TURUN YLIOPISTON
MERENKULKUALAN KOULUTUS- JA TUTKIMUSKESKUKSEN JULKAISUJA

PUBLICATIONS FROM THE CENTRE FOR MARITIME STUDIES
UNIVERSITY OF TURKU

A 46
2008

TRANSFORMING MARITIME SAFETY CULTURE

Evaluation of the impacts of the ISM Code on maritime safety culture in Finland

Jouni Lappalainen

Leverage from the EU 2007–2013

European Union
European Regional Development Fund

MERI KOTKA

TURUN YLIOPISTON
MERENKULKUALAN KOULUTUS- JA TUTKIMUSKESKUKSEN JULKAISUJA

PUBLIKATIONER AV SJÖFARTSBRANSCHENS UTBILDNINGS- OCH
FORSKNINGSCENTRAL VID ÅBO UNIVERSITET

PUBLICATIONS FROM THE CENTRE FOR MARITIME STUDIES
UNIVERSITY OF TURKU

A 46
2008

TRANSFORMING MARITIME SAFETY CULTURE

Evaluation of the impacts of the ISM Code on maritime safety culture in Finland

Jouni Lappalainen

Turku 2008

SARJAN PÄÄTOIMITTAJA / EDITOR-IN-CHIEF

Juhani Vainio

JULKAISIJA / PUBLISHER :

Turun yliopisto / University of Turku
MERENKULKUALAN KOULUTUS- JA TUTKIMUSKESKUS
CENTRE FOR MARITIME STUDIES

Veistämönaukio 1–3
FI–20100 TURKU, FINLAND

Puh. / Tel. +358 (0)2 281 3300
Fax +358 (0)2 281 3311
http://mkk.utu.fi

Kopijyvä Oy
Kouvola 2008

ISBN 978-951-29-3776-9 (paperback)

ISBN 978-951-29-3777-6 (PDF)

ISSN 1456 - 1816

PREFACE

Growing maritime transports in the ports in Finland and particularly the transportation of oil and other dangerous goods in the Gulf of Finland increase the risk of a serious maritime accident. The METKU Project (Developing Maritime Safety Culture) researches maritime safety in Finland and attempts to measure the prevailing safety level of the Finnish maritime sector.

An international safety management code (the ISM Code) was established over a decade ago in order to improve maritime safety. The primary aim of the ISM Code was to create a safety-oriented culture in the maritime community. The ISM Code provides measures for a safety management system for shipping companies. The purpose of this study is to evaluate the development of safety culture in maritime industry and to examine the weaknesses found in the safety management systems of shipping companies.

The ISM Code has brought a significant contribution to the progress of maritime safety in recent years. Shipping companies and ships' crews are more environmentally friendly and more safety-oriented than 12 years ago. Even though the roots of the safety culture have been established there are still serious barriers to the breakthrough of the safety management. These barriers could be envisaged as cultural factors preventing the safety process.

This literature review is the first report of Work Package Two of the METKU Project. The purpose of this literature review is to formulate a theoretical framework for the forthcoming research. The previous literary works concerning the effects of the ISM Code are evaluated.

This project was funded by the European Union and several private partners. Centre for Maritime studies in the University of Turku expresses its gratitude to the European Community, Regional Council of Päijät-Häme, City of Kotka and all the member companies of the project corporate group.

Turku 1st December, 2008

Juhani Vainio
Director
Centre for Maritime Studies

ABSTRACT

The purpose of the METKU Project (Development of Maritime Safety Culture) is to study how the ISM Code has influenced the safety culture in the maritime industry. This literature review is written as a part of the Work Package 2 which is conducted by the University of Turku, Centre for Maritime Studies.

The maritime traffic is rapidly growing in the Baltic Sea which leads to a growing risk of maritime accidents. Particularly in the Gulf of Finland, the high volume of traffic causes a high risk of maritime accidents. The growing risks give us good reasons for implementing the research project concerning maritime safety and the effectiveness of the safety measures, such as the safety management systems. In order to reduce maritime safety risks, the safety management systems should be further developed. The METKU Project has been launched to examine the improvements which can be done to the safety management systems.

Human errors are considered as the most important reason for maritime accidents. The international safety management code (the ISM Code) has been established to cut down the occurrence of human errors by creating a safety-oriented organizational culture for the maritime industry. The ISM Code requires that a company should *provide safe practices in ship operation and a safe working environment and establish safeguards against all identified risk.* The fundamental idea of the ISM Code is that companies should continuously improve safety. The commitment of the top management is essential for implementing a safety-oriented culture in a company.

The ISM Code has brought a significant contribution to the progress of maritime safety in recent years. Shipping companies and ships' crews are more environmentally friendly and more safety-oriented than 12 years ago. This has been showed by several studies which have been analysed for this literature research. Nevertheless, the direct effect and influence of the ISM Code on maritime safety could not be isolated very well. No quantitative measurement (statistics/hard data) could be found in order to present the impacts of the ISM Code on maritime safety.

In this study it has been discovered that safety culture has emerged and it is developing in the maritime industry. Even though the roots of the safety culture have been established there are still serious barriers to the breakthrough of the safety management. These barriers could be envisaged as cultural factors preventing the safety process. Even though the ISM Code has been effective over a decade, the old-established behaviour which is based on the old day's maritime culture still occurs. In the next phase of this research project, these cultural factors shall be analysed in regard to the present safety culture of the maritime industry in Finland.

Keywords: Maritime Safety, Safety Management, Safety Culture, ISM Code

TIIVISTELMÄ

”METKU –projektissa” (Merenkulun turvallisuuskulttuurin kehittäminen) tutkitaan kansainvälisen turvallisuusjohtamiskoodin (ISM-koodin) vaikutuksia merenkulun turvallisuuteen ja etsitään kehittämiskohteita merenkulun turvallisuusjohtamisen parantamiseksi. Tämä kirjallisuusraportti on laadittu METKU –projektin työpaketissa kaksi vuoden 2008 syksyllä.

Meriliikenteen jatkuva voimakas kasvu lisää mahdollisen merionnettomuuden riskiä Itämerellä ja erityisesti Suomenlahdella. Yksi tärkeimmistä merenkulun riskien hallinnan keinoista on ISM-koodin mukaiset turvallisuusjohtamisjärjestelmät varustamoissa ja aluksilla.

Inhimillisen virheen katsotaan olevan suurin yksittäinen onnettomuuksiin johtava tekijä. ISM-koodin mukaisella turvallisuusjohtamisella tähdätään inhimillisten virheiden vähentämisen. ISM-Koodin mukaan varustamon täytyy varmistaa aluksen turvalliset toiminnot, luoda turvallinen työympäristö sekä varautua kaikkiin tunnistettuihin vaaratekijöihin. Turvallisuusjohtamisen tulee perustua jatkuvaan parantamiseen sekä johdon sitoutumiseen.

Tässä kirjallisuustutkimuksen kuvataan, kuinka merenkulun turvallisuus on parantunut ISM-koodin vaikutuksesta. Kansainväliset tutkimukset ovat osoittaneet, että varustamot ja alukset sekä näiden miehistöt suhtautuvat turvallisuuteen sekä ympäristöön myönteisemmin kuin reilut 10 vuotta sitten, kun ISM-koodin mukaiset turvallisuusjohtamisjärjestelmät tulivat pakollisiksi merenkulussa. Samanaikaisesti myös monet muut tekijät ovat vaikuttaneet merenkulun turvallisuuden paranemiseen. Tästä syystä on vaikeaa osoittaa, mikä on ISM-koodin suora vaikutus turvallisuuteen. Myös sopivat tilastolliset aineistot ISM-koodin vaikutusten arvioimiseksi puuttuvat.

ISM-koodin myötä merenkulkuun on syntynyt turvallisuuskulttuuri, joka myös edelleen kehittyy. Kuitenkin turvallisuusjohtamisessa esiintyy puutteita, joita voidaan pitää kulttuurisina. Tämän kirjallisuustutkimuksen pohjalta käynnistetään projektin empiirinen osa, minkä aikana merenkuun turvallisuuskulttuuria analysoidaan haastattelemalla erityisesti alusten miehistöjä.

