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MANAGEMENT OF SHIPPING

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ABSTRACT

Ships carry over 90 % of global trade, and the international commerce widely depends on shipping. Requirements of the modern global economy put pressure on shipping companies and management aboard, which creates challenges as shipping is already a high-risk industry. For these reasons it is important to research management of shipping. The purpose and aim of this literature review is to give an overview of how the management of shipping has been researched and what the results are and to identify needs for further research. It focuses on management onboard and the effects the shore-based management has on the ship crew. Safety has always been a major concern in shipping, and safety management has become one of the most essential research topics in ship management. Leadership and management of human factors are the things that almost all research themes relating to management of shipping aboard have in common. Human error contributes to 80 % of accidents at sea, so communication and management of non-technical skills were found to be important in safety and security management as well as in crew resource management and in management of human errors. Management of shipping has been researched mostly by conducting questionnaires and accident analysis. At the end of this report there are suggestions for further studies.

TIIVISTELMÄ

Yli 90 % maailmanlaajuisessa kaupassa liikkuvista tuotteista kuljetetaan laivoilla, joten kansainvälinen talous on riippuvainen kauppamerenkulusta. Modernin maailmantalouden vaatimukset kaupankäynnille luovat paineita laivayhtiöille ja laivan johdolle. Tämä on haasteellista, sillä merenkulku on jo ennestään riskialtis ala, ja siksi on tärkeää tutkia laivan ja laivayhtiön johtamista. Tämän raportin tavoitteena on antaa yleiskuva, kuinka merenkulun johtamista on tutkittu, millaisia tuloksia näistä tutkimuksista on saatu ja identifioida tutkimus- ja kehitystarpeita. Kirjallisuuskatsauksessa keskitytään johtamiseen laivalla. Laivayhtiön johtamista käsitellään laivan miehistön näkökulmasta ja käsitellään tutkimuksia, joissa on selvitetty laivayhtiön johtamisen vaikutuksia mm. laivan työntekijöiden käsityksiin työpaikan turvallisuudesta. Turvallisuus on aina ollut suuri huolenaihe merenkulussa, ja turvallisuusjohtaminen on noussut yhdeksi laivan ja kauppamerenkulun johtamisen keskeisimmistä tutkimuskohteista. Ihmisten johtaminen ja inhimillisten tekijöiden johtaminen yhdistävät lähes kaikkia tärkeitä merenkulun johtamiseen liittyviä tutkimusaiheita. Inhimillinen virhe on osallisena 80 % merellä tapahtuvista onnettomuuksista, joten kommunikaatio ja teknisiin taitoihin kuulumattomien kykyjen johtaminen näyttää olevan tärkeää niin turvallisuusjohtamiselle kuin miehistöjohtamiselle (crew resource management) sekä inhimillisten virheiden johtamiselle. Laivan johtamista on tutkittu pääasiassa kyselylomakkeiden ja onnettomuusanalyysien kautta. Tämän kirjallisuusraportin lopussa on vielä ehdotettu tulevia tutkimusaiheita ja -menetelmiä.

CONTENTS:

1 INTRODUCTION

Shipping is one of the world's great international industries. The importance of shipping is undeniable, since over 90 % of global trade is carried by sea (IMO). Shipping is also the most efficient, safe and environmentally friendly way of transporting goods globally.

Even though shipping is the safest form of commercial transport, the sea is considered to be a dangerous working environment (IMO). This has been proved with research, for example, a study on fatality on British registered ships showed that between 1976 and 2002 the fatality rate was 13–28 times higher than the fatality rate of general British workforce (Bhattacharya & Tang, 2013, referring to Roberts & Marlow, 2005). New challenges to safety are created by e.g. the structure of the global marketplace by setting a very precise schedule for every shipment (IMO). The development of global economy has affected shipping more than just via schedules and the amount of shipping operations. Networks and supply chains have become a factor shipping companies need to take into account.

Management aboard is still based on strict hierarchy. The hierarchic order is seen on work, but it also affects spare time behaviour (Bhattacharya & Tang, 2013). This sets the shipping industry apart from other industries. However, management of shipping has attracted surprisingly little research concerning how essential role shipping has in the global economy.

Most of the new research of maritime management has focused around two themes: safety and human factors. Safety has always been an important topic in discussion concerning shipping. As the quality of equipment and technology has advanced, the focus of the safety and safety management research in shipping business has recently shifted to the question how to prevent injuries and accidents with management of human factor. On the other hand there has been more research on management of non-technical skills, so these two themes have grown closer. The hierarchic system has been questioned as well, and many studies approach the question of how to improve the working environment from the ratings' point of view and study their chances to affect the management, e.g. Bhattacharya and Tang (2013). Due to strict timeframes of shipping operations, also supply chain management has attracted some research.

1.1 Aim and structure of the study

This report concentrates on management of merchant shipping and the main focus is on management onboard. Studies presented in this report are mainly researches published as journal articles mostly after year 2000.

This literature review is a part of the research project Competitive Advantage by Safety (CAFE). The project started in 2010 and is will be finished in 2013. The CAFE project focuses on shortcomings in the maritime safety and improvement of the sector's competitiveness. The main focus is e.g. on efficient use of near miss reporting systems, de-

veloping the use of maritime safety statistics and enhancing the sector's competitiveness by improving occupational safety. The project is funded by the European Regional Development Fund, the ERDF program for Southern Finland, the City of Kotka, Varustamosäätiö, Kotka Maritime Research Centre corporate group: Aker Arctic Technology Inc., Port of HaminaKotka, Port of Helsinki, Kristina Cruises Ltd and Meriaura Ltd. The project partners are 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 literature review is a part of work package 2: Modelling safety management to increase the competitive advantage in shipping. In the work package 2 the Centre for Maritime Studies of the University of Turku will construct a model of safety management covering the factors affecting the level and effectiveness of safety management in shipping and the effects of safety management on the safety level of a ship. On the course of the work it turned out there is a need to look at the management of shipping also in more general level than just safety management's point of view. This review is written by Vilma Naski as a trainee in the Centre for Maritime Studies of the University of Turku and project manager Jenni Storgård and researcher Vappu Kunnaala have supervised the work.

The structure of this literature review is as follows: chapter 2 defines the key concepts of this report and introduces the international conventions relating management of shipping; chapters 3-5 cover studies of management of shipping; chapter 6 sums up the most important studies and findings that were explained in more detail in chapters 3-5; chapter 7 is dedicated to conclusions and chapter 7.1 identifies the needs for further studies.

2 GENERAL BACKGROUNDS

The aim of this chapter is to present the most essential terms covered in the literature review and legislation concerning management of shipping.

2.1 Definitions

The next chapters will explain the following terms: management, leadership, occupational health and safety management, human resource management, human error, multinational crew and supply chain.

2.1.1 Management and leadership

Management and leadership are two separate concepts, but they usually go hand in hand. The differences are in the roles: a manager focuses on systems and structure while a leader focuses on people. A manager's job is to plan, organize and coordinate, leader's to influence, motivate and inspire. A manager organizes human and physical resources to achieve business goals. Leaders try to create strong teams with people who are committed to organization's overall goals (Business Case Studies, 2013).

A manager has always a target or an objective. He or she chooses the appropriate approach for reaching the target and after this allocates and delegates the responsibility and tasks to each team member. A leader sets the objectives, but empowers team members to decide how to achieve these objectives (Business Case Studies, 2013). In shipping industry, where the hierarchy is still strict, especially onboard, leadership is closer to management than in many other businesses, but it has an important role in managing the crew and human factors.

2.1.2 Occupational health and safety management

Occupational health and safety management is preventing accidents and injuries in workplace. Managing hazards includes e.g. making sure everyone has and everyone uses the required equipment, offering training and information of safety, informing the crew of accidents on the ship or other ships, listening to employees and asking them of workplace safety and passing the notes forward or fixing the hazards. Effective occupational health and safety (OHS) management is developing, coordinating and controlling an improvement process by setting and adjusting standards that will better the health and safety of the employees (Zimolong & Elke, 2006).

