise comparisons are extremely difficult to make (European Commission 2008).

Due to the history of American colonization of the Philippines, the proficiency in English is considered to be an absolute advantage and the reason for the Filipino seafarers to remain the leading provider of seafarers in the global market. A good deal of courses and course material are offered in English. The case in China is unfortunately not so good. Poorer skills in English prevent Chinese seafarers from getting employment on foreign ships. The level of education in Chinese training facilities has said to be very good, whereas in the Philippines it varies a great deal depending on the facility. In both countries students have to pay high fees (about \$ 1200/semester compared to a monthly income of \$ 280 for a peasant) for their maritime education and training. This is a huge burden for students and their families (Zhao & Amante 2003).

When issuing certificates the aspect of corruption has to be taken into account by several ship owners. Some shipping companies offer additional training to seafarers from China and the Philippines, which are also countries from where corruption to get certificates has been reported. Shipping companies state that “there was a feeling that STCW had done nothing... to achieve standardization in maritime education and training across the world” (Sampson 2003b). The maritime industry can easily be used as a means for illegal

immigration, as it is impossible to check the reliability of the one million ship officers plying the seas. Falsified seafarer certificates can easily be brought from the black markets all over the globe (Kanev 2005).

3 LEGISLATION CONCERNING MANNING AND CREW COMPETENCE

The International Labor Organization (ILO 2006) has established the Maritime Labor Convention. This is because shipping is an industry of global nature, and seafarers need special protection. The convention states that every seafarer has the right to a safe and secure workplace, a right to fair terms of employment, a right to decent working and living conditions on board a ship and a right to health protection, medical care, welfare measures and other forms of social protection.

The regulations mentioned below are regulations that directly affect crews and their role in maritime safety as given by authorities. Therefore, they are factors not influenced by a single crew member or organization.

3.1 International Maritime Organization (IMO): the SOLAS and the STCW conventions

To ensure crews are competent and have proper education for ships plying international waters, the International Maritime Organization (IMO 2004b) has adopted qualification standards for seafarers on merchant ships. These qualification standards were named the International Convention on Standards of Training, Certification and Watch keeping for Seafarers (STCW). It sets basic requirements for training and certification in international seafaring. The STCW had in year 2011 altogether 134 parties, which represent a majority of the world shipping tonnage (IMO 2011a). The instructions for the proper manning of ships are stated in the IMO resolution on the principles of safe manning A.890 (21) (IMO 2000). It states that there should be enough crew on board a merchant ship to have the capability of maintaining safely the navigation, mooring, environment, fire prevention and fighting, medical care, life-saving equipment and cargo handling of the ship.

SOLAS (International Convention for the Safety of Life at Sea) from 1974 is applied for the manning and training of seafarers (SOLAS chapter V, regulation 15). STCW is also the prime authority on training. The STCW, too, applies to ship-owners, training establishments and national maritime administrations and it concerns merchant ships in domestic or international operations. The convention applies separate requirements for each position on board a ship. It specifies the amount of seagoing experience a master of a ship has to have, the certificate of education and training and the age of the seafarer. It also states that “all officers must have a good command of spoken and written English. Senior officers with functions at a managerial level must also speak and write English”. Crew members in lower positions are required to be able to comply with helm orders issued in English (Obando-Rojas 2002). The STCW standard specifies a required level of fluency in the ship's declared working language that each employee must speak to a certain level (Hetherington et al 2006). The so called Manila amendments were adopted in 2010 as an addition to the convention (IMO 2011b).

3.2 The European Union

Economic cooperation and therefore the free movement of labor is one of the basic foundations of the EU (European Union 2012). The union has stated that the free movement of labor also has to be applicable to maritime transport. Furthermore, the maritime field has to be more attractive for workers without weakening its competitiveness (European Union 2007). The EU maritime transport policy strategy until year 2018 states that maritime careers and skills must be valued in the EU to improve the image of the sector and to work with the growing shortage of maritime labor. Better working conditions shall be created by implementing the ILO Maritime Labor Convention in the Union countries. The European Commission has therefore been actively supporting the work of preparing the ILO Convention on Maritime Labor in the Union (European Union 2009).

The transport policy strategy also includes examples for proper training and suggestions for the minimum salary levels in the Union. The act on seafarer training and recruitment from 2001 aims to promote the maritime field as an attractive place to work and wishes to invite more women into the field (European Union 2001). One possibility for making the field more attractive for potential young seafarers would be proper compensation in terms of payment for young officers on board. The Union proposes measures for improving seafarers' education and training as a whole. That includes, according to the transport policy strategy, improving the on-board training, adapting training programs and concentrating resources to a restricted number of training facilities inside the European community, to name some examples.