Avainsanat: Merenkulun turvallisuus, turvallisuusjohtaminen, turvallisuuskulttuuri, ISM-koodi

TABLE OF CONTENTS

1 INTRODUCTION

The ISM Code has been set up by the UN's agency for maritime affairs, the International Maritime Organization (IMO). The ISM Code provides the shipping companies and mariners a standard for safety management. The ISM Code has been in use since 1996. Thus, experiences and practices have accumulated now even more than within a ten-year period. (Anderson, 2003).

The purpose of this study is to research **how the ISM Code has influenced the safety culture in the maritime industry in Finland.**

1.1 Background of the study

The ro-ro Ship Estonia capsized and sunk in heavy weather in September 1994. The primary reason for the accident was a failure and loosing of the bow visor of the ship. The public significance of the disastrous accident of the Estonia was enormous especially in the Nordic countries. The accident was thoroughly investigated. Despite of the fact that the official accident investigation reported about the technical failure wild rumours about conspiracy theory spread in public, especially in mass media.

Hannu Hänninen analysed the report of the investigation board thoroughly in his doctoral thesis concerning the Estonia accident *(Hänninen 2007),* Hänninen stated that the cause of the Estonia accident was not only a technical failure of the bow visor. Hänninen widened the scope of the study from the accident itself to the surrounding social and institutional system of the maritime industry. Hänninen shows that there are major defects in the safety culture of the maritime industry.

Even before the Estonia accident occurred, deficiencies in the maritime safety culture were considered as the reason for the accident of the Herald of Free Enterprise (FMA 2006). Among the other fatal accidents that occurred in the late 1980s, the accident of the Herald of Free Enterprise was triggering concern about the maritime safety culture among international maritime authorities. This concern leads the International Maritime Organisation (IMO) to start to develop a new approach for managing safety in the maritime industry. As a result, the IMO provided an international safety management code (ISM) in 1993.

Many saw the ISM Code as a promising solution to the required change towards a better safety culture in the maritime industry (Anderson, 2003; IMO, 2005; Mejia 2001). Nevertheless, strong criticism towards the ISM Code has appeared throughout its application. There have been both positive arguments and negative arguments for the benefits of the ISM Code in Finland as well. Also Hänninen mentioned in his doctoral thesis that the application of the ISM Code could lead the maritime industry into a safer route. In that view, we could see the ISM Code as a remedy for the poor safety culture of the maritime industry. Therefore, this is the right time to study what is the significance of the ISM Code for the maritime safety in Finland.

1.2 METKU Research Project

The METKU research project evaluates the impacts of the ISM Code on the maritime safety culture in Finland (METKU – Developing Maritime Safety Culture). The program started at Kotka Maritime Research Centre in the first quarter of the year 2008. The project lasts for 2,5 years. The METKU project is funded by the European Union and other financing comes from the European Regional Development Fund of Southern Finland, Regional Council of Päijät-Häme, City of Kotka and private companies.

The purpose of the project is to study how the ISM Code has influenced the safety culture in the maritime industry. The project attempts to find the best practices for the shipping companies while improving their operations by implementing and developing their safety management systems.

1.2.1 Project plan and organization

The METKU project consists of the following work packages and responsible research partners:

- WP1: Statistical measurements of maritime safety, Helsinki University of Technology, Ship Laboratory
- WP2: Evaluation of the performance of Safety Management Systems in Finnish shipping companies, University of Turku, Centre for Maritime Studies
- WP3: Comparing ISM –OHSAS practices in shipping companies and port operations (ISM – OHSAS), Kymenlaakso University of Applied Sciences, Maritime Studies
- WP4: Exploring the Best Practises in shipping companies, Turku University of Applied Sciences, Ship Laboratory
- WP5: Safety management practices in Finnish maritime and port authorities, Kymenlaakso University of Applied Sciences
- WP0, Project management and communications, Kotka Maritime Research Centre

Kotka Maritime Research Centre is a rapidly growing research centre located in Kotka, in Southeast Finland by the Baltic Sea and the Gulf of Finland. The research centre consists of professors, researchers, project managers and administrative staff, currently of over 20 persons altogether. The research staff belongs administratively to the Helsinki University of Technology, the Kymenlaakso University of Applied Sciences, the University of Helsinki and the University of Turku.

Kotka Maritime Research Centre conducts research related to the maritime industry, maritime safety and marine environment especially in the Gulf of Finland and the Baltic Sea. Maritime transport and environmental safety threads have substantially increased in the Gulf of Finland and the Baltic Sea. Kotka Maritime Research Centre aims at reducing these threats through research and education. Maritime transport and port operations and their economic impacts are also important areas of research at the Centre.

This literature review is written as a part of the Work Package 2 which is conducted by the University of Turku, Centre for Maritime Studies. The Centre for Maritime Studies (CMS) was founded in 1980 and was converted into a special unit of the University of Turku in 1984. The CMS has developed into one of the leading providers of education, research and expert services in the maritime field and in other related fields in Finland. The CMS has developed into a strong provider of research and expert services related to seafaring and logistics. The services it offers include logistics and industry business consulting, research and development projects for the maritime sector and international co-operation projects. Most of the reports of the research and development projects are published in the CMS's own series. These publications are available, for example, at the special maritime library located at the Centre for Maritime Studies in Turku. In addition to its national activities, the CMS has taken part in international projects, especially those concerning the Baltic Sea. For example, CMS has led several EU-funded projects, taken part in other EU projects and participated in the research and development work of other types of projects.

A group of Finnish shipping companies and major Finnish ports participate in the project. The project partners are listed below:

- Finnlines Oyj
- Kristina Cruises Oy
- Meriaura Oy
- VG-Shipping Oy
- Port of Helsinki
- Port of Kotka
- Port of Hamina

These business partners support the project through financing and by providing information on their safety management systems.

1.3 The content of the report

The target of the Work Package Two is to study the development of the Finnish Maritime Safety Culture considering the effects of the ISM Code from the middle of the 1990s to the present. The Work Package Two is divided into three main parts. Literature review forms part one. The second part consists of empirical research examining the impacts of the ISM Code on the Finnish shipping companies. The third part includes evaluations of safety performance according to European Quality Award Criteria.