A company creates practices and systems to identify, evaluate and control hazards. To ensure commitment, OHS management should be aligned with human resource management (Zimolong & Elke, 2006).

2.1.3 Human resource management

Human Resource Management (HRM) is a mix of personnel management and business strategy (Hendry, 1995). It is the function within an organization that focuses on recruitment and management of the people working for the company. With HRM a company tries to match its employment practises, such as rewarding systems, to organizational strategy.

2.1.4 Human error

Human error can be a wrong decision, poor performance of a task or an action that should not have been taken (Rothblum, 2000). Accidents are not usually caused by just one mistake, but a chain or series of errors. Human error is caused by a human. The major types of accident contributing human errors are wrong habits, wrong diagnoses, lack of attention, lack of training and unsuitable personality (Wagenaar & Groeneweg, 1987).

Human errors often occur because something is disturbing or distracting the person performing a task and restraining him or her from carrying out the task correctly, e.g. fatigue. Behind human errors are usually factors that should be taken care of in order to reduce human errors. These factors can be technology, environment or organizational structure or practises (Wagenaar & Groeneweg, 1987).

2.1.5 Supply chain

Supply chain includes everything; activities, services and information, associated with the manufacturing and movement of goods from the point of origin to the point of consumption. An international supply chain consists of e.g. suppliers, manufacturers, freight forwarders, carriers, logistics service providers, customs and buyers (Yang & Wei, 2013). Supply chain is nowadays actually rather a network than a chain.

By value creation and delivery, supply chain management affects competitive advantage. Supply chain management is not only an extension of logistics management, but it is more management of relationships across the networks of the supply chain (Christopher, 2010).

2.2 International conventions

International Convention on Standards for Training, Certification and Watchkeeping for Seafarers (STCW) by International Maritime Organization (IMO) was amended in 2010 and the new amendments started to apply in 2012. STCW covers mostly the training and competence requirements of the crew. For this review it is sensible to focus on the parts concerning management or leadership (STCW Manila Amendments).

The officers are expected to act as managers and leaders, and the competence requirements in the STCW Convention concerning it are the following: working knowledge of shipboard or engine room personnel management and training; knowledge of related international maritime conventions and recommendations and national legislation; ability to apply task and workload management including planning and coordination, personnel assignment, and time and resource constraints and prioritization; knowledge and ability to apply effective resource management including allocation, assignment and prioritization of resources and effective communication onboard and ashore, decisions reflect consideration of team experience, assertiveness and leadership, and obtaining and maintaining situational awareness; and knowledge and ability to apply decision-making techniques including situation and risk assessment, identifying and considering generated options, selecting course of action and evaluation of outcome effectiveness (Yabuki, 2011).

IMO has also had the International Safety Management Code (ISM) since 1993. The ISM Code covers mainly the following issues: assuring safe practices in ship operations and a safe working environment, establishing safeguards against all identified risks and continuous improvement of the safety management skills of the personnel ashore and aboard. According to the ISM Code the safety management system should ensure compliance with mandatory rules and regulations and that applicable codes, guidelines and standards recommended by authorities are taken into account. Every company should develop, implement and maintain a safety management system which includes a safety and environmental protection policy, instructions and procedures to ensure safe operation of ships, defined levels of authority and lines of communication between and amongst shore and shipboard personnel, procedures for reporting accidents, hazardous occurrences and non-conformities, procedures to prepare for and respond to emergency situations and procedures for internal audits and management reviews (IMO, 2010).

The ISM Code is mandatory for all tankers, passenger ships, bulk carriers and cargo ships. Its emphasis is to be a statutory requirement to establish a safety management system for safe operation and management in maritime industry (Pun et al., 2003). The Code is based on general principles, because there are very different shipping companies working under a wide range of very different conditions. Because of the same reason the Code is expressed in broad terms. This way it can have a widespread application.

The International Organization for Standardization (ISO) has standards that affect management in maritime environment. For this review the important standard is ISO 9001:2008 Quality management systems. According to ISO 9001:2008 principles a company should focus on customers, leaders should motivate the employees, involve them and take the needs of all associates into account, the management should manage activities and related resources as a process and interrelated processes as a system, a company should have the continuous improvement of company's overall performance as permanent objective, adequate and accurate information should be available for people making decisions, and finally the company should make sure both parties benefit from supplier relationships (ISO 9001:2008). Certification for the ISO standard is voluntary and it is applicable to all sizes of organization in all industries (Pun et al., 2003).

As shipping is one of the most dangerous industries, Occupational Health and Safety Standards (OHSAS) are important as well. The OHSAS assists organizations to develop OHS to protect employees and other people who may be affected by the company. Compliance of the OHSAS is also voluntary and it gives more of recommendations than standards (Pun et al., 2003).

Besides implementing international conventions in their national legislation countries have also their own maritime legislations that differ from each other and affect the practices. For example, according to the Finnish legislation, the captain of a Finnish merchant ship has to be a citizen of one of the countries in the EU or the European Economic Area, even if the crew would be multinational (Merilaki (674/1994, amendment 310/2008) 6:1 §).

3 PERCEPTIONS OF SAFETY MANAGEMENT

Most of the research concerning management of shipping is somehow related to safety. This chapter covers safety management that affects safety directly by identifying and fixing workplace hazards. The studies presented here are both conducted using interviews and field study as methods. The chapter is separated in two: occupational health and safety on organizational level and occupational health and safety onboard. Under the subtitle "Occupational health and safety management on organizational level" is explained a study (Bailey et al., 2012) that is about the perceptions sea-staff has of their employer company's commitment to safety and how well the shipping companies have succeeded to communicate their safety message to their employees. "Occupational health and safety management onboard" has the same subject, but it focuses on the safety practices and communication onboard. This has attracted a little more research than occupational health and safety management on organizational level of the shipping companies, but the most significant and widest study is by Bhattacharya and Tang (2013).

3.1 Occupational health and safety management on organizational level

Bailey et al. (2012) explored perceptions of risk and its management in different shipping companies. They based their report upon case studies of five companies, field notes and interview transcripts from aboard and the offices of the companies onshore, and a large scale questionnaire. Two of these companies were large and the three others were small or medium-sized. Two of the shipping companies were operating in the tanker, two in the container and one in the bulk trade.

The two large companies were officially committed to safety and risk management and addressed the issues at higher levels of management. They had separate departments focusing on the protection of health, safety and the environment. Two of the smaller companies operated with their larger counterparts with safety management systems and procedures for reporting incidents, and they had regular safety meetings aboard ship. One of the smallest shipping companies, called Roberts, had most effectively convinced the employees that safety was a priority (Bailey et al., 2012). Its safety systems were similar to other companies, but their way to handle safety issues was different.

All five companies used basically the same methods for communicating the safety messages to their employees: bulletins, videos, posters and safety meetings on board on monthly basis. The seafarers appreciated the bulletins and memos about incidents. In most of the companies the safety meetings were from top down messages and the communication didn't work upwards. In addition to hierarchy, vulnerability of the workforce, racism, the appraisal system and occupational culture were reasons for this. In most of the companies it wasn't unusual that items raised by the safety committee were not acted upon. Bailey et al. (2012) found out that the seafarers were afraid to bring up any safety issues, because it could impair their re-hiring. Many sea-staff members who had reported about problems had been told that they were being obstructive. The companies had made an effort to document and identify their safety strategies, but this was

not enough to give the seafarers the perception that the company was committed to safety management, usually because the company management was giving very mixed signals.