3.3 National regulations

The IMO conventions and regulations are not binding in the member states until they have been ratified. For an instrument or regulation to come into force, it needs to be ratified in a certain amount of member states of the current total of 169 countries belonging to the IMO. Once a convention or other instrument is ratified, it is binding in the member state (IMO 2009a). Some codes and recommendations adopted by the IMO serve as recommendations and are therefore not binding in the member states. The IMO regulations and conventions serve as the basis when member states write their own national acts for shipping and the ships flying their flags. An example of the Finnish maritime is presented in the next chapter.

The Finnish act on Ships' Crews and the Safety Management of Ships (1687/2009) states that "every ship shall be manned in such a manner that the ship, crew, passengers, cargo, other property or the environment are not needlessly put at risk and that the qualifications of the crew shall be such as to enable the proper performance of all watch keeping duties on board" (§ 5). It also states that "certificates of competency are issued by the Finnish Transport Safety Agency", where "provided that the applicant meets the requirements with respect to age, medical fitness, knowledge and skills, training and experience" (§ 17).

About the working language on board the act notes that all seafarers shall have a sufficient understanding of the working language and that safety instructions shall be issued in that language (§ 25). The usage of English as the working language on the bridge is obligatory on all ships except warships, ships below 150 gross tonnage on any voyage, ships below 500 gross tonnage not on international voyages and fishing vessels (SOLAS 2004). On a passenger ship, the crew is in emergency situations obliged to communicate in Finnish, Swedish and English.

According to the Finnish maritime law, in ships flying under the Finnish flag, the captain has to be a citizen of a country in either the European Union or the European Economic area. In comparison, for example, in Russia the captain or first officer has to be Russian (Russian code for Merchant vessels 2011, article 56).

4 SUMMARY OF PREVIOUS STUDIES CONCERNING CREW AND SAFETY ISSUES

Studies on accidents (i.e. Baylon & Santos 2011; Mårtensson 2006; Rothblum 2000) show that the ship crew is the highest risk factor when it comes to maritime safety since approximately 80-90 % of maritime accidents are caused by human error. The role of crews on the bridge has changed in terms of advances in technology and in the way of manning ships due to the employment of multinational crews (The Nautical Institute 2012). This makes the impact of humans in the maritime safety system evident. The major challenges that characterize the maritime crews of today according to studies are cited below: multiculturalism and communication, crew members' motivation and commitment to their jobs and the training and recruitment of new seafarers.

Rothblum (2000) suggests that the most severe problems in human factor analysis are fatigue, lack of communication and coordination between the crew, as well as poor technological skills concerning, for example, the use of radar. The human error is very often caused by the social organization of the personnel onboard, error of judgment and improper lookout or watch keeping as well as misunderstandings between the pilot and the master or the officer on watch (Hetherington et al 2006). Horck (2010) adds that major reasons for accidents are poor communication, loss of situation awareness, poor decision-making and lack of effective leadership and breakdown of team performance. Theotokas & Progoulaki (2007) emphasize that people related aspects to be related to safety, such as good communication, team spirit, trust and low conflict between seafarers, are associated with superior safety performance.

For this report a number of studies concerning crew and safety issues were surveyed. A summary of these can be found in table 3.1.

Table 3.1. Summary of previous studies concerning crews and safety cited in this report.

Study	Published in/ type of publication	Target of study	Subject of study	Method	Conclusion
<i>Ala-Pöllänen (2012)</i>	Unpublished studies in the field of Maritime history	The contemporary culture of modern seafaring	A general descriptive study on what is happening on ships today	Observational and interviewing study	Culture dating back to the era of Windjammers affects the seafaring a great deal even in present times
<i>Barsan et al (2012)</i>	International Journal on Marine Navigation and Safety of Sea Transportation	Human Resources in the Maritime Transport	Training as a subject of competitiveness	Case study	Training is important in ensuring the competitiveness of the ship as well as in minimizing the risk of accidents
<i>Baylon & Santos (2011)</i>	International Journal of Innovative Interdisciplinary Research	Filipino Maritime education in a global context	How Filipino seafarers affect the global markets	Case study	Filipinos have a positive impact if training is emphasized
<i>Benton (2005)</i>	Conference paper presented at the International Association of Maritime Universities (IAMU) 6th Annual General Assembly and Conference	Multicultural crews	Problems at sea caused by multicultural crews	Case study	An education program that emphasizes critical thinking skills and knowledge about diversity and trans-cultural interactions would improve maritime security.
<i>Grøn & Knudsen (2011)</i>	the Danish International Ship Register	Accident reports from Danish ships	The differences between Danish and Filipino seafarers	Several different; Interviews being the most important	Filipinos are causing less accidents than Danes
<i>Hansen et al (2008)</i>	International Maritime Health	Danish and Filipino seafarers	Comparison of the health of the two groups of seafarers	Accidents reported to the Danish maritime authorities, accidents reported to an insurance company, files on medical costs reimbursed by the government and radio medical reports	Filipinos are healthy and encounter less accidents, but it may be a result of underreporting of accidents happening to foreigners