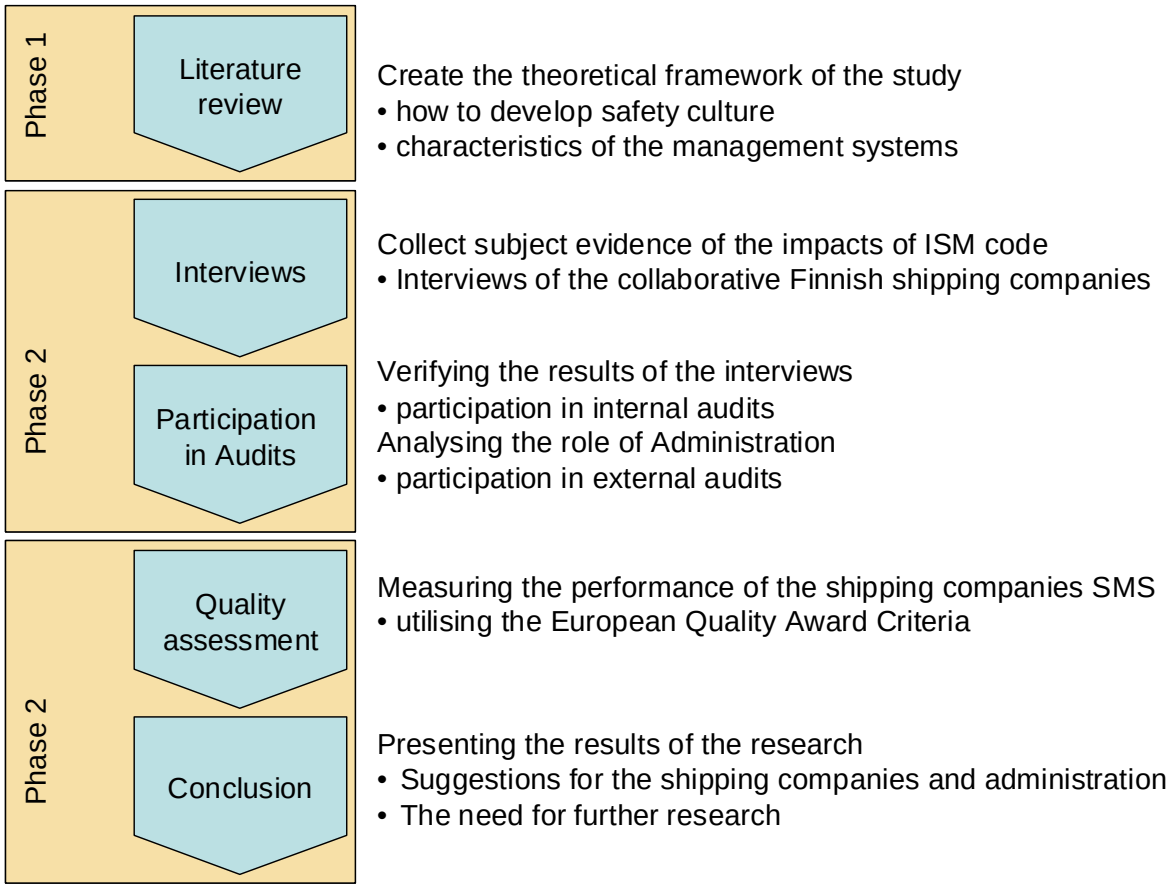


Figure 1.1: An overview of the Work Package Two

The purpose of the literature review is to attempt to formulate a theoretical framework for the forthcoming research project. This literature review provides a starting point for a more comprehensive study including profound interviews of maritime personnel and evaluating the performance of the safety management systems of Finnish shipping companies.

In order to evaluate the effects of the ISM Code on maritime safety culture we have to specify the concept of safety culture and recognize the means which could cause changes to the safety culture. The safety culture is a part of a wider concept of an organizational culture. Typically, the means for changing the organizational culture utilized by companies is called a management system. Different management systems

have been established for different purposes, for example quality management, environmental management and safety management. The ISM Code provides specifications for a safety management system in a shipping company. With the intention of discovering the success factors of a well performing organization we have to build a link between the management systems and the organizational culture.

Section two presents an overview of the economic and environmental conditions of Finnish maritime traffic in order to understand the demands and challenges confronted by the shipping companies nowadays. The demanding environmental and navigational circumstances which the Finnish maritime traffic has to face are described in this section. In addition, the Finnish maritime regime is described with a meaning to discover the position of the ISM Code as a part of the Finnish maritime law.

The purpose of section three is to build a bridge between the organizational culture and the management systems. The third section provides a description of the safety culture and an overview of popular management systems. In addition, the most common management principles of the management systems are characterized. Major similarities and differences between the management standards are also evaluated.

Section four concentrates on the earlier studies in regard to the impacts of the ISM Code. The earlier literature about the experiences of the implementation and maintenance of the safety management system are considered. Particularly the studies concerning the measurement of safety improvement and safety performance are reviewed.

Section five provides a conclusion of the literature review. The next phase of the project is presented in the last section.

2 MARITIME TRAFFIC IN FINLAND

Maritime traffic is crucial for the Finnish economy and the welfare of the Finnish citizens. As much as 90 % of the Finnish export and over 70 % of the Finnish import are transported by sea. Finland is totally dependent on seaborne traffic (Karvonen et al. 2008).

Finnish maritime transportations have grown during the first decade of the 21st century, except in 2005, as a result of labour unrest in the Finnish forest markets (Karvonen et al. 2008). Seaborne transports between Finland and foreign countries achieved the milestone of 100 million tons in 2007 (FMA 2008). The seaborne transportation is mostly operated by vessels which are reflagged under foreign flags. The percentage of vessels which fly the Finnish flag has decreased dramatically during the last few years. In 2007, the percentage of the vessels flying the Finnish flag was as low as 29 % (FMA 2008). The amount of port calls at Finnish ports was almost 40 000 in 2007. The Ports of Kilpilahti, Helsinki and Kotka are the busiest ports in Finland (FMA 2008).

Passenger traffic between Finland and foreign countries is an important part of the Finnish maritime traffic. Passenger traffic abroad grew constantly in the 1990sexcept during a short period after the accident of the ro-ro ship Estonia. In the current decade, the passenger volumes have remained on a steady level. The volume of the passenger traffic has totalled about 16 million passengers per year. The most important destination for passenger ship traffic is Sweden and the second most important is Estonia. The amount of passengers between Finland and Sweden was 9,3 million in 2007 and between Finland and Estonia 5,8 million passengers in 2007. The passenger traffic between Finland and Germany was 0,25 million passengers in 2007. The traffic volumes of passenger ships in the Gulf of Finland and in the northern part of the Baltic Sea are still considerable. The Port of Helsinki is the busiest and the Port of Turku the second busiest passenger port in Finland (FMA 2008).

Domestic passenger traffic is mainly provided by local charter boats in coastal cities and in cities in the Lake District. These charter boats are typically managed by small companies and they offer sightseeing cruises near by the home port. The shipping company Kristina Cruises is the only company providing long-distance cruises between the Finnish coastal cities and the cities in the Lake District onboard one passenger ship, M/S Kristina Brahe.

Also the international maritime traffic has grown strongly in the neighbouring sea areas of Finland. Maritime traffic in the Baltic Sea Region is growing rapidly due to the economic growth of Russia. The most rapidly growing transportation, however, is the oil transportation between Russia and international markets.

2.1 Shipping business trends in Finland in the early 21st century

In the current (2000) decade, the Finnish shipping business has internationalized significantly (Karvonen et al. 2008). The internationalization has developed in various ways. Firstly, Finnish-owned vessels have been transferred to fly a foreign flag. Reasons for flying a foreign flag are, for example, more favourable manning costs and tax policies in the foreign country compared to Finland. At present, nearly half of the Finnish-owned fleet is reflagged abroad.

Secondly, some Finnish shipping companies have expanded into foreign countries via acquisitions. For example, Rettig Oy Bore purchased a Dutch shipping company in 2001 and, also, Finnlines purchased the German Team Lines and Swedish Nordö-Link shipping companies in the early 2000s. (Karvonen et al. 2008)

Thirdly, the Finnish shipping business has become international by merging parts of it into foreign shipping companies by foreign buyers. The major Finnish forest companies have sold their earlier ownerships of the shipping companies such as Finnlines, Transfennica and Silja Line. Likewise, some (private) owners who have been engaged in the shipping business for a long time have sold their ownerships abroad (Karvonen et al. 2008).

Also, some shipping companies have merged with domestic shipping companies in the current decade. ESL Shipping and Bore have grown significantly through acquisitions of domestic shipping companies (Karvonen et al. 2008).

The internationalization and concentration of the shipping business have brought about some effects on the safety management systems of the shipping companies. The merged companies have to consolidate their safety management systems by a standardization of the company's safety policy, safety documentation, manuals etc. Also there have been notable differences between the safety cultures of the merging companies which might produce some friction between the personnel coming from different organizations. For example, the way in which the concept of non-conformity has been specified in shipping companies has varied.

Changing of the flag is a symptom of uncompetitiveness of the Finnish vessels in the international shipping market (Karvonen et al. 2008). The uncompetitiveness and a poor economic situation of a shipping company could defeat the company's safety progression when the ability to invest is weak.

The Finnish maritime traffic concentrates mainly on short sea shipping business. The main part of the Finnish-owned fleet cruises in the Baltic Sea and the North Sea region (Karvonen et al. 2008). The maritime traffic in the Baltic Sea is characterised by short high see legs and frequent and short calls to port. This type of "feeder traffic" could pose a threat to maritime safety. The personnel onboard could suffer from fatigue due to insufficient sleep, particularly when the ship is manned only with a master and one mate. (Accident Investigation Board Finland, 2008).

As a whole, the outlook of the shipping business seems positive in Finland. According to Karvonen et al., the demand situation in the Finnish shipping market is believed to strengthen in the future. The Finnish shipping companies believe that the turnover of the business is going to grow and companies are going to hire new employees in the near future (Karvonen et al. 2008). The positive outlook could also cause investments in new technology and this might benefit the safety process.