In two of the companies the workers said the management did not care of the fatigue of the seafarers. The companies had also dismissed seafarers for trying to follow the procedures of the company's safety management systems. It was normal that crews were replaced by cheaper crews with poor English skills. The seafarers believed these companies wanted to present themselves to clients as safety conscious but behind those statements was an attempt to protect the company, not the workers (Bailey et al., 2012).

The shipping company that had convinced the employees of the management's true interest in safety, Roberts, was a family concern. The managers at the highest level spoke with all the ratings on vessel visits and listened to their views. When seafarers raised some issue at a safety meeting, the management acted swiftly to fix the problem unlike in the other companies. When the weather was severe or the seafarers were suffering fatigue, they were allowed to find shelter or go to anchor, and the company actually insisted the captain to do this. The other companies had the same thing documented on their safety strategies, but in reality this was not accepted and one company had even dismissed a captain for following the safety rules and stopping for fatigue. Roberts not only provided the needed equipment, but also practiced efficient human resource management (Bailey et al., 2012).

In the questionnaire there was a stronger correlation between senior sea-staff and the shore-based management than between the lower ranking sea-staff and the management onshore. According to Bailey et al. (2012) this was because there was very little communication between the ratings and the onshore management, and shipping companies had problems communicating their safety messages to other seafarers than senior officers. Seafarers' views on corporate commitment to safety did not base on only the safety strategies the companies were officially using, but on a holistic appraisal of the company approach to its employees.

3.2 Occupational health and safety management onboard

Ship officers and ratings should both be committed to improve safety onboard, but communication between seafarers with different ranks seems to be difficult (Bhattacharya & Tang, 2013). OHS management onboard means all the systems and practises that are used not only by the company, e.g. mandatory safety meetings, but also by the captain and senior officers to find out what safety hazards there are onboard and how those hazards could be eliminated.

Bhattacharya and Tang (2013) have researched occupational health and safety management using the shipping industry as a case study. They noticed that employee participation and commitment from top management were the most important factors in successful OHS management. Since the top management in shipping industry is usually work-

ing onshore, middle managers have an important role in leading the ratings' participation in OHS management.

Middle managers are in hierarchy between the top management and the employees. In shipping industry they are also the highest authority onboard. They interact with the ratings directly and therefore they have a direct impact on the ratings' safety perceptions and performances (Bhattacharya & Tang, 2013).

The ratings' participation in OHS management is crucial, because they know their workplace and its potential hazards the best. They also have the most direct interest in securing the workplace health and safety. Empirical research in various workplace settings proves that active employee participation helps to reduce the injury rates substantially. The need for employee participation in occupational health and safety management is also mentioned in many guidelines and statuses. Number of studies show that a lack of organized labour and short-term employment inhibits ratings from participating in OHS management (Bhattacharya & Tang, 2013)

The strict hierarchy of command aboard ships seems to make upward communication in formal environments nearly impossible. Using informal settings the senior officers can elicit effective participation from ratings (Bhattacharya & Tang, 2013). These informal settings could be, for example, working alongside the employees or meeting them in social activities. However, communication in informal settings can't compensate poor employment relations.

In general, there are several studies about the middle managers' role in affecting the employees' perceptions of hazards on workplace, but the shipping industry is less researched. The theories apply also in the shipping industry (Bhattacharya & Tang, 2013), even though the working environment is different from many other industries and requires supervisors and employees to stay on the same area at all times. For example, research shows that employees with an approachable supervisor were more likely to think that their workplace is safe (Bhattacharya & Tang, 2013 referring to Watson et al., 2005) and if the supervisor encouraged employees to participate in the OHS management, they were more likely to comply with the safety rules (Bhattacharya & Tang, 2013, referring to Simard & Marchand, 1997). Also, when the employees believe their supervisors care about safety, they are more likely to report near misses and incidents (Bhattacharya & Tang, 2013, referring to Lauver et al., 2009), which makes it easier to improve the safety at work, in this case, aboard a ship.

Research suggests that when supervisors pay more attention to monitoring the employees' performance, give the workers more often feedback of the consequences of their actions and spend more time talking with the employees about non-work related topics, the workplaces suffer from fewer accidents (Mattila et al., 1994). This study was conducted at 16 sites of a construction company with 15 site managers and 16 other first-line managers, but Bhattacharya and Tang (2013) suggest this would apply also in shipping industry and other high risk environments, although there are no research results of that.

Surveys often prove that when supervisors set up good examples by following safety rules, the employees are likely to follow them, too. Inness et al. (2010) suggest there are two types of safety behaviours an employee can perform: safety compliance, which means the behaviour focused on meeting the minimum safety standards, e.g. wearing required equipment or following safety procedures; and safety participation, which means behaviour supporting the workplace safety, e.g. the employee puts an effort into improving safety in the work place by helping co-workers with safety-related issues. The hierarchical system and the fear of losing the chance for re-employment make it difficult for ratings to perform the latter type of safety behaviour.

O'Dea and Flin (2001) researched the offshore oil and gas industry quantitatively by gathering responses to context-free hypothetical questions. They found out that supervisors had difficulties in motivating the workforce into participating in the management of OHS. The managers were aware of best practice in safety leadership, but they did not always act in ways consistent with this. They also found that experience is not a dominant factor in determining leadership style and attitudes to safety, but less experienced managers tend to overestimate their ability to influence and motivate the workforce. The questionnaire was conducted on 15 oil and gas installations belonging to 36 organizations operating on the United Kingdom Continental Shelf. Bhattacharya and Tang (2013) are also referring to this research and making it a part of their report as the working environments of an oil installation and a ship have many similarities.

Bhattacharya and Tang (2013) got the same type of results, when they studied qualitatively the difficulties in eliciting employee participation. They collected data with semi-structured interviews and observations onboard ships from two shipping companies, which both had their shore-based managements located in Europe. One of the companies conducted business globally, the other one in Europe. They interviewed 16 senior officers and about 50 junior officers and ratings on a total of four ships.

Bhattacharya and Tang (2013) found out that the most common concern was a fear of losing employment, since nearly all of the seafarers interviewed were employed on a short-term temporary contract. This caused the employees to be very careful when communicating with the senior officers and avoid involving themselves in the management of OHS. They were afraid that voluntarily participating and criticizing anything would portray them as trouble makers and damage their re-employment chances, since the reports of their work were sent to manning agencies.

The strong and strict hierarchy on board made the formal communication difficult during the working hours, but the interviews and field study showed the hierarchy was clearly visible also in onboard social life, for example, the senior officers had larger cabins located on upper decks, while the ratings had the smallest cabins on the lowest levels of the accommodation block. After work everyone kept to their peers in rooms that were meant for their use only, ratings and senior officers in their own areas. This made also the informal communication practically impossible (Bhattacharya & Tang, 2013).

On each ship the supervisors and the ratings had a formal safety committee meeting once a month, but in these meetings none of the ratings spoke. Due to weak employment relations, the ratings thought of the meeting as time for attending and listening, not talking. On the other hand, when senior officers came into rating recreation room, the ratings spoke more spontaneously without feeling judged for what they said (Bhattacharya & Tang, 2013).

The norm, however, was a supervisor, who maintained the hierarchal divide, but the ratings preferred a senior officer, who would join them at work. From the 16 senior officers interviewed, half did not see socializing with the ratings important and six were worried how socializing with them would affect the work relationship. The research also showed the popular senior officers, who spent time with the ratings did not lose their authority. Instead it was important that the leader was able to change the style of leadership to what was best in the occasion (Bhattacharya & Tang, 2013).

4 MANAGEMENT OF HUMAN FACTORS

4.1 Human resource management

Progoulaki and Theotokas (2010) studied human resource and crew management practices used in Greek-owned shipping companies. The data was gathered in personal interviews with crew managers and managing directors using a structured questionnaire examining the applied HRM practices and strategies and attitudes regarding the competitiveness of seafarers. Both quantitative and qualitative data was used. The field study took place in Athens and Piraeus in 2007. 91 Greek-owned shipping companies participated in the survey; altogether these companies owned 1076 vessels and they were bulk carriers, tankers and containers.