Study	Published in/ type of publication	Target of study	Subject of study	Method	Conclusion
<i>Hetherington et al (2006)</i>	Journal of Safety Research	Some 20 studies of seafaring: fatigue, stress, health, situation awareness, teamwork, decision-making, communication, automation and safety culture	How humans affect maritime safety	Literature review	Lack of language skills causes problems at sea
<i>Horck (2010)</i>	PhD thesis, Malmö University	Students at World Maritime University	Cultural matters in maritime training	Phenomenography and discourse psychology	The cultural background of crew member does matter
<i>Horck (2006)</i>	Licentiate thesis, Malmö University	Students at World Maritime University	Communication among international students	Discourse analysis, phenomenography and discourse psychology	The cultural background of a crew member causes differences in the ways of communicating
<i>Håvold (2007)</i>	Work & Stress Journal of Work, Health & Organizations	Survey data from 2,558 seafarers from 27 countries	The association between national culture and the safety orientation of seafarers on Norwegian-owned vessels	Interviews, multivariate correlation analysis	The more different nationalities on board, the bigger is the risk for misunderstandings
<i>Lu et al (2012)</i>	Accident Analysis and Prevention	Human failures in container shipping	Effects of national culture on human failures in container shipping	Questionnaire study	The theory of cultural dimensions affects maritime safety
<i>Mårtensson (2006)</i>	PhD thesis, Luleå tekniska universitet	Mainly Officers and engineers of cargo ships	Understanding the problems tied to safety by utilizing an organizational perspective	Interviews, observations on board Swedish and Danish freighter ships	Multicultural crews are a risk for maritime safety
<i>Oltedal et al (2010)</i>	Conference paper presented at the European Safety and Reliability Conference	The use of safety management systems within the Norwegian tanker industry	How the ISM by IMO works on Norwegian tankers	Interviews and observational study	More responsibility should be taken in shipping companies regarding safety issues as well as closer and stable relationships with the contract crew board

Study	Published in/ type of publication	Target of study	Subject of study	Method	Conclusion
<i>Popescu et al (2010)</i>	Conference paper presented at Advances in maritime and naval science and engineering, Romania, September 2010	Young students going on board ships as apprentices	Communication in a language that is not the native one for many seafarers	Observational study	More education in maritime English is needed
<i>Pyne & Koester (2005)</i>	The Archives of Transport	Maritime accident reports	Communication of crews	Literature review	Language skills are an important factor in maritime safety
<i>Rothblum (2000)</i>	Congress paper presented at the National Safety Council Congress and Expo, Orlando 2000	Statistics and reports on accidents all over the world	Human error such as communication and situation awareness	Literature review	Ship crew and their fatigue are the most important factors causing accidents
<i>Sampson & Wu (2007)</i>	Conference paper presented at SIRC's seventh Symposium July 2007	Maritime education system in the Philippines and China	Maritime education and students in China and the Philippines	Literature review	Filipinos hold an advantage in the global market since better command in English
<i>Sampson & Zhao (2003)</i>	World Englishes	Multilingual crews	Communication and the operation of ships in a multilingual environment	Interviews of crew members	The development of a more standard maritime English is needed
<i>Theotokas & Progolaki (2007)</i>	Maritime Policy & Management	Greek seafarers interacting with crews from other nationalities	For Greeks it is harder to cooperate with people from cultures with lower power distance	Observational study	The study indicated that mixed crews can be a risk if they are not properly supported
<i>Thomas (2003)</i>	Conference paper presented at SIRC'S third symposium September 2003	Women seafarers working in the maritime industry	Differences in attitudes concerning the perspective of gender	Literature review, discursion analysis	More women are needed in the industry to make the crew composition of ships more balanced and therefore more safe

The table shows that a distinctly diverse sample of studies about crews and maritime safety exists. It is evident that a major part of the studies are done from a western point of view, which also Horck (2010) has noticed.

4.1 Cultural factors as a matter of safety

Culture is, according to the Oxford dictionary (2012), defined as ideas, customs and social behavior of particular people or a society. The so called shipping culture dates back to the era of sailing ships. It consists of habits, traditions and terminology that are common even today. Calling the right side of the ship starboard and keeping the same watch system as always are examples of a fairly persistent shipping culture.

Cultural issues are not to be underestimated when, for example, implementing new safety concepts, since many habits and traditions are adopted by younger seafarers from old seamen as so called *silent knowledge* not taught in maritime training institutions. Very often new restrictions and codes do not meet with old habits and are therefore difficult to take into use on board. Luckily culture is also a subject of change, for example the old habits of alcohol abuse at sea has today almost totally vanished (Ala-Pöllänen 2012).

4.1.1 The theory of cultural dimensions

Lu et al (2012) state that national culture has significant importance in explaining the occurrence of human errors on ships. They emphasize that dimensions of national culture are related to human failures in ship operations. Lu et al (2012) studied the impact of national culture on work safety on board tankers by comparing the beliefs of seafarers from different national cultures in a questionnaire to seafarers. They used the theory of cultural dimensions presented by Geert Hofstede in the 1970s as a reference. The theory of cultural dimensions suggests that there are five elements that affect intercultural cooperation and therefore also maritime safety the most. These are *Power Distance*, *Collectivism*, *Uncertainty Avoidance*, *Masculinity* and *Confucian Dynamism* later referred to as *Long term orientation*.