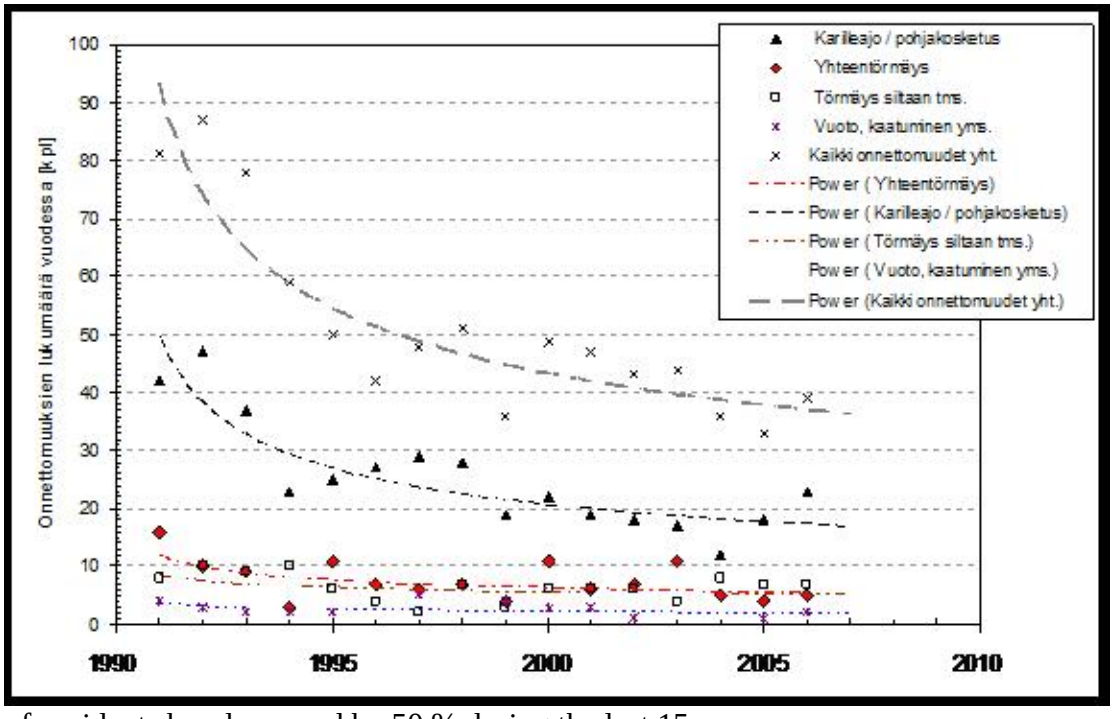
Nevertheless, the Finnish shipping companies are anxious about the supply of professional labour. Particularly a shortage of competent engineers and senior officers has been seen as a threat to the maritime safety.

2.2 Safety and risks in the Baltic Sea

2.2.1 Traffic volumes and occurrence of accidents

The most important risk factor effecting maritime safety is the huge traffic volume in the Baltic Sea and especially in the Gulf of Finland (Karvonen et al. 2006 and Arola et al. 2007). The density of the maritime traffic has been heavy in recent years and it is growing rapidly all the time. The volume of the maritime traffic is expected to double until 2015 (Karvonen et al. 2008).

Although the volume of the maritime traffic has grown in recent years, the occurrence



of accidents has decreased by 50 % during the last 15 years.

Figure 2.1: Occurrence of accidents in years 1991 – 2006 (Jalonen et al. 2007)

The fast growing traffic in the Gulf of Finland keeps the risks on a high level in any case (Jalonen et al. 2007).

2.2.2 Special risk areas

Oil transports equal 57 % of the total cargo in the Gulf of Finland. Particularly, the amount of oil tankers is abundant due to oil transportation from the Russian ports of Primorsk and Vysotsk. Russia is currently building a new oil terminal in Ust Luga. Also Russia is expanding its oil pipeline capacity from oil fields to the ports in the eastern part of the Gulf of Finland. The volumes of the oil transportation are forecast to grow up to 200 million tons until 2010 (Kommersant, 29. October 2007).
Another significant risk factor is heavy gross traffic through the Gulf of Finland from Helsinki to Tallinn. This traffic concerns mostly passenger traffic between Finland and Estonia. The ultimate accident scenario is a collision of an oil tanker with a full passenger ship. In that case, thousands of people will be in jeopardy. Also, the marine nature of the Gulf of Finland will be endangered (Arola et al. 2007).

The dimensions of the oil tankers are growing in the Baltic Sea. At the moment, the oil tankers vary in size from 80 000 to 100 000 tons. The dimensions of the new oil tankers are designed for 200 000 tons with a 15,4 meters draught. These are the limits for a safe navigation through the Danish strait (Markku Mylly, General Director of FMA, at a presentation in a seminar held on 20 Nov 2007). The length and the width of the planned tankers will be more extensive than of the oil tankers which are currently navigating in the Baltic Sea. The navigation of these new vessels will be more difficult due to the narrow fairways of the Baltic Sea. Also their assistance by ice breakers will be more difficult in winter conditions. The risk of a larger oil spill is higher for these giant tankers.

2.2.3 Navigation circumstances

Because of the environmental circumstances, navigation in the Finnish sea region is very challenging. The Finnish sea areas are shallow and rocky. Also the fairways in the Finnish sea areas are very narrow.

The Finnish Sea region is covered with ice nearly half of the year. In normal winters, the Bay of Bothnia, the Gulf of Finland and the northern part of the Baltic Sea are ice-covered. In a harsh winter, almost the entire Baltic Sea is covered with ice. The winter conditions set special requirements for the technology and equipment of the vessels as well as the competence and skills of the maritime personnel. The obstacles caused by the winter conditions are packed ice, ice banks, jammed ice fields and damages of navigation signs caused by drifting ice floes (Arola et al. 2007).

The seafarers confront an additional challenge due to the fact that a significant part of the marine work is done during the dark hours in difficult weather conditions and in winter conditions (AIB, 2008).

The maritime personnel of the vessels in the Baltic Sea represent many different nationalities. The rules of navigation are the same to all but the competence of the maritime personnel on different vessels may differ greatly. Particularly, the personnel might not have the required competence for winter navigation. Nevertheless, no international requirements for the competence of winter navigation are available (Sergey Aysinov, Project Manager, the Admiral Makarov State Maritime University, presentation in 20. November 2007). The lack of competence and experience could pose a risk in the Baltic Sea especially in the winter time.

2.2.4 Environmental issues

The Baltic Sea has been recognised as a particularly sensitive sea area PSSA. PSSA refers to an area that needs special protection through actions by the IMO because of its significance for recognized ecological or sociological or scientific reasons which may be vulnerable to damage by international maritime activities (IMO, 2008c). The PSSA status enables that specific measures can be used to control the maritime traffic in the Baltic Sea. The measures which are used in the Baltic Sea are, for example, routeing measures and Vessel Traffic Services (VTS). The Baltic Sea has been designated as a PSSA in 2005.

2.3 The ISM Code and Maritime Safety Regulation

Maritime safety legislation is mainly international. The most important actor is the International Maritime Organization (IMO). The IMO is a specialized agency of the United Nations. The primary purpose of the IMO is to provide conventions and resolutions for safety at sea. The IMO's convention became mandatory when the majority of the member states had ratified the convention. The IMO focuses on the safety and health of people, on vessel safety and, during the recent decades, much more on environmental aspects (Kristiansen, 2005; Mitroussi, 2003 and 2004).

2.3.1 The evolution of Maritime Safety Regulation

The evolution of the Maritime Safety Regulation has gone through three stages. The first stage was the era of culture of punishment. The culture of punishment means that if you are found responsible for an accident you will get a punishment like a fine or even imprisonment. A good example of the culture of punishment in connection with the Maritime Safety Regulation from the present day is the Oil Pollution Act from 1990 (OPA90) in the United States. The Oil Pollution Act gives ship owners full economic liability for oil spills in the US coastal waters (Kristiansen, 2005).