Progoulaki and Theotokas (2010) define the resource-based view (RBV) as a bundle of resources and capabilities that create the base for sustainable competitive advantage. These resources can be divided into three categories that are physical capital resources, e.g. equipment; organizational capital resources, e.g. organizational structure; and human capital resources, e.g. skills of the employees. A firm needs capabilities to take advantage of its assets. Together capabilities form competencies. The competencies can be either threshold (can be imitated) or core competencies (cannot be imitated).

RBV is based on the VRIO model: value, rareness, imitability and organization support. A company holds a competitive advantage, when it has some competence or capabilities, that rivals do not have and cannot imitate (Barney, 1997). This core value is created by effective HRM and requires time to develop. To achieve short-term competitiveness, companies should seek to exploit valuable and rare characteristics in the human resource. To get sustainable competitive advantage, a company should maintain its structures, systems and relationship with the employees, because practises are easily imitated, but coherent human resource systems are not. Companies should focus on specific skills, teamwork and HR systems, because these create core competencies that competitors cannot imitate (Progoulaki & Theotokas, 2010).

From human resources, financial resources, physical resources, organizational resources and intangible resources Greek shipping companies ranked human resources as the most important. The result wasn't unanimous. Opinions were different depending on the size of the company. Large and medium-sized companies saw human resources as the most vital resources, but small companies thought financial resources were more important (Progoulaki & Theotokas, 2010).

Almost 50 % of the companies did not seek to find or compare relevant data of their competitors' employees. This means they did not identify how the valuable and rare characteristics of their human resources could give them advantage and they were not able to manage them in a way that could increase the seafarers' performance and the ships' competitiveness. Large and medium-sized companies conducted benchmarking by comparing their seafarers' characteristics with the characteristics of their competitors' seafarers more than small companies (Progoulaki & Theotokas, 2010).

74,7 % of the respondents said there is no imitation among shipping companies, and when there is, it is often between large-sized companies that were considered as rivals. However, many crew managers kept personal relations and arranged often informal meetings to discuss issues relating crew management. So imitation was actually supported by the shipping companies, but the companies did not see it as imitation, because it was not aggressive. The large-sized companies that admitted imitation found out almost all their HRM practices were based on imitation. Medium-sized companies mostly imitated the rewarding systems. HRM of the small shipping companies was often based on long relationships with their seafarers and implementing practices that lead to employing loyal employees. Many of these small companies were owned by families that have long tradition in the industry (Progoulaki & Theotokas, 2010).

Shipping companies employ two types of employees: shore-staff and sea-staff. Organizational support in HRM means that these two groups would have a unified HRM system. Most of the companies do not have it. 89 % operated in a crew department, 20,9 % in a shore-based personnel department. Only three companies shared training activities between these two groups of employees. Most of the shipping companies did not even implement the same practices to all seafarers, but the benefits depended on the seafarer's nationality and rank. Large companies give the best benefits to their national officers, medium-sized and small companies again give the best benefits to their officers regardless their nationality. This only applies to officers; Greek ratings are constantly substituted by low-paid foreigners. The shipping companies seem to think that the officers are the most valuable human resource and therefore they are trying to keep them on their ships (Progoulaki & Theotokas, 2010).

4.2 Management of human error

Human error can be defined as an incorrect decision, an improperly performed action or an improper lack of action (Rothblum, 2000). In shipping human error can be caused by e.g. people onboard, management onshore or an equipment manufacturer. Accidents are the consequences of complex coincidences (Wagenaar & Groeneweg, 1987) and human errors play a dominant role among the contributing factors.

According to a research board in the UK in 1976, about 80 % of maritime casualties were caused by a human error (Rothblum, 2000, referring to Goulielmos, 1997). The number has not significantly decreased since. The percentage is so high, because human factors can be seen also in accidents that have been caused mainly by e.g. equipment failure. Human error contributes to e.g. 86-96 % of collisions, 84-88 % of tanker accidents and 75 % of fires and explosions (Rothblum, 2000). Accidents are not usually caused by only one failure, but a series of errors.

The most common way to study the subject is by analyzing accidents and near misses at sea, because these are the situations when the problems become visible. When studying how accidents happen, it is possible to trace the development of an accident, even if there are several discrete factors attributing the casualty (Rothblum, 2000).

A study conducted in Netherlands of 100 maritime accidents found human errors contributing to 96 of the casualties. Those accidents had other reasons too, but in all of the 96 cases the people involved could and should have prevented the accident. In 93 accidents several human errors contributed to the accident. Usually errors were made by one or two people, and each person made about two mistakes. From these human errors every single one was a necessary condition to the accident, which means if at least some of these errors could be prevented, fewer accidents would occur and safety at sea would increase (Wagenaar & Groeneweg, 1987). The total number of causes per accident ranged from 7 to 58. According to Wagenaar and Groeneweg (2009) accidents occur because the behaviour that causes them is not seen as risky. Often the accidents based on complex coincidences occur because people do not believe the accident that is about to happen is even possible. To prevent this, good management is needed. In many of the cases one of the reasons was the captains or officer's negligence and tolerance of malpractice. The other common reason was the lack of communication.

Goulielmos (1997, referred by Rothblum, 2000) listed the leading causes of human errors and they were: lack of knowledge and experience, overconfidence, recklessness in responding to commercial pressures, fatigue and discomfort, boredom, anger, unhappiness, illness, confusion and lack of adequate communication. All of these made people more prone to mistakes.

Rothblum (2000) describes the maritime system as a people system, where people interact with the environment, technology and organizational factors. Humans have certain abilities and limitations that influence their performance, such as knowledge, skills, and abilities in general, memory, motivation and alertness. This perception is congruent with the causes of human errors Goulielmos (1997) listed.

Technology does not always make the work only easier. It can also lead to human errors, if the equipment is designed in a way that makes it difficult to use or there is not enough information of the usage of the automation available. The environment can affect the seafarers' performance due to e.g. weather, temperature, climate, high sea states or ship vibration. From organizational factors e.g. the crew size and training decisions affect the crew work load. Lack of sleep causes fatigue and pressures from company to stay on schedule increases risk-taking (Rothblum, 2000).

Wang and Zhang (2000) wrote about reducing human errors and what areas to focus on to make it happen. These areas were competency, which practically means enhancing training and assessment; organization and methods, efficient management being the most crucial factor in this category; communication, the importance of which increases more and more with the growing number of multinational crews; and design, when automation reduces human involvement, also the probability of human error decreases and the workload of each crew member should be limited to a reasonable level.

Rothblum (2000) has a different approach to the issue. According to her, human errors are generally caused by technologies, environments and organizations that are incompatible with human performance. This incompatibility leads people to make mistakes. Traditionally management has tried to prevent human errors by enhancing their motiva-

tion by cajoling and threatening. The goal has been to make people to adapt the system, but Rothblum (2000) says instead the system needs to be adapted to the humans. Rothblum (2000) says this human-centred approach would not only decrease errors and accidents, but also increase effectiveness and morale and decrease personnel injuries, lost time and training costs. This means management should keep the human operator uppermost in their minds when making decisions. By analysing the causes of human errors and the things that have led to the condition that has enabled the error (e.g. causes of fatigue), management can make decisions that prevent human errors.

4.3 Crew resource management

Crew Resource Management (CRM) is typical for high risk working environments. It is a form of management that focuses on non-technical skills that are crucial in enhanced operational performance, e.g. leadership, communication, team work, situation awareness and decision making (Flin et al., 2002).

As mentioned before, safety research has found human error and team work failures to be major causal factors in industrial accidents. This attracted more research mostly in aviation industry. In order to improve safety, the aviation industry started more than 30 years ago to develop training programs to teach crew resource management that would increase the effectiveness of flight crews and decrease the amount of failures. Since then CRM has been adopted to other high reliability working environments, such as merchant navy (Flin et al., 2002).