Power distance refers to how members of an organization or institution accept how power is distributed. For example, people from countries with low power distance relations are more consultative and democratic whereas individuals from high power distance cultures are more respectful of authority and less effective without orders from their supervisors. Collectivism refers to how individuals are treated in a group. In collectivistic cultures individuals feel strongly committed to the group and prioritize the group over the individual. Uncertainty avoidance refers to the society's ability to tolerate changes. People from countries with high levels of uncertainty avoidance try to avoid the occurrence of unknown by trying to predict changes as early as possible and by implementing rules and restrictions to cope with them. On the other hand, people from societies with low uncertainty avoidance are comfortable in changing situations and they try to have as few rules as possible, being at the same time more tolerant of change. Long term orientation is defined as society's attitudes towards time. People with a low level of orientation have higher appreciation towards the future and they are careful, hardworking and continuous,

while those with a high level of long term orientation are respectful of tradition and protecting one's face.

4.1.2 Examples of cultural dimensions affecting maritime safety

There is evidence that lower levels of masculinity leads to a safer working environment. Lu et al (2012) assume that the higher the masculinity level in a culture, the higher the probability of human failures. Factors such as saving one's face, shame and respect for social status are seen to have a negative relation to work safety. Therefore, the seafarers who are motivated to look to the future are safer as operators compared to those who are afraid of losing their face or fulfilling social obligations in the short run. Lower power distance and Collectivism as experienced by seafarers helps reduce human failures in container shipping operations.

Lu et al (2012) continue that if a person's Long term orientation is high, it weakens the relationship between collectivism and human failures in container shipping: high collectivism will lead to fewer human failures experienced by seafarers, but only when the levels of long term orientations among the crew are high. The authors mention the Filipinos as an example. They score high degrees in collectivism, being more group oriented and co-operative, whereas the Chinese culture relies on a high power distance and organizational hierarchy and face-saving. Seafarers from lower power distance cultures participate in contributing to a safer work environment and risk reporting.

Grøn & Knudsen (2011) present the concept of *social cultural structure* on board a ship and use the same theory of cultural dimensions as their background. When comparing Norwegians and Filipinos, the issue of cultural differences comes up. Norwegians see work as a value and highlight individualism, whereas a Filipino, originating from a highly collectivistic culture, sees work as a means to support the family and community, which leads to fewer risks from them compared to their northern colleagues. Grøn & Knudsen 2011 state that Filipino seafarers encounter fewer accidents than Danes, but that the results are disputable to some extent.

There are several reasons for why Filipinos are considered to be safer mariners. One is stated to be that Filipinos are usually younger and their selection process is tougher: the so called *healthy immigrant effect*, stating that workers are selected for their good health and physical abilities. It may also be that different nationalities do different kinds of jobs and thus others than the Filipinos get to do jobs that are less risky than others. This argument needs further research - it is against the *3-d theory* of employees from the third world countries performing the more dirty, difficult and dangerous tasks. Different positions may be more severely undermanned than others. This might lead to fatigue and stress in workers in such groups and therefore to more accidents. Filipinos work more seldom as officers, of whom there is severe lack of (Grøn & Knudsen 2011). Horck (2006) also mentions issues such as different ways of thinking, better attitudes towards obeying orders, a selection

where only the best of the best are chosen, Asians having less alcohol problems and a better contribution to a global market, which supports the global development.

A stronger social network among the Filipinos also leads to better mental health. According to Pyne & Koester (2005), studies indicate that Asians commit less murders and suicides. Another cultural issue are the cultures with a high power distance, where it is not allowed to question the decisions of one's superior. An example of this occurred on board the Bunga Teratai Satu in 2000 with an Asian crew, where the wheelman of the tanker knew something was wrong but for this reason did not tell his officer, and the ship ran aground (Pyne & Koester 2005). In their report, Pyne & Koester present some interesting examples of cultural factors affecting people's working habits. One example is that the word 'no' is considered rude in Asian cultures. This is a challenge when, for example, the pilot is a westerner used to getting straight feedback from the mariners.

Also Hansen et al (2008) studied the on board occurrence of accidents and illnesses of different nationalities by comparing Filipinos with Danes. They discovered that Filipinos encounter less occupational accidents than Danish seafarers. They also found differences in the physical abilities of the two groups. The Danes, for example, are more often overweight, which leads to a significant amount of back problems. They draw a conclusion that a seafarer from the Philippines has a higher risk of losing his job due to an accident and may for that reason be willing to avoid potential risk situations to a greater extent than his Danish colleague.