The second stage was called culture of compliance where the focus is to comply with numerous prescriptive rules concerning the construction of the ship, the competence of the crew, the required safety equipment etc. Typically, the rules are scrupulous and strictly mandatory. Examples of the culture of compliance are The SOLAS rules (International Convention for the Safety of Life at Sea) and the STCW rules (International Convention on Standards of Training, Certification and Watchkeeping for Seafarers) (Kristiansen, 2005).

Thirdly, culture of self-regulation is based on a standard established by the industry itself. The ISO 9001 quality standard is a good example of self-regulation. Likewise, we could see the ISM Code as a leap forward towards the culture of self-regulation although the application of the ISM Code is mandatory for all shipping companies by virtue of international and domestic law (Kristiansen, 2005).

Major accidents have been activating the renewal of the international maritime safety regulation. The International Convention for the Safety of Life at Sea (SOLAS) was established in response to the Titanic disaster which occurred in 1912. The SOLAS convention is generally regarded as the most important of all international treaties concerning the safety of merchant ships (IMO, 2008). The first version of the SOLAS convention was adopted in 1914. The SOLAS convention has been revised couple of times during the 20th century: the second version was established in 1929, the third in 1948 and the fourth in 1960. The latest convention of the SOLAS was adopted in 1974. This version includes the amendments agreed until the date of the agreement. The SOLAS convention 1974 includes a new approach to the renewal of the convention which is called tacit acceptance procedure. The tacit acceptance procedure means that, instead of requiring that an amendment shall enter into force after being accepted by, for example, two thirds of the Parties, the tacit acceptance procedure provides that an amendment shall enter into force on a specified date unless, before that date, objections to the amendment are received from an agreed number of Parties. The tacit acceptance procedure was designed to ensure that changes could be made within a specified (and acceptably short) period of time. As a result, the 1974 Convention has been updated and amended on numerous occasions. The Convention in force today is sometimes referred to as SOLAS, 1974, as amended. The ISM Code was included in the SOLAS convention by International Maritime Organization in 1994. (IMO, 2008).

2.3.2 The ISM Code

The foundation of the ISM Code was laid in the late 1980s. In the late 1980s numerous fatal accidents had occurred and the amount of maritime insurance claims exploded dramatically. Particularly the capsizing of the Herald of the Free Enterprise in 1987 awoke broad concern in the maritime community about maritime safety. Through a thorough analysis of the accidents, the shipping community came to a resolution that the main reason for these accidents was human error. As the main reason for the accident of the Herald of Free Enterprise was seen a lack of a comprehensive management system in regard to organizational safety. The roles and responsibilities of the crew were poorly described and this led to a situation where the bow door was left open without anyone noticing the hostile situation. Consequently, the roots of the numerous human errors were seen to stem from a lack of a comprehensive management system in relation to safety management in shipping (Anderson, 2003).

The ISM Code was established in three phases. In the European Union, the application of the ISM Code became mandatory for ro-ro passenger ferries which were operating between different ports in the EU on the first of July 1996. Clearly, the accident of the Estonia hasted the process. The next phase began when the ISM Code came into operation in worldwide shipping on first of July 1998. On that day, the ISM Code became mandatory for all passenger ships, high speed craft, tankers and bulk carriers. Finally, all the other ships and mobile offshore drilling units fell under the effect of the ISM Code on the first of July 2002. The ISM Code may be applied to all ships from 500 gross tonnages upwards (Anderson, 2003).

The ISM Code was included in the SOLAS convention by International Maritime Organization in 1994. Chapter IX of the SOLAS convention makes the application of the ISM Code mandatory for a shipowner. Chapter IX requires a safety management system to be established by the shipowner or any person who has assumed responsibility for the ship (the "Company") (IMO, 2004). According to Chapter IX of the SOLAS convention the safety management system shall be in compliance with the ISM Code (International Management Code for the Safe Operation of Ships and for Pollution Prevention).

By ratifying the SOLAS Convention, Finland has incorporated the ISM Code into the Finnish maritime law in 1995 (The Finnish Maritime Law, Laki merilain muuttamisesta 369/1995). According to the Finnish maritime law, the shipowner should establish and maintain a safety management system which is compliant with the ISM Code. Detailed specifications of the required safety management system are enacted in the statute of the shipowner's safety management systems (Statute/Asetus 66/1996).

2.3.3 The enforcement of the ISM Code

According to the ISM Code, national maritime administrations are responsible for the enforcement of the ISM Code in each member state of the IMO (IMO, 2008a). The Administration is responsible for issuing a Document of Compliance (DOC) to a Company which operate a ship. The document of compliance should be issued to any Company which has implemented a safety management system in compliance with the requirements of the ISM Code. The safety management system covers any ships operated by the Company. The Safety Management Certificate (SMC) should be issued to any ships which are compliant with the ISM Code. External audits are performed by administration prior to the issuance of the document of compliances and the safety management certificates. These audits are carried out in a Company and onboard ships in order to control the conformity of the safety management system. (IMO, 2008a)

The Administration could authorize an external organisation to perform the safety management audits and issue the document of compliances and the safety management certificates (IMO, 2008a). These organisations are called Recognized Organisations (RO). Typically, the recognized organisations are Classification Societies.

In Finland, Finnish Maritime Administration is responsible for the enforcement of the ISM Code. The role and the responsibilities of the Finnish Maritime Administration are defined in the Finnish Act of Supervision of the Vessel Safety (Laki alusturvallisuuden valvonnasta). Typically, the Finnish Maritime Administration has delegated the issuance and auditing to the recognized organizations in case of cargo ships. Passenger ships flying the Finnish flag are audited by the Administration.

Regional Port State Controls have an essential role in the enforcement of the ISM Code. In Europe, the regional Port State Control was initiated in 1982 when fourteen European countries agreed to co-ordinate their port State inspection effort under a voluntary agreement known as the Paris Memorandum of Understanding on Port State Control

(Paris MoU). Current membership includes 27 countries. The purpose of the Port State Control is described as follows:

> *Port State Control is a check on visiting foreign ships to see that they comply with international rules on safety, pollution prevention and seafarers living and working conditions. It is a means of enforcing compliance where the owner and flag State have failed in their responsibility to implement or ensure compliance. The port State can require defects to be rectified and if necessary detain the ship for this purpose. It is therefore also a port State's defence against visiting substandard shipping.*

Finland is a member of the Paris MoU. The Paris MoU ranked Finland as the safest flag State in 2005 and as the third safest flag State in 2007. The Paris MoU has accepted *38* countries to the "white list" which means that the maritime safety risk is low on the ships flying the flag of these countries. (Paris MoU, 2008a).

The Paris MoU has organised three concentrated inspection campaigns (CICs), which have been targeted to inspect the ISM compliance of visiting vessels in the European ports. The latest CIC was launched in September 2007 with co-operation with the Tokyo MoU, the Mediterranean MoU and the Indian Ocean MoU (Paris MoU, 2008).

In addition to the concentrated inspection campaigns, the Port State Control pays attention to the ISM-related issues during the ordinary inspections. The non-conformities and deficiencies found in the inspections are reported to the ship's flag State administration. Due to a major non-conformity or a hazardous deficiency concerning the ISM Code the Port State Control has the authority to detain the vessel until the deficiency is repaired.

3 MANAGEMENT SYSTEMS AND SAFETY CULTURE

The purpose of this section is to offer context to the study by giving an overview of different theories about organizational culture. The framework of the organizational culture sets the limits and restrictions for the evaluations of this study when assessing the possible changes in the maritime safety culture as a result of the application of the ISM Code.

Various management systems for different purposes are described. Management systems provide the methods which are applied to improve the performance of the organization.

3.1 Organizational culture

The concept of culture is adhered to the organizational context in this study. According to Schein (2001), a unique organizational culture could be established whenever and wherever a group of people join together for a reasonable period of time. Even a small group could forma culture of their own.

The concept of organizational culture is described in various ways in different literary works. According to Wiegmann et al. (2002), two main perspectives of the organizational culture are available.