The need for CRM has been researched with interviews and accident analysis. The studies are unanimous of the essential role human error has in accidents, and this does not change significantly depending on the industry (Flin et al., 2002). For example, in an analysis of Boeing's (1993) civil aviation accidents, the crew is the primary cause in over 73 % of the accidents studied. In the same study data from cockpit voice recorders from the accident aircrafts suggested that the crews were not properly fulfilling their assigned roles on the flight deck and the occurring problems were in cognitive and social skills, not in technical abilities. Most of the failures happened in communication, crew coordination, decision making and leadership. This all applies also in the maritime industry (Flin et al., 2002).

Wagenaar and Groeneweg (1987) analysed 100 accidents at sea and found that only four of them happened without any contribution of human error. Byrdorf (1998, referred by Flin et al., 2002) again stated that incidents and accidents in the Danish shipping company Maersk have decreased by a third since 1994, when the company introduced CRM for ships. The company attributes this reduction to the CRM training consisting of four-day classroom course followed by three days of sailing in a ship simulator. The course covered resource management, assertiveness, communication, team work and stress coping.

4.3.1 Ship management attitudes

Cockpit Management Attitudes Questionnaire (CMAQ) (Gregorich et al., 1990) and different versions of it are part of crew resource management research. The original questionnaire was conducted with flight pilots, but the theory following the study has been adapted to all high-risk working environments, including maritime industry, even though there are very few studies of management attitudes in shipping business.

Gregorich et al. (1990) carried out a study on Crew Resource Management (CRM) related attitudes with the Cockpit Management Attitudes Questionnaire (CMAQ). After analyzing the data from the responses of several thousand captains, first officers and flight engineers, they composed the items of the CMAQ to three scales. The first scale is called Communication and Coordination (COCO), and positive attitudes from this scale are, for example, clear briefings and crew members monitoring each other for symptoms of stress. Positive attitudes in the second scale, Command Responsibility (COMMAND), reflect a sense of shared responsibility. An effective attitude in the third scale, Recognitions of Stressor Effects (RSE), is to acknowledge how stressors can impair personal performance.

Investigating the results of accident analyses has been an important way of getting more information of the shipping companies' non-technical skills and organizational problems. Röttger et al. (2013) give an example of this, the collision of the passenger ship Empress of the North with a rock. The accident was investigated by the National Transportation and Safety Board in 2008. The captain had sent a newly licensed and inexperienced officer for watch to replace a sick senior officer. The captain assigned an older seaman, unknown to him, to help the junior officer navigating the ship. The older seaman himself did not consider himself experienced in the area. The seafarers on the bridge attributed the responsibility for safe navigation to one another and suffered from lack of communication. The ship got too close to an island and hit the rocks around it. This was caused by the combination of inexperience, the darkness of the night and the circadian low on human performance. The captain had not seen the dangers of the situation. Although Gregorich's (1990) survey was conducted in flight management, according to Röttger et al. (2013), the cockpit management attitudes also apply in the shipping industry and the attributes of the collision of Empress of the North can be divided into COCO, COMMAND and RSE scales.

In maritime environment the cockpit management attitudes are still a relatively little researched subject. O'Connor (2011) made a survey with naval officers using Flight Management Attitudes Questionnaire (FMAQ), which is a more comprehensive version of CMAQ. Naval officers' attitudes regarding stressor effects were neutral, as well as attitudes regarding questioning of a superior's decision and slightly positive when it came to the need to take the stress and the problems of others into account. They agreed on the importance of briefings, debriefings, cooperation and communication. Still it is unclear if the attitudes are correlated with the behaviour and performance on board. Another research (Helmreich & Merritt, 1998, referred by Röttger et al., 2012) suggests that compared to medical doctors and pilots merchant mariners show the most pronounced underestimation of stressor effects on human performance.

4.4 Resource management and leadership behavioural markers

The IMO Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) is a set of international regulations to ensure seafarer competence globally. The amendments added in 2010 are somewhat open to interpretations especially when it comes to management, so Devitt and Holford (2010) conducted a survey of how seafarers understand the convention.

Devitt and Holford (2010) researched the development of resource management and leadership behavioural markers in merchant navy. They wanted to identify if the broad competence criteria of the STCW amendments (STCW Manila Amendments) would be consistently construed by maritime industry stakeholders. The research was carried out as a semi-structured interview with 20 participants typically with a deck rather than an engineering background. With one exception, all the interviewees were white Westerns.

Principles of resource management have been adapted for merchant navy, among other high risk environments, from the aviation industry. However, measuring and monitoring non-technical competencies vary company to company. In the STCW amendments resource management competence presents itself in leadership and team work at the operational level, but also in leadership and managerial skills at the management level. Similar behavioural markers are needed on both levels, but the responsibilities are different. No differences are seen between the skills needed in the management and those needed in a leader, either. This confusion is shown in the views of the seafarers Devitt and Holford (2010) interviewed. Some of them saw no difference between leadership and management at all, while some were clear that they were two different concepts. This is not the only ambiguity in the STCW. The study shows resource management and leadership/management separately in the sections on deck and engineering onboard, even though they require identical competences. This means that training in resource management for the departments usually takes place separately. When the concepts are unclear, evaluating competence in resource management becomes difficult.

In the interviews the response ranges varied a lot. Devitt and Holford (2010) suggest some behaviours were easier for the interviewees to explain. Respondents were better able to describe behaviours for externalized activities, such as communication, than internalized activities, such as decision-making. Some respondents saw training and regulatory competence as a process and did not understand how behaviour would affect that. Some interviewees found it more difficult than the others to identify behaviours that demonstrate competence in a multicultural working environment.

In the interviews Devitt and Holford (2010) noticed that respondents could remember strong positive or negative leadership experiences that had happened years ago. Ineffective leadership affected the efficiency of the operations and the crew morale. In the study leadership was seen as a combination of task skills and interpersonal attributes. In some interviews there was a link between good leadership and effective team performance, too: good team work comes out of good leadership.

When the seafarers were asked about difficulties of communicating with non-native English speakers, many interviewees recognized them. Respondents suggested several strategies of managing a multicultural crew. These were: reducing the complexity of sentence structure, moderating the speed of communication, avoiding non-standard terms and questioning to confirm understanding (Devitt & Holford, 2010).

Identifying behaviours of decision-making process was difficult for many respondents, because it was seen as an internal process that was not shared with others before the action was taken. Stages of decision-making at operational and management level according to the STCW are: situation and risk assessment, identifying and considering generated options, selecting the course of action and evaluating effectiveness of the outcome. The seafarers thought stage one was very important, and the officer making the decision should have enough information and she or he should be able to understand the consequences of each option. If there was more than one officer keeping watch the emphasis of discussion was big, but with the current manning levels on vessels there was often only one officer keeping watch and he or she had no chance to discuss the options with anyone. Therefore, observing behaviour related to stage two would be difficult. Many respondents thought it was best in dynamic situation to make a decision that would give as much options in the future as possible. According to the interview it was the most important thing that the outcome was successful. It was not important, whether it was achieved by the most effective way (Devitt & Holford, 2010).

Even though resource management has been adapted as a part of management in shipping companies, measuring and monitoring non-technical skills linked to it vary a lot. The ambiguities in the STCW split the participants of the study and e.g. some see leadership and management as two different operations, some as synonyms for each other. Interpretations of the STCW have an influence on training, too. When the participants were asked to explain behaviours relating to different activities, it was much easier for them to describe external than internal behaviours. Also describing competence in multicultural environment was challenging, but they could suggest several strategies for managing a multicultural crew. The importance of good leadership came up, when respondents could remember good and bad experiences of leadership for years.