Håvold (2007) studied cultural differences on board Norwegian ships and presents the term *safety orientation*, which is a mixture of cultural, organizational, and contextual factors creating attitudes and behaviors that are related to safety. To demonstrate, Håvold presents the fact that the more nationalities there are on board the ship, the lesser scores are obtained in safety attitudes. This is also what Mårtensson (2006) found out. National culture also affects the safety culture: people from cultures with higher power distance, high uncertainty avoidance and high individualism score positively in terms of safety and are therefore safer employees. He states that if a seafarer comes from cultures with high uncertainty avoidance, they are more likely to follow orders and standard operating procedures.

Theotokas & Progoulaki (2007) studied how well Greek seafarers interact with crews from other nationalities. They found out that for the Greeks, it is more difficult to cooperate with people from cultures with a power distance lower than their own, such as Russians, since they feel that they might question their position and behavior. It is also evident that when all crew members participate in the decision making and a flexible leadership management exists, the crew works more effectively. The Greeks also had problems with communication, language, customs and religion. The study indicated that mixed crews can be a risk if they are not properly supported.

Filipinos have been reporting that they often do not want to work with fully Filipino crews because of nepotism, favoritism towards relatives, which on board ships means favoring

seafarers from the same region. It is also indicated that working with persons from different kinds of cultures increases safety, as it creates a social distance, tolerance and respect among people from different nationalities and makes it easier to form especially professional relationships on board. Some crew members also stated that a multinational crew increased cultural understanding and racial tolerance (Sampson & Zhao 2003).

The problem with a multicultural crew is according to Horck (2010; 2006) the diverse background of the seafarers and that the crews often do not know each other in advance and are therefore not able to work as a team very fast. Introducing more social activities on board the ships as well as making longer contracts with the crews would, according to Horck (2010) increase maritime safety. In these kinds of situations the leader has to act differently than in a crew that in everybody comes from similar cultural backgrounds. When discussing cultural stereotyping is a way of defining cultural differences and “it makes it easier to predict another person’s character and as to reduce our own uncertainty”. To accomplish a working multicultural environment on board ships the maritime industry needs the adopting of stronger leadership and a more developed culture of teamwork (Horck 2010).

Sampson & Wu (2007) point out that a seafarer’s experiences within national frameworks have a great impact on what a person considers to be a risk. These are, for example, safety practices, safety regulations and labor market conditions that vary internationally.

4.2 Communication

Language is one of the strongest elements in culture (Horck 2010). He states that “people from the same culture have to be able to communicate” and that language is undoubtedly the greatest facilitator of communication. The proper knowledge of a language clearly leads to fewer accidents. Research has shown that those who have stayed in a country longer encounter fewer accidents, evidently due to the improvement of his or her language skills (Grøn & Knudsen 2011). Lack of communication has been reported to be common and language problems are mentioned since a declining number of ships have single nationality crews (Hetherington et al 2006).

Pyne & Koester (2005) bring up several cases of communication failures in their report. These are listed as problems related to different cultures and languages between the crew and the pilot, the crew and the passengers on passenger vessels, and with respect to external communication and VHF communication with other vessels. They justify that it is possible to minimize the amount of accidents directly related to poor communication since most of the accidents occur when the level of understanding English is poor. Other factors to be improved are procedures for communication, better selection of personnel and improved design of maritime equipment and technology, including means for communication. Pyne & Koester (2005) further state that especially crew communication is a significant factor in maritime accidents. When crewmembers speak the same language, there is a risk of

misunderstanding. When adding people using English as a second language and the possible cultural differences, the risk of miscommunication increases a great deal.

A lack of communication is a problem on an organizational, but also on an individual level. Horck states in his licentiate thesis from 2006 that the lack of a common language in a multinational crew can lead to the isolation of a crew member and a limited social life on board. He writes: "To be onboard for say half a year and not have anyone to talk to more than to say 'good morning' and 'thank you' etc. leads you to alienation and becomes a risk factor". Moreover, if the majority of the crew speaks a different language than the person in question, the "lack of information contributes to fear, uncertainty and the spread of rumors". The effect of culture on the means of communication gives the individual an understanding of the social interaction. Sampson & Zhao (2003) emphasize the importance of English also in social situations, leading to a more uniform crew and therefore an improved safety culture.

Without a common language, the person gets isolated and suspicious towards others in the group (Horck 2006). He presents several accidents where the lack of communication causing an accident has been clearly shown. These are, for example, the collision of Silja Opera in the Baltic in 2003, the collision between Xu Chang Hai and Aberdeen in 2000, and a fire aboard the Scandinavian Star in 1999.

It is often stated that a great deal of communication is what we call *non-verbal* (Horck 2010). This can be understood as the things people do not say that are expected to be understood from manners and facial expressions. In understanding non-verbal communication, culture plays a crucial role. We know, for example, that nodding one's head in Western countries is understood as *yes*, whereas in for example India it is a *no*. As Horck underlines, non-verbal communication is probably not an issue when serious orders are given but in other situations it surely does matter. Horck throws the ball to the officers by stating that it is their job to make sure that everybody on board understands what is happening. As a warning example of the lack of cultural understanding in terms of communication, Horck (2006) shows that dealing with cultural issues is also a fact of honor: people often have difficulties in admitting that they do not understand what a colleague is saying.