- the socio-anthropological perspective
- the organizational psychology perspective

The organizational culture could be seen as an aggregation of symbols, heroes, rituals and values which are materialized as visible objects or practices. According to the socio-anthropological theory of the organizational culture, there is a deeper structure of culture inside the structure of symbols, heroes, ritual and values. This structure could be invisible for outside observers and it can be difficult even for the member of the organization to literally phrase the characteristics of the prevailing culture. Due to these unconscious and deep-rooted characteristics, Schein (2001) is convinced that the manipulation of the organizational culture is not an easy task.

As well as the socio-anthropological theory, the organizational psychology perspective of the organizational culture focuses on shared values and beliefs manifested through symbols etc. On the other hand, according to Wiegmann et al. (2002) organizational psychology perspective postulates that organizational culture consists of functional factors which could be manipulated. The organizational psychology theory believes that in the long run attitudes, beliefs and values can be changed through the methods of endurance management.

In order to rapidly improve the performance and effectiveness of the organization, one has to be deeply conscious of the factors of the prevailing organizational culture

(Schein, 2001). The chosen measures for the improvement should coincide with the current organizational culture.

3.2 Management systems and organizational culture

The popular management systems which are applied to quality, safety and environmental management have their origin on the organizational psychology. In general, the functions of the management systems are:

- to set a company policy,
- set goals
- and provide a systematic approach for operations

According to Deming (1986), the corporate culture supports the total commitment of a company to quality and high productivity. In the 1970s, Deming called in question the prevailing organization culture and the approach to quality in the American industry. Deming attempted to demonstrate that there has to be revolutionary cultural changes in the management of the American companies in order for them to survive the increasing international competition. According to Deming, the utmost requirement for the American management is a firm commitment to the quality approach including willingness for constant learning and continuous improvement. Later on, Deming's philosophy was named as Total Quality Management (TQM).

3.3 Safety culture

Safety culture has been examined as a part of the organizational culture. Wiegmann et al. (2002) have performed a comprehensive literature analysis concerning the safety culture. They have explored numerous definitions of safety culture in different industries for example within the energy industry, aviation and manufacturing. One of the most uncomplicated definitions of the safety culture is:

> *"Safety culture reflects the attitudes, beliefs, perception and values that employees share in relation to safety"*.

Wiegmann et al. establish their analysis of the safety culture on the organizational psychology theory. For the purpose of measuring organization's safety culture they represent indicators for an accomplished safety culture. These indicators are:

- organizational commitment,
- management involvement,
- employee empowerment,
- reporting system and
- rewarding system.

These indicators are also common for popular quality and environmental management systems which will be described in detail below.

Krause et al. stated that the safety management system reflects the safety culture of the organization (Kristiansen 2005). The success of the safety management system is very depended on the prevailing safety culture.

Pun et al. (2002) performed a comprehensive analysis of the problems and difficulties in regard to the implementation of the safety management system based on the ISM Code in Asian shipping companies. They came to the conclusion that one of the main reasons for the problems with the implementation was a mismatch in the current safety culture of the company. They showed that the companies which have faced difficulties with the implementation process did not sufficiently take the prevailing corporate safety culture into consideration (Pun et al. 2002).

3.4 How to change the safety culture

According to Schein (2001), the organizational culture is difficult to change. Schein described that changing the organizational culture might begin when something is threatening the survival of the organization. The purpose of the culture for an organization is to maintain the stability and predictability of the future. In order to change the current organizational culture there has to be something disturbing the ongoing stability. According to Schein, the organization culture affects the actualized operations through a cognitive framework of the people which are involved in the organization. The transformation of the organizational culture presumes an adaptation of a new cognitive framework of the personnel of the organization (Schein, 2001). Schein itemized two different ways to establish a new cognitive framework:

- imitation of and identifying with the role model provided by a management system (learning)
- trial and error until the behaviour remains successful (experiences)

According to the organizational psychology theory, the organizational culture could be developed by the systematic tools of management. Krause et al. represent the causation from the safety culture to the appearance of the incidents (near misses, hazardous situations, accidents etc.) (Kristiansen, 2005). The prevailing culture determines the phenomenon of the safety management system and its mediation into actualized operations. These causal relationships could be seen as bidirectional. In the long run, the actualized operations affect the safety culture through learning and the experiences of the personnel in the organization (Lanne, 2007).

The interactions between safety culture, safety management and active operations are shown in Figure 3.1.

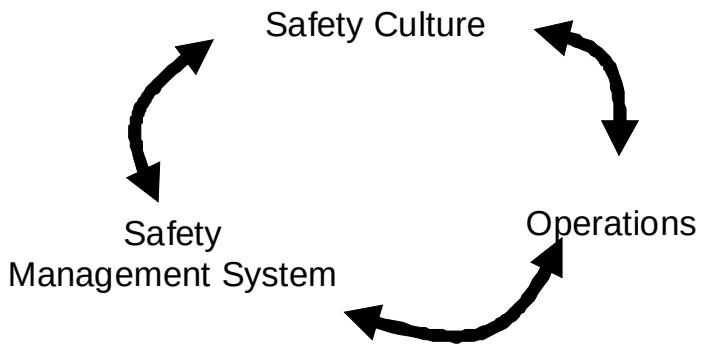


Figure 3.1: Interactions between safety culture and safety management and operations

3.5 Maritime safety culture

According to Hänninen (2007), the accident of the ro-ro ship Estonia was caused by poor maritime safety culture. Hänninen showed that the characteristics of the maritime culture had prohibited the precautions a long time before the accident happened.

Hänninen saw that there is a lack of risk handling measures and that the risk management systems are underdeveloped in the maritime industry. Due to these deficiencies in the risk management systems, the safety culture of the maritime industry includes poor procedures for handling incidents and safety warnings. The fact is that there had occurred other bow visor failures even before the Estonia accident. Hänninen supposed that there might have been opportunities to avoid the bow visor failure of the Estonia if an industrial-level system for handling incidents as bow visor failures had existed. There was no cumulative information about the other bow visor incidents in the industrial level so the other shipping companies could not learn from the other companies' mistakes. Even national maritime administrations were reported inadequate by the shipping companies.

Hänninen (2007) shows that there are major defects in the safety culture of the maritime industry:

- there is a higher tolerance to accept incidents and near misses in the maritime community
- shipping companies are more profit-oriented and neglect safety issues
- there is no systematic procedure for incident management
- mariners are not proactive for safety issues
- information about nonconformities does not cumulate in the maritime industry and reporting of nonconformities is not reported accurately to the maritime authorities

Hänninen urged that in order to avoid similar accidents in the future and in order to get improvements in the maritime safety operations there has to be a revolutionary change in the safety culture of the maritime industry.

When adapting Schein's (2001) theories about the transformation of the organizational culture to the transformation of the maritime safety culture, the change from the old-established maritime safety culture to the new safety culture requires that the current cognitive framework is thrown overboard and a new cognitive framework is adopted onboard instead. The ISM Code could be considered as the new cognitive framework.

3.6 IMO's safety philosophy

Due to the accumulation of disastrous maritime accidents in the 1980s and in the early 1990s, the maritime community took the attempt to create an accomplished safety culture for the maritime industry seriously. The IMO adopted the concept of safety culture profoundly at that time (Anderson, 2003; Mitroussi, 2003 and 2004; Karvonen et al. 2006). The IMO's statement about the safety culture is composed as follows (IMO, 2008)

> *An organization with a "safety culture" is one that gives appropriate priority to safety and realises that safety has to be managed like other areas of the business.*

The IMO provides the ways in which the safety-oriented culture can be achieved in the shipping business. The IMO's current means for achieving the safety culture are listed below:

- *recognising that accidents are preventable through following correct procedures and established best practices;*
- *constantly thinking about safety;*
- *and seeking continuous improvement.*

In practice, these prerequisites are established in the clauses of the ISM Code.

When establishing the ISM Code in the IMO in the early1990s there was a prevailing assurance that poor maritime safety culture could be improved (Anderson, 2003; Mitroussi, 2003 and 2004; Karvonen et al. 2006).