4.5 Managing a multicultural crew

The business environment of the shipping industry, institutional arrangements and international regulations affect the shipping companies' strategies of cost reduction. Since manning expenses are a big part of the operational costs of shipping companies and the global maritime labour offers officers and ratings that are willing to work on lower wage than officers and ratings from traditional maritime countries such as Great-Britain, the crews are more and more often multicultural. Managing a multinational crew has its own challenges (Progoulaki &Theotokas, 2010).

Manning expenses are almost 50 % of the operational cost and it's a flexible cost. This leads to hiring low-cost seamen, typically from developing countries or Eastern Europe. The survey showed that Greek shipping companies employed a variety of 34 nationali-

ties; most frequently Filipinos, Greeks, Ukrainians and Romanians. From human resource management's view the variety could be seen as strength, but usually it is treated as a problem (Progoulaki & Theotokas, 2010).

Companies' representatives graded the different nationalities of the employees by the characteristics that can be seen as crucial for the efficiency and productivity of seafarers. Different nationalities scored differently. From Greeks, Filipinos, Russians, Polish and Ukrainians all scored clearly above average and almost all the other nationalities had above average scores as well. This means that the companies acknowledge their valuable characteristics (Progoulaki & Theotokas, 2010).

Progoulaki and Theotokas (2010) tried to find out, whether Greek shipping companies were training seafarers to eliminate the disadvantages caused by multiculturalism, by teaching e.g. cultural diversity management. Only small part of the companies offered this kind of training and it was mainly for Greek officers.

Konstantopoulos and Alexopoulos (2007) also researched the Greek shipping industry through a survey. They focused on the changes happening in the human resource management onboard and especially in dry-bulk shipping. They studied mainly the impacts of crew nationality changes and the captains' ways to manage it. The survey was made by sending a questionnaire to 74 captains commanding 1760 seamen. 28,6 % of the seamen were Greek, 71,4 % were foreigners. The captains were categorized in three groups, those who have a work history of 1-12 years; those who have a work history of 13-21 years and those who have been in the dry-bulk shipping industry over 22 years. This categorizing was important, because Konstantopoulos and Alexopoulos (2007) are comparing the ways to manage human resources nowadays and before most of the crew members were foreigners.

Kostantopoulos and Alexopoulos (2007) take for granted that a multinational crew causes problems or at least it cannot be seen as an advantage. In the questionnaire they asked the captains how they perceive their work compared to what it was like before. Only to unmixed Greek crews the answer "easier than before" was suggested. To mixed crews the options were: "more difficult than before", "the same" and "different to the one before". To this question 46 % of the captains answered it was more difficult and about 11 % that it was the same.

Majority of the captains (58,1 %) preferred an unmixed Greek crew. However, most of the captains who had been in the industry more than 22 years saw a mixed crew of Greek and foreign seamen as the most efficient, when the newest captains thought a Greek crew was the most efficient (Konstantopoulos & Alexopoulos, 2007).

The captains with work history of more than 22 years and less than 12 years implement concentrative communication on their ships, e.g. communication based on the captain knowing everything going on in his ship. The captains with work history of 13-21 years preferred a hierarchic system and assigning duties (Konstantopoulos & Alexopoulos, 2007).

The multicultural factor is essential in human resource management nowadays. Often the variety caused by employees coming from different countries is seen as a problem, but variety itself could be seen as strength. Studies found that lack of a common first language and poor English skills among crew members cause problems, but e.g. cultural diversity management training is rarely offered (Progoulaki & Theotokas, 2010).

5 SUPPLY CHAIN SECURITY MANAGEMENT

A supply chain is a system encompassing all activities and services associated with the flow and movement of goods and related information from the point of origin to the point of consumption (Yang & Wei, 2013). In an international supply chain shipping has an important role in the overall supply chain as it is responsible for handling and carrying cargos across the oceans.

Security is a process and it requires continuous improvement (Thai, 2009). Yang and Wei (2013) referred to Closs and McGarrel (2004) who defined supply chain security management as "the application of policies, procedures, and technologies to protect supply chain assets (products, facilities, equipment, information, and personnel) from theft, damage, or terrorism, and to prevent the introduction of unauthorized contraband, people, or weapons of mass destruction into the supply chain". The task of supply chain security management is to support the company in safely achieving its business goals (Yang & Wei, 2013).

Globalization of the world economy has led the shipping companies to outsource their value added logistics activities, which has increased the risk of interruptions and shut-downs of supply chains (Yang & Wei, 2013). That is why enhancing supply chain security without affecting efficiency has become important. Yang and Wei (2013) have studied how supply chain security management affects safety performance in container shipping and Thai (2009) has carried out a study on how to enhance the supply chain security while facilitating the smooth flow of materials and keeping the organizational efficiency (Thai, 2009).

Over 99 % of Taiwan's international trade is carried by sea (Yang & Wei, 2013). To enhance the competitiveness of the country, it is important to find out, where the problems lie. According to statistics, each company experiences on average 1.2 security incidents per year and each of these incidents results in an average loss of 110,000 US dollars (Yang & Wei, 2013). Supply chain security management is crucial for sustaining competitive advantage.

Yang and Wei (2013) conducted a study testing two hypotheses: security management has a positive effect on the safety performance and security management has a positive effect on the customs clearance performance in the container shipping sector. The container shipping sector here includes container shipping companies, container shipping agencies and container shipping terminal operators.

Data for Yang and Wei's (2013) study was collected by a questionnaire survey. 85 container shipping executives answered to the mailed questionnaire. More than 68 % of the respondents were either a vice president or above, or managers or assistant managers. Over two-thirds of the firms were local, but there were also foreign owned and foreign-local owned firms. Almost half of the firms employed 50 or less people, and 21 % employed between 101 and 500 employees. Respondents were asked to rate 30 security management attributes. Responds were given by using a five-point Likert scale, 1 meaning "strongly disagree" and 5 "strongly agree".

When asked to rate seven items regarding the security performance of their employing firms, respondents were the most satisfied with the item “decrease in number of personal injuries”. It was followed by “increase in cargo flow”, “decrease in cargo loss and damage”, “decrease in frequency of equipment failure”, “decrease in frequency of accidents”, “decrease in waiting times at the border” and “decrease in number of customs inspections”. Respondents were clearly more satisfied with the safety performance than customs clearance performance.

Yang and Wei (2013) identified four crucial security management dimensions in container shipping operations: facility and cargo management is clearly the key security management dimension in Taiwan, and the rest follow; accident prevention and processing as the second, then information management and partner relationship management.

Facility and cargo management dimension consisted of items such as installation of 24 hour camera system, monitoring and controlling access to areas where cargo is kept, controlling the entry and exit of people and cars, storing different types of goods separately, performing inspections during the shipping process and reporting of anomalies (Yang & Wei, 2013).

Accident prevention and processing dimension consisted of e.g. providing statistical data of security incidents for modifying security policy and documenting security incidents, quickly sharing information with all employees in case of security incidents, investigating security accidents and conducting security analysis regularly to improve safety (Yang & Wei, 2013). Information management dimension included protecting business information in different ways, regularly exchanging data with customs administrations and backing up all commercial data and programs, also regularly. Partner relationship management dimension consisted of establishing collaborative relationships with authorities, encouraging business partners to enhance supply chain security and selecting low-risk business partners, having a good system for recording and controlling commercial intercourse and performing background checks on the company’s employees (Yang & Wei, 2013).

Analyzing the results, Yang and Wei (2013) found that information management and partner relationship management were positively related to safety performance and customs clearance performance. Facility and cargo management and accident prevention and processing dimensions had no significant effect (Yang & Wei, 2013). Yet the responses imply the managements of shipping firms in Taiwan are focusing on facility and cargo management and accident prevention and processing management.