The aviation industry is generally viewed as advanced in terms of research and safety and much of the work that is under construction in the field of marine accident prevention has already been done in aviation. Pyne & Koester present maritime accidents caused by lack of communication in a literature review published in the Archives of Transport in 2005. They base their study on the ADREP taxonomy used in the investigation of aviation accidents. Implementing a similar kind of system into the maritime field would certainly help accident analysis at sea as well. In aviation, the Crew Resource Management (CRM) has been used for a long time. It is a list of best practice training based on non-technical skills, such as communication, teamwork, situation awareness, leadership, assertiveness, decision making and workload management.

A ship is a very different work environment compared to other work places. The crew can be separated from their families for long times and the hierarchy on board is often strong and of a vertical nature, which has a negative impact on the communication among the crew. This may lead to authoritarian relationships where superiors' words are not questioned and therefore to severe misunderstandings occurring (Mårtensson 2006).

4.2.1 Maritime English

Because of the international character of shipping, maritime English has proved to be a very important part of future officer training. If an officer is not used to speaking English, in the beginning it may be difficult to express oneself. A paper written by Popescu et al (2010) suggests that the improvement of the standard maritime English would help young apprentices to communicate and so to avoid accidents that happen due to human errors caused by bad communication. Despite the positive impacts of multinational crews, communication was seen as the major problem. When skills in English are not good enough, it increases the risk of misunderstandings. This is a risk considering the ship is a highly hierarchical system. Sampson & Zhao present an example of a captain who had poor knowledge of English.. This caused problems with the lower ranks in terms of a loosened authority.

Recommendations for standard maritime English have been adopted by the IMO. It is a simplified version of English including standard vocabulary for maritime communication (Sampson & Zhao 2003). Despite good efforts of adopting Maritime English into the field, it was not detected in the study on board ships. Also the drive for cheaper crews from less developed countries can, according to Sampson & Zhao, be seen as a risk, since the assumption is that their English skills may be poorer.

The additional training in English is well acknowledged by maritime training facilities (Horck 2010). In any case the English skills of seafarers are often very basic, and the situation in ports is similar, too (Horck 2010). This said, it is evident that the level of English taught in maritime education has to be more advanced and also implemented for on shore operators such as port operators.

4.4 Masculinity

The STCW amendments resolution 14 underlines the need for getting more women into the maritime industry (IMO 2010). At present, women only make up 2 % of the whole maritime workforce in the world. They work mainly in the cruise and ferries sector and often for vessels sailing under flags of convenience. Fewer women work as officers compared to their male colleagues (International Transport Workers' Federation 2012).

Gender is discussed by several scholars (i.e. Horck 2010; Sampson 2003b; Thomas 2003). Horck (2010) states that since seafaring traditionally is a male dominated profession, one should be aware that women do not think in similar ways to men. This could be strongly contested, as it could be a matter of personality and the sample of woman leaders in the field is small. Even if one could argue against the statement that a woman is a safer captain than a man, introducing a more gender equal industry would have a positive impact. As Thomas (2003) writes, “Introducing more women to the maritime field would actively improve the morale and atmosphere on board, promoting a more ‘normal’ environment for the crew to live and work within”. A more balanced and normal environment would clearly bring more safety to the maritime industry. It is evident that women are a highly unused resource in a field where a clear shortage of labor exists. Many of those interviewed in Thomas’s study pointed out that being at sea is a hard job and not suited for women, and that they are not brave or able enough to make critical decisions while at sea (Thomas 2003). This said, the maritime sector still has a long way to go in terms of bringing equality to the field.

4.5 Training

As shipping grows to be a more and more international business, also its managers need to be more aware of cultural differences. The STCW convention has acknowledged the cultural effects on people’s ways of communicating and it has been added to the regulations as an issue of training and education. The question is how much resources the training programs use on this. Horck has in several studies suggested introducing more education in cultural awareness into the maritime education (Horck 2010; 2006; 2005). Benton (2005) states the same. Horck (2006) states that ship owners are the biggest problem in the industry. Many of them do not see mixed crews as a possibility but more as a safety risk, while they at the same time take advantage of the possibility of saving crewing costs.