According to Anderson, the IMO's primary aim with the ISM Code is that there is a chance to create new safety-oriented culture in the maritime community in the course of time. There is great confidence in the safety-oriented culture that it can reduce accidents, damages, personal injuries and lost-time incidents in shipping operations. The safety culture provided by the ISM Code advances safer ships and cleaner seas. Anderson sees also that due to proper safety management the business of the shipping company will be more competent (Anderson, 2003).

The organizational psychology theory examines the safety culture on the basis of the establishment of the ISM Code. The IMO expressed its firm confidence in the success of the ISM Code as follows:

> *"The application of the ISM Code should support and encourage the development of a safety culture in shipping. Success factors for the development of a safety culture are, inter alia, commitment, values and beliefs (IMO, 1995)."*

Hänninen showed that the prevailing culture, including the adopted values and preconceived beliefs, was the major barrier towards safety behaviour of the maritime personnel (Hänninen, 2007). Therefore, the major challenge when implementing the ISM Code is to elicit the transformation in the values and beliefs of the maritime personnel.

3.7 TQM provides the basis for the ISM Code

Safety can be seen as the key factor in expressing organizational quality in shipping. In other words, "safety and quality could be seen as synonymous in shipping" (Kristiansen, 2005; Mitroussi, 2004). Hence it looks natural and obvious to adopt a similar approach to quality management as the basis of the development of the safety management standard in the early 1990's.

The concept of Total Quality Management was established in the 1980s. Total Quality Management is based on the perception of organizational psychology. Deming has been seen as a prominent co-founder of the school of the Total Quality Management. Deming has stated that the corporate culture supports a company's commitment to produce quality and high productivity for the organization (Deming, 1986).

The other co-founder of the Total Quality Management was Joseph M. Juran (1904 – 2008). Juran analyzed the well-performing American companies in the 1980s and 1990s. Juran saw that good performance by these companies was due to an ideal organizational culture. Juran emphasized that the success factors of an ideal organizational culture are a designed process for making improvements, which is applied to all business processes as well as to manufacturing processes, empowered working force to participate in making improvements, and established measures to evaluate, review and reward the progress against the improvement goals. (Juran and Godfrey, 1998.)

The foundation of the ISM Code is largely based on the philosophy of Total Quality Management (TQM). In regard to the safety management, the key fundamentals adopted from the Total Quality Management include:

- Management commitment
- Personnel empowerment

- Continuous improvement

According to Deming (1986):

> *"top management is responsible for 94% of the problems because they control the assignment of resources, establish and implement the methods of work, develop the politics, and so forth."*

The role of the top management is essential when improving the quality or safety of a company. Firstly, the management should set a company policy which describes where and how the management will lead the company in terms of quality, safety and environmental issues. Secondly, the management should provide adequate resources and tools for the personnel in order to ensure that the company policy could become materialized. The management should define the roles and responsibilities of the personnel related to quality and safety unambiguously. Finally, the management is responsible for setting realistic and achievable targets for demanded quality and safety performance. The performance should be reviewed on a regular basis and the quality and safety targets should be updated on the grounds of actual performance (Deming, 1986; SFS, 2001).

The involvement of the personnel is a prerequisite for a successful quality management system. Employees should have a feel of ownership in regard to the management system. The feel of ownership is established by providing an opportunity to participate in establishing, implementing and operating the management system on all organizational levels.

According to the literature on common quality management, TQM is based on the concept of continuous improvement. The concept of continuous improvement requires that a company improves its quality of products, services, capabilities and competence in a continuous basis on all organizational levels. A common tool for continuous improvement is called Deming's cycle of continues improvement or as the PDCA cycle (plan – do – check – act). See the picture below (Deming, 1998; Kristiansen, 2005; Roughton and Mercurio, 2002)

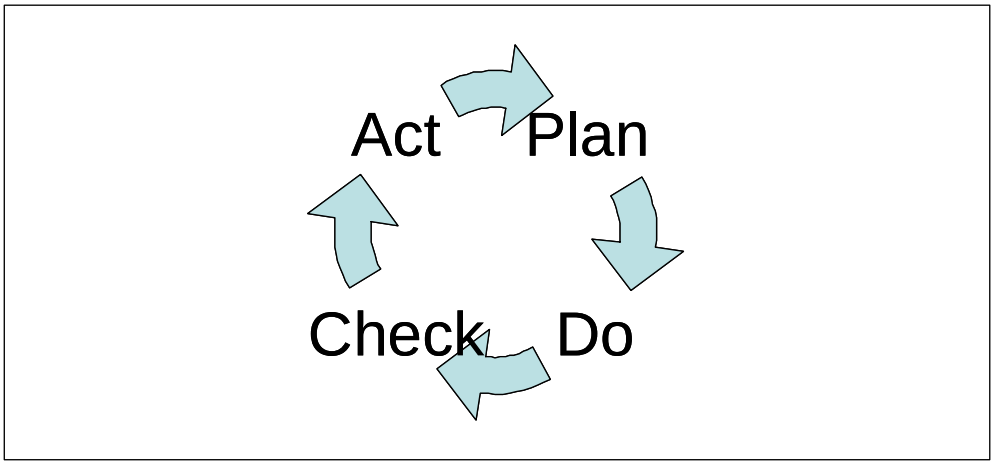


Figure 3.2: Cycle of continuos improvement (Kristiansen, 2005)

The PDCA cycle is a useful tool for improving, for example, the manufacturing processes or business processes. In the first phase of the PDCA cycle, one should make an action plan of the changes intended for the process. In second phase, one should carry out or test the changes intended for the process. In the checking phase, one should measure or analyze the results of the changes. In the action phase, the intended changes are implemented into actual operations. (Kristiansen, 2005; Roughton and Mercurio, 2002.)

3.8 TQM-based management standards

The most commonly utilized standard for quality management based on the TQM philosophy is the ISO 9001 quality standard provided by International Standardization Organization (ISO). The ISO 9001 quality standard has evolved considerably. The first version of the ISO 9001 quality standard was published by the ISO in 1987. The second version was published in 1994 and the current version of the ISO 9001 was published in 2000. Updating of the current version is under way and the new version may be published in 2009 (SFS, 1995; SFS, 2001).

Each new version published by the ISO is based on the concerns and criticisms expressed by the broad users of the quality standard. The first version focused on the manufacturing of new products. The second version (1994) focused on quality assurance by preventive actions towards identified risks. The present version (2000) concentrates on process improvement (process approach) (SFS 2001). The forthcoming version emphasizes more management commitment and customer orientation.

The evolution of the quality standard has affected the utilization of the standard. The application of the ISO 9001 quality standard started mostly in manufacturing companies in the late 1980s. Later on, the application of the ISO 9001 has been expanded into service business and public administration mainly in the middle of the 1990s. Also some shipping companies have adopted the ISO 9001 quality standard as a basis for the companies' quality management system.

The first international version of the environmental management standard was published in 1996 (ISO 14001 Environmental Management Standard). The first version stressed the importance of the statutory and regulatory requirements and strict documentation (SFS, 1997). As the present ISO 9001 quality standard, the current version of the ISO 14001 (2004) environmental standard has adopted the concept of process approach (SFS, 2004).

OHSAS 18001 provides a specification for occupational health and safety management in any organization. The OHSAS 18001 is widely used internationally. The origin of the OHSAS 18001 lays in the British standard on occupational health and safety (BS8800). The OHSAS 18001 went through a thorough revision in 2007. The OHSAS 18001 was harmonized with the ISO 9001 and ISO 14001 standards. The harmonization helps organizations to integrate the quality, environmental and safety management systems easier into to one common management system. The new version of the OHSAS 18001 provides a more result-oriented approach to the health and safety management. The new version of the OHSAS considers accurately accident prevention, risk reduction and the well-being of employees.

3.9 Substances of the ISM Code

3.9.1 General objectives of the ISM Code

The ISM Code itself has been written in broad terms; and the descriptions of the rules of the ISM Code are very general. Thus the Code is suitable for any kind of shipping companies and any type of fleet or ships. Section 1.2.1 describes the general objectives of the Code, in other words the ultimate purpose of the Code (IMO, 1993).