Thai (2009) identified 13 dimensions of effective maritime security model: well-structured security policy, security risk assessment, risk-based security mitigation strategies and plans, communication and consultation with stakeholders, security monitoring and reviewing, continuous security improvement, senior management commitment and leadership, employee empowerment, employee involvement, security training, security design and process control, holistic approach and incident handling and response. In addition, Thai (2009) also listed 24 critical success factors that are part of the dimensions and define further the strategies to control the dimensions.

In the survey, factors involving security incident handling and response and factors involving security risk assessment, risk-based security mitigation strategies and plans, and senior management commitment and leadership were rated as the most important in magnitude. Based on the results Thai (2009) divided supply chain security management in three categories that require attention when planning effective security management: quality management, risk management and business continuity management.

Quality management in supply chain security management in shipping means designing processes that prevent tampering with a shipment before, during and after the loading process and making sure all processes have been designed correctly from the beginning of shipment movement along the chain (Thai, 2009). All processes in the shipping supply chain need to be controlled and managed for security purposes. Also, in quality management the company needs to adapt a total organizational focus in security management and create a strong security culture throughout the organization (Thai, 2009).

A risk-based management process consists of threat identification, risk assessment, acceptance criteria and implementation process of risk control (Thai, 2009). The organization should communicate and consult risk management processes with its internal and external stakeholders, and address business continuity management as an integral part of its security management.

Thai (2009) collected data for the research with a survey questionnaire and confirmatory interviews. The questionnaire consisted of two questions: in the first one respondents were asked to rate the perceived importance of the 24 critical success factors of maritime security on five-point scale; the second one was open-ended and respondents were asked to rate any other critical success factors in their business sectors. The interviews were recorded with a tape recorder and they lasted from 45 minutes to an hour and 15 minutes. 119 maritime service-providing organizations in Vietnam that were shipping companies, port operators and freight forwarders, answered to the questionnaire. 25 of them were chosen for the interviews.

Security and incident handling and response was seen as the most important dimension. This dimension is also closely connected to quality management, as plans regarding contingency and recovery should be continuously reviewed and updated (Thai, 2009). Interviewees widely agreed that organizations should have in place a detailed contingency to respond to materialized security risks and a plan to restore business operations. This is explained by perception that even though it is important to assess risks in advance, not all risks can be prevented. Security risk assessment and senior management commitment and leadership were other essential dimensions.

6 MOST IMPORTANT FINDINGS

Occupational health and safety management is developing and maintaining systems and practises to ensure safety onboard. This requires collaboration between the shore-based management and the staff onboard. Usually companies create systems to identify and fix hazards and these are documented. Occupational health and safety management is troubled in shipping. A company summarizes its policy in a vision and tries to communicate the message to employees and customers. This policy is used externally to impress customers and internally to make the work environment safe.

In shipping industry safety communication takes place both onboard and onshore and between onshore managers and officers onboard (Bailey et al., 2012). However, Bailey et al. (2012) found out that most shipping companies do not succeed in communicating their safety messages to ratings, because they give mixed and contradictory signals. Ratings believe safety is not a genuine priority to the shipping companies. Safety rules and practices are documented on the company's safety strategy, but according to the ratings, company managements onshore expect these rules to be broken e.g. for economical advantage. There is barely any communication between the shore-based management and the lower-ranking seafarers, which is why it is challenging for a company to convince their employees of their commitment to safety management.

The shore-based management's visions of safety or the company's reputation on market concerning safety are not enough to ensure safety onboard (Bailey et al., 2012). Because of the nature of the shipping industry, the staffs of the shipping companies are divided. To make a company's operations safe, the management onshore, officers and ratings onboard all need to be committed to safety management.

Bhattacharya and Tang (2013) suggested that onboard safety messages are passed top-down without any problems, but upward communication is inadequate. The hierarchic culture on ship and the weak position of the ratings working on short-term employment are the biggest obstacles for employee participation to OHS management. The ratings avoid all types of communication that could make them appear as trouble makers and impair their chances for re-employment, with their superiors. OHS management has been researched using questionnaires and methods of field study.

Human resource management has been studied by using field study methods and questionnaires. A company can have physical or human capital resources or organizational resources. Capabilities in these resources form competencies that can be imitable threshold or core competencies. In order to have a sustainable competitive advantage, companies should develop and maintain its human resource systems and relationships with employees, because these are difficult to copy.

Human error contributes to most of the accidents at sea. It is a mistake made by a person. It can be a bad decision, some action that should not have been taken or absence of an action that should have been taken. Usually human errors do not just occur, but behind them is often an issue with technology, the environment or organization (Rothblum, 2000). According to Wang and Zhang (2000) human errors can be reduced

by increasing communication, training fatigue management, e.g. employing enough workers so seafarers do not have to suffer from fatigue or stopping the ship if needed, and by affecting the causes of the conditions increasing the risk of human error, e.g. shore-based management could decrease the commercial pressure of the seafarers. By preventing the conditions leading to wrong decisions and such, one can manage human errors and decrease accidents. Human errors are researched by investigating accidents and tracing the development of accidents.

Crew resource management is an attempt to prevent human errors by focusing on management of non-technical skills. All the studies described earlier give an essential role to communication, and e.g. in CRM training the Danish shipping company Maersk offered to its employees concentrated mainly on social skills.

Cockpit Management Attitudes Questionnaire (CMAQ) researches attitudes of crew resource management. The results can be divided into three scales: Communication and Coordination, Command Responsibility and Recognitions of Stressor Effects. By changing the attitudes in these scales more to positive and acting accordingly can decrease the amount of casualties and increase safety at sea. Changing the attitudes changes the behaviour and performance, which affects human error. Therefore, managing the attitudes regarding crew resource management is one way of managing human errors.

Most captains prefer a national crew to multinational (Konstantopoulos & Alexopoulos, 2007), because communication is problematic when no one is speaking their first language and English skills of the crew members vary. Yet, training for cultural diversity management or such is rarely offered (Progoulaki & Theotokas, 2010).

Devitt and Holford (2010) studied interpretations of the STCW and found out they varied a lot in different companies. There were confusions with the definition of management and leadership, and what type of management skills were needed in each position. Interviewees defined leadership as a combination of task skills and interpersonal attributes. Good team work was seen as a consequence of good leadership. Communication was also seen important for decision-making.

Globalization and third-party logistics providers have highlighted the importance of supply chain security management in shipping business. Supply chain security management has been researched mostly by using questionnaires and interviews to find out perceptions and attitudes regarding the matter. In both Yang and Wei's (2013) research and Thai's (2009) research respondents thought that information and communication management was one of the most important ways to manage security.

Yang and Wei (2013) studied supply chain security management and found out that partner relationship management and information management affect the security performance positively. These dimensions are underrated in security management in Taiwan, where the survey was conducted. This implies that shipping companies should e.g. communicate and take care of good relations to authorities, protect business informa-

tion, choose low-risk business partners and encourage them to enhance their supply chain security.

This chapter summarizes the most important findings of the studies covered in this literature review. To give an overview, the most important studies are also summarized in the following table.