Horck (2006) states that a greater focus should be given to the human element should instead of automation and technology in decreasing the impact of the human factor. One improvement would be better cooperation on board. Hence education and the knowledge of cultures and how people act together as a group are needed, as misunderstandings are a great threat to safety in the shipping industry. No statistics on whether accidents are caused by differences in cultural behavior and/or lack of communication has yet been conducted to support the theory Horck is presenting. Still, the clear outcome of the study is “to realize that we all need education in cultural awareness to be efficient in an industry getting more and more globalized”. Furthermore, it is necessary, according to Horck (2010), for maritime students to attend courses in pedagogy. Horck states that gender perspective, cultural awareness and pedagogy are the three subjects that should be introduced at maritime education training facilities very soon. Maritime education institutions do not, in Horck’s (2010) opinion, “give enough time in their curriculums to teach communication and management skills whereas the technical issues are highly emphasized at all parts of the education of mariners”.

At sea, errors are caused by bad design, poor training and bad management systems. Competitive seafarers are well trained and low risk takers. These are made by good quality training. Training ensures a ship maintains a high standard of operation and it enhances the safety culture aboard a vessel (Barsan et al 2012). The increase of technology aboard ships has increased the need for training and especially training on modern ships.

4.6 Motivation and attitudes towards safety of crew members

The motivation of crews can be considered a risk factor: the lower the motivation among the crew is, the higher the risk for an accident to happen (Mårtensson, 2006). Employees' motivation and work morale are important factors in enhancing safety as well as fatigue and risk taking. Lu & Tsai (2007) studied attitudes towards safety on ships. They found out that if seafarers feel their working conditions are less safe, risky and unhealthy, it leads to more accidents. Improvement of safety culture therefore leads to fewer accidents. This is why improving management safety procedures and increased safety training are suggested. These would include, among others, frequent inspections of navigation and safety equipment, better provision of safety information and safety training programs for crews.

To improve maritime safety, companies have to be competitive and have crews that are motivated and engaged in a safer working environment. An important factor in minimizing human error is the management of human resources. This can be done, according to Barsan et al (2012), by improving communication by creating a favorable communication climate, opening new communication channels among the company and crew, developing interpersonal communication skills such as cooperation, dealing with emotions and team work. Furthermore, employment conditions for seafarers should be acknowledged to have an obvious impact on maritime safety (Barsan et al 2012).

4.7 Crew-related organizational factors that affect maritime safety

In a large analysis about risks in the maritime sector, it was shown that shipping can be considered a social system with interaction of different actors and common values. The problem is, however, that safety values do not seem to exist even if regulations from IMO and the EU have been implemented. Another problem is that actors are at the same time controllers, which should not be the case and puts them into a "double role". Improving safety at sea requires a change of safety culture and therefore changes to the structures of maritime organizations. The author suggests fees and other financial sanctions for those not following the regulations (Mårtensson 2006). An investigation of how the International Safety Manual implemented by the IMO works on Norwegian tankers demonstrated that there are several gaps in the system. The survey suggests that shipping companies should take more responsibility for safety issues. Also a closer and stable relationship with the

contract crew shall be established in the shipping companies to improve safety management on board (Oltedal et al 2010).

Fatigue is, as mentioned earlier, one of the main factors contributing to human error. It is clearly an organizational issue, since the number of crewmembers, schedule of the ship and route are organized by the shipping company, giving less leeway to the crew to plan working hours and watches. Studies have shown that fatigue is a major contributor to safety because of its impact on performance, and it is therefore considered to be the cause of several marine casualties. Significantly, seafarers work in an environment that is subject to often unforeseeable weather conditions, no clear division between recreation and work, and they are expected to work and live together with seafarers that they often do not know and who come from different backgrounds and cultures than their own. Factors such as the quality and quantity of sleep, stress, fear, boredom, workload and interpersonal relationships affects sleep negatively and are therefore contributors to fatigue. Even if the number of maximum working hours on board is restricted by authority regulations, the problem is that the time for rest is seldom constant, but interrupted by different kinds of disturbances (IMO 2001).

5 CONCLUSIONS

In this review, a large number of studies concerning maritime safety issues related to the crew have been cited. A large consensus exists on that the human element directly referenced to as the crew is the main factor causing accidents. Scholars also agree on the fact that the human element is most often caused by issues related to communication and lack of situational awareness. But when going deeper to the analysis of what is causing these communication failures, the results seem to be somewhat contradictory. As a summary, here are some of the most interesting findings:

Grøn & Knudsen (2011) and Hansen et al (2008) found out that Filipino crew members encounter fewer accidents and have a higher commitment to their jobs because of their cultural background. Mårtensson (2006) on the other hand writes that Asians are culturally more likely to form authoritarian relationships in which orders from the master are obeyed without questioning. This can lead to more accidents when something seems to be going wrong. Horck emphasizes in several studies the understanding of English which is proven to be better among Filipinos (Wu & Sampson 2005) than among other nationalities, such as east Europeans (excluding crews from Western Europe and naturally the US). Pyne & Koester (2005) also highlight the lack of language skills that may cause accidents as misunderstandings are inevitable in an environment where the crew shares no common language.