> The ISM Code section 1.2.1:
> The Objectives of the Code are to ensure safety at sea, prevention of human injury or loss of life, and avoidance of damage to the environment, in particular to the marine environment and property

3.9.2 Responsibility of the Company

The ISM Code requires the company to set in place a safety management system (SMS). The objectives of the safety management system of the company are described in section 1.2.2 of the Code.

> The ISM Code section 1.2.2
> 1. The company should provide for safe practices in ship operation and a safe working environment;
> 2. Establish safeguard against all indentified risks; and

3. Continuously improve safety management skills of personnel ashore and on board ships, including preparing for emergencies related both to safety and environmental protection

These targets reflect the philosophy of the Total Quality Management correspondingly. Herein, the company is comparable with the concept of management commitment. Also the requirement for continuous improvement is given literally. In addition, the company has to be prepared for possible hazardous situations beforehand. This principle of preparedness is common in quality management as well.

3.9.3 Legislative conformity

The ISM Code requires a Company to document its safety management system in accordance with legislative requirements and with standards and guidelines set by e.g. classification societies. The SOLAS requirements are the most important requirements to be considered. According to the ISM Code, the safety management system should be able to ensure (IMO, 1993):

The ISM Code section 1.2.3
1. Compliance with mandatory rules and regulations; and
2. that applicable Codes, guidelines, and standards recommended by the Organization, Administrations, classification societies and maritime industry organizations are taken into account

Both the ISO 9001 quality standard and ISO 14001 environmental standard require that a company has to obey the law in its operations. This requirement is included in the ISM Code in a very similar manner.

3.9.4 Functional requirements of the safety management system

According to the ISM Code, the safety management system should include the following functional requirements (IMO, 1993):

The ISM Code section 1.4
1. a safety and environmental protection policy
2. instructions and procedures to ensure safe operation on ships and protection of the environment in compliance with relevant international and flag state legislation
3. defined levels of authority and lines of communication between, and amongst, shore and shipboard personnel
4. procedures for reporting accidents and non-conformities with the provisions of this Code
5. procedures to prepare for and respond to emergency situations and
6. procedures for internal audits and reviews

These six paragraphs are quite well corresponding with the requirements of the ISO 9001 quality standard and the ISO 14001 environmental standard. The company is responsible for setting the safety and the environmental protection policy in a similar manner than the quality and environmental standards require the quality policy and environmental policy to be, described by the top management.

The company is responsible for defining the operative processes onboard and providing necessary guidance and instructions for the personnel which are involved in these processes. Safety and environmental issues should be recognized and included in the safety management manuals.

3.10 Comparing the ISM Code with the quality and safety standards

When comparing the ISO 9001 quality standard with the ISO 14001 environmental management standard and the OHSAS 18001 occupational health and safety standard point by point, they look literally very similar. The clauses of the ISM Code make a remarkable difference. The ISM Code is seemingly written in much broader terms than the ISO 9001, ISO 14001 and OHSAS 18001 standards. Also, the actual text is much shorter and not so detailed than the ISO 9001, ISO 14001 or OHSAS 18001.

Nevertheless, the ISM Code and the ISO 9001 quality standards and the ISO 14001 standards share common management principles and features which are described in the table below (IMO, 1993; SFS, 2001; SFS, 2004 and BSI, 2007):

Table 3.1: Comparison of the ISM Code, ISO9001 and ISO14001

	ISM	**ISO 9001**	**ISO 14001**
Purpose	To provide safety operation of ships and prevent the pollution of the environment	To ensure the high quality of production, services and business processes	To prevent the pollution of the environment; consideration of environmental aspects
Target group	ship operating companies of all types and sizes	organizations of all types and sizes	organizations of all types and sizes
Fundamentals	management commitment, continuous improvement, personnel empowerment,	management commitment, continuous improvement, personnel empowerment, + strong customer orientation	management commitment, continuous improvement, personnel empowerment,
Driver	mandatory	voluntary	voluntary
Primary object	Compliance with the Code	Fulfil customer requirements	Compliance with the standard
Common management principles	Documentation of operation and processes, Document control, Incident reporting, Audits, Management Reviews, Roles and responsibilities, Corrective and preventive action , Training		
Performance Measurement	N/A	Statistical technique	N/A

The ISO 14001 and OHSAS 18001 standards are similarly structured and therefore the OHSAS 18001 is not included in the table above.

Pun et al. (2002) compared the ISM Code with the quality, safety and environmental management standards. They perceived that the ISO 9001, ISO 14001, OHSAS 18001 and the ISM Code work in a similar way. These standards differ in terms of their focuses to some extend. The ISM Code focuses on operations and practices of safety management in the shipping business. The ISO 9001 focuses on compliance with the customer requirements. The ISO 14001, on the other hand, focuses on compliance with the environmental legislation and consideration of environmental aspects. And the OHSAS 18001 focuses on compliance with the occupational health and safety regulation and company performance in the occupational health and safety.

The quality, environmental and safety standards share common management practises and requirements as well. These practises include, for example, regular management meetings to review the progress and performance of the system and defining the objectives and targets of the system, systematic document control, systematic recording of non-conformities and procedures for periodic audits (IMO, 1993; SFS, 2001; SFS, 2004 and BSI, 2007).

Although the primary purpose and objects of the ISM Code and the ISO standards are different, there are so many common features that there are good possibilities to merge the safety management systems, quality management systems and environmental management systems into one integrated management system in a shipping company. For example, the Bureau Veritas ship classification society and the International Shipping Management Association (ISMA) perceive that it is beneficial for the shipping company to consolidate the quality, environmental and safety management systems (Pun et al. 2002; Bureau Veritas, 1995).

4 FORMER ANALYSES OF THE ISM CODE

4.1 Implementation of the safety management system

A lot of guidance and handbooks on how to use the ISM code have been published during the years of application of the Code. These guides provide practical advice for shipping companies when they are implementing and employing a safety management system for operations ashore and operations onboard (IMO, 2008b).

Pun et al. have discovered the problems and difficulties which have appeared when the shipping companies were implementing their safety management systems according to the ISM Code (Pun et al. 2002). They listed the major obstacles which occurred in the implementation process of the SMS. According to Pun et al. the most difficult problems are:

- Resistance to change
- Lack of human resources
- Insufficient knowledge of procedures
- Lack of inter-departmental communication
- Low level of education
- Frequent staff turnover
- Time pressure to obtain registration of the SMS

From the cultural point of view the resistance to change seems to be an obvious obstacle to the implementation of the ISM Code. According to Schein (2001), the transformation of the organizational culture collides frequently with the resistance to change. Because the maritime personnel were heavily bounded to the current organizational culture, they were resistant to absorb the new procedures and instructions. Also Pun et al. mentioned that there is a mismatch between the prevailing organizational culture and the requirements of the ISM Code (Pun et al. 2002). Good communication between the personnel and management, between persons onboard and onshore and between the different departments of the company has been recognized as the key success factor in terms of a safety-oriented culture (Anderson, 2003; Kristiansen, 2006; Lanne, 2007).

The commitment of the top management is referred to as one of the main demands for a successful implementation of the cultural transformation (Schein, 2001; Deming, 1986 and Wiegmann et al. 2002). A lack of human resources could be regarded as poor commitment on the top management's part. According to the ISM Code, the responsibility of the Company (top management) is to provide adequate resources and support for the organization especially for the Designated Person to carry out their functions (IMO, 2008a).

Pun et al. (2002) found cases were the personnel onboard and onshore were subject to face the new requirements of the ISM code without proper training or they were pressured to complete the safety management system in a short period of time. These

problems could be understood as indications of the poor management commitment as well.
The low level of education of the ship crew and frequent turnover of the ship crew are considered as big problems in international shipping (Karvonen et al. 2008). In order to economize their personnel costs, the shipping companies recruit members of the crew from the developing countries (Pun et al. 2002). The crew might be unqualified due to poorer educational possibilities in their home nations and the crew members and the officers might have communication problems because they have no common language. Heterogeneous and continually changing personnel makes it difficult to cultivate the company's safety values to the crew. The diverse personnel and staff turnover make it expensive and challenging to properly familiarize the new personnel with their duties as the ISM Code requires.

Also Anderson (2003) listed the problems and difficulties with