6.1 Summary of significant previous studies

Study	**Type of publication**	**Target of study**	**Subject of study**	**Method**	**Conclusion**
Bailey et al. (2012)	Published online by Cardiff University	Perceptions of risk and its management	Risk and risk management from employees of shipping operators point of view	Case studies	Problems in communicating safety issues between ship and management onshore
Bhattacharya & Tang (2013)	Safety Science	Middle managers' role in OHS management	Middle managers' commitment and employees participation to OHS management	Interviews and observations	Difficulties in formal communication between ratings and middle managers
Devitt & Holford (2010)	Published online by Warsash Maritime Academy	Development of resource management and leadership behavioural markers	Interpretations of STCW standards of resource management and leadership in merchant navy	Interviews	Interpretations vary a lot, leadership is essential for team work and work morale
Flin et al. (2002)	Team Performance Management	Improving team work in high reliability industries	Studies of CRM and team work in high-risk environments	Literature review	Human error contributes to nearly all accidents at sea, and safety can be improved with CRM training
Gregorich et al. (1990)	Journal of Applied Psychology	The Structure of Cockpit Management Attitudes	Crew resource management attitudes in aviation	Questionnaire	Three scales that include positive and negative attitudes, and these attitudes cause behaviour and practices

Konstanto-puolos & Alexopou-los (2007)	AIP Conference Proceedings	The Human Resource Management in Dry-Bulk Shipping	Changes in HRM and management of multi-national crews	Question-naire	The perceptions vary depending on how long a work history the captain has had
O'Dea & Flin (2001)	Safety Science	Safety leadership in the offshore gas and oil industry	Safety leadership and motivating workforce to safety	Question-naire	Management has considerable difficulties in motivating workforce and controlling safety crucial behaviour
Progoulaki & Theotokas (2010)	Marine Policy	Human re-source man-agement as a base for competitive advantage	Competences that contribute to competi-tiveness and managements' perceptions of identifying them	Question-naire - structured interviews and obser-vations	Resource-based view on management, focusing on core competencies to achieve sustainable competitiveness
Rothblum (2000)	Published online by Bowles-Langley Technology	Human error	Factors attributing conditions that enable human error	Accident analysis	Human errors are generally caused by the environment, technologies and organizations that are incompatible with human performance
Thai (2009)	Maritime Policy & Manage-ment	Maritime security management	Improvement possibilities and practices of security management	Question-naire and interviews	13 dimensions of effective maritime security model

Wagenaar & Groeneweg (1987)	International Journal of Man-Machine Studies	Accidents caused by human error	Chains of human errors causing accidents	Accident analysis	Accidents are caused by multiple human errors and complex coincidences that occur, because of tolerance of malpractices, lack of communication and because practices are not seen as risky
Yang & Wei (2013)	Supply Chain Management: An International Journal	Supply chain security management in shipping business	Supply chain security contributing competitiveness and ways to improve supply chain security	Questionnaire	Information management and partner relationship management affect safety and customs clearance performance positively

7 CONCLUSIONS

The role of shipping is emphasized nowadays due to globalization of the world economy. Clearly most of the international trade is carried by ships, e.g. in Taiwan the percentage even higher than 99 % (Yang & Wei, 2013), and globally the percentage is over 90 % as well (IMO). Globalization has not only affected the amount of goods shipped, but it has also put a lot of pressure on the shipping companies. It has made the competitive business even more competitive (Progoulaki & Theotokas, 2010). As the technology advances, human error remains as the main cause of accidents (Rothblum, 2000). In maritime management research there are two main themes to be seen: management of human factors including managing a multicultural crew and human errors, and safety management including safety of employees and security of cargo. In recent studies these themes are surprisingly close to one another, because they both focus on leadership and management of non-technical skills. It should be noted that often in research it is studied, how one should manage human factors, yet in most of the studies it is unclear how those practices fit in the hierarchic system aboard. The conventions found best in theory might cause problems in practice, since it is also found that most seafarers are not willing to give up the hierarchy (Konstantopoulos & Alexopoulos, 2007)

One of the main goals of the shipping companies has always been to produce low-cost services, but now the competition is forcing the companies into operational cost reductions, which has led to replacing seafarers from the company's country of origin with lower-paid seafarers from the global maritime labour market. Usually this cheap workforce comes from China, Philippines or the Eastern Europe, and they have poor English skills, which causes problems, since a multicultural crew may not have a common language (Progoulaki & Theotokas, 2010).

Safety in the researches made of shipping seems to consist of internal and external safety. Threats to safety of the ship and the people working there are e.g. fatigue, human error and bad weather. Threats to external safety that in research is called as security are e.g. terrorism and piracy. Security has risen to a topic especially after the terror attacks of September 11th 2001 (Thai, 2009). Safety that is accomplished by management of human error has been researched for over 30 years, even though aviation has attracted more research in this matter and many reports on maritime safety use these studies as they are. As technology develops, the cause of a human error is often the incompatibility between technology, environment or organization and people working onboard. There has been discussion whether this means that new technology that reduces human involvement is needed (Wang & Zhang, 2000) or that technology, environment and organizational structures should be adapted to human performance (Rothblum, 2000).

The methodologies used in researching the management of shipping seem to be rather established. There are mainly three ways of collecting data: questionnaires, interviews and accident analyses. Often questionnaires and interviews are both conducted in the same study to get both quantitative and qualitative information. In many studies the interviews take place onboard, when also field notes and observations are included. Questionnaires and interviews are used to collect data for surveys that aim to find out perceptions or attitudes, e.g. studies of multicultural crews or studies strongly related to hierar-

chy and culture onboard use these methodologies, but they have been used to study human error and supply chain security management as well. Accident analysis is used to find out the causes of accidents or the conditions that have enabled them.

7.1 Further studies

This review has focused on management onboard and how shore-based managements of shipping companies affect the onboard crew and security. A ship is a high-risk working environment, so it is logical that most of the research concerns safety one way or another. However, many studies used in reports of shipping are not carried out in shipping industry at all. Many studies are conducted in aviation or oil installations and they are assumed to apply in other high-risk environments, too. This is in many cases questionable, e.g. Bhattacharya and Tang (2013) referred to Mattila et al. (1994) whose research was conducted on building sites of a construction company. Surely some management practises apply in every working environment, but it must be kept in mind that shipping industry differs from most other industries.

Ship as a workplace is challenging, because it is isolated, sometimes for long times, both supervisors and employees have to stay in the same restricted area during working hours and spare time and the ship should stay on schedule. These special characteristics offer many possibilities for research, for example Bhattacharya and Tang (2013) suggested it is possible to get the ratings to participate the occupational health and safety management if the supervisors communicate with them in informal situations, but it could be also studied how relations outside working hours affect the management aboard and how to exploit them. Also, based on the studies covered in this review it seems that poor employment relations are a common problem in shipping. This is partly caused by short-term employments of the ratings, the uncertainty of future employment and the obvious hierarchy that makes upward communication unlikely to success. In order to better workplace safety and reduce human errors, the relations should be good and communication should work both ways. How management could improve employment relations so that everyone would benefit of it could be another research topic.

Safety management has been studied by analyzing accidents and by questionnaires and interviews. This leaves some uncertainties. In questionnaires and interviews the researcher finds out the attitudes and perceptions, or sometimes cases when something has gone wrong. In accident analysis are found only the things that have gone wrong enough to cause an accident. On the ship that has had the accident that is being analysed, there might have been several other errors that did not lead to the accident, but could have. Wagenaar and Groeneweg (1987) suggested that accidents are usually consequences of complex coincidences. According to this perception risky practices should be found to prevent and break the possible chain of events leading to accidents. But the problem is, by analysing accidents it is possible to find only the errors that have led to the accident that time. For research of management onboard it would be useful to interview crews, make field notes from different ships and study their practices and their records of injuries or near misses. By comparing data from different ships it could be

possible to recognise efficient practises and how and what affects the experience of safety.

Comparing the management practises of different ships and shipping companies would also be a way to find out the effects of e.g. safety and security management on the economical results and competitive advantage. Safety or security as a priority requires investments, but offers not only decrease in the amount of accidents and injuries, but also competitive advantage and savings due to fewer accidents. By comparing ships and shipping companies with different safety strategies and practises one could find the most cost-effective way of operating. This could promote health, safety and security management and increase the number of shipping companies that operate in a responsible manner. One way to find out how shipping companies benefit their effective safety management would be to conduct interviews on customers and associates of the shipping companies instead of management or employees of the shipping companies. This sort of research could focus on what the customers think is important in a shipping company and on what they base their choice of a shipping company, which would help to develop the management to the required direction.

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