Horck (2004), too, reports similar kinds of results in a conference speech. As he concludes, “one report states that mixed crews can operate extremely successfully, the other that the captain was worried all the time, one report states that there are some problems and the fourth that the issue is not problem free”. This said, a conclusion would be that no research indicates that a mixed crew is an advantage. A fact is that crew members who do not speak English well enough is a severe problem in the constantly increasing number of mixed crews in the maritime industry. It seems the common denominator for the problems related to multinational crews are cultural misunderstandings. It is evident that we need more education in language skills, but also in cultural understanding, as Horck (2004) summarizes.

The Baltic Sea is, according to the Baltic Marine Environment Commission HELCOM, one of the most intensely operated seas in the world and the amount of traffic is expected to grow in the near future. According to HELCOM (2008), some 2000 vessels ply the waters of the Baltic area at any moment. The Baltic is also a shallow sea with rocky coasts, causing more challenges to navigation. Considering that about 80 % of the ships have multicultural crews, in total there are up to 1600-1800 ships with multicultural crews. The question remains if this creates a risk to maritime safety, and how multicultural crews should be taken into consideration in the mitigation of potential risks.

Not only is the Baltic an area of dense traffic and vulnerable environment, but also the only sea where a great number of ports are annually surrounded by ice. This is a challenge for

navigators entering the area, especially for crews not familiar with winter navigation. Examples of damages have been reported as damages to hull, or propulsion and grounding, or collision due to avoiding ice and loss of stability due to ice (Hänninen 2008).

6 SUGGESTIONS FOR FURTHER STUDIES

This report has studied how crews contribute to maritime safety mainly on the individual level. It is noticeable that the organizational level, referring mainly to shipping companies, affects the function of the crews a great deal. Fatigue of crews due to tight schedules, possible undermanning of ships, bad management, unequal or low salaries, old or otherwise insufficient equipment or technology, the safety culture of the company and its recruitment policy are, among others, factors that affect the maritime safety from the crew point of view, but that a single crew member can hardly or at all, change or influence. These factors are equally important points for further studies. Another possible object of study is the aspect of multiculturalism in ship operation, and how possible problems caused by multinational crews could be avoided in the future.

The CAFE-project aims to improve maritime safety in the Baltic Sea region by finding and evaluating factors that affect maritime safety. As stated earlier, it is the ship's crew that causes about 80 % of the accidents, and therefore the impact of a ship's crew on safety cannot be underestimated. However, no studies are available on what kind of ship crews and competence the ships entering the Baltic Sea have. Suggestions for further studies include: What is the composition (amount of crew, nationality, competence) of an average crew on a ship sailing in the Baltic Sea area? How well do the crew members speak English? Are the crew members capable enough to handle the occasionally harsh conditions of the Baltic, for example the ice in the winter time? What is the situation of multicultural crews in the Baltic compared with the situation worldwide? Do the composition and competence of ships in the Baltic differ from ships in other sea areas?

6.1 Suggestions for sources of information about crews and manning in the Baltic Sea area:

6.1.1 Portnet

Portnet is a web based information system used by the Finnish Transport agency and the Finnish customs to monitor the ships entering and leaving Finnish ports (Portnet 2012). All reports given by ships coming to Finnish are reported to the system and are used by the customs for inspections, by ports for charging and monitoring dangerous cargo, and by maritime authorities and coast guards for the surveillance of ships. Information recorded to the Portnet database includes the IMO crew list, which provides information about the amount of crew, their rank, nationality and flag of a ship. This could provide valuable information on what kind of crew a ship sailing in Finnish waters has.

6.1.2 GOFREP

The Gulf of Finland Reporting system is a Mandatory Ship Reporting System adopted by the IMO. It is a reporting system to which all ship entering the Gulf of Finland are obliged to report information about their vessel to Finnish, Estonian or Russian maritime authorities. Information required includes the amount of crew on board, thus providing some information about the manning of the ship (Finnish Transport agency and Estonian Maritime Administration 2010).

6.1.3 Accident reports and near miss reports

As shown earlier, accident reports given by authorities provide valuable information about how crews affect maritime safety. Also near miss reports are a valuable source of information, since many they give information on how to avoid possible accidents in the future.

6.1.4 Authorities and organizations

Several authorities could provide valuable information into the field of study of crews and their impact of maritime safety. Pilots and port authorities are an extremely valuable source of information, also as used by Hetherington (2006), Pyne & Koester (2005) and Lane (1999). The Finnish Transport Safety Agency Trafi keeps a record on crews sailing under the Finnish flag. The records are published annually and contain information on, for example, the proportions of age groups in different occupation groups, the proportions of foreign seafarers in different occupation groups, and the numbers of personnel onboard the ships. Unfortunately, the reports do not present the nationalities of foreign seafarers (*Seaman statistics 2010*). Additionally, the Vessel Traffic Service (VTS) operators may have valuable information of how the ships communicate since they follow the radio operations in real time.

Other potential sources of information include those operating the ships, such as ship owners and ship crews themselves, as well as maritime training facilities. The Finnish Seamens' union also has valuable information about crews sailing under the Finnish flag.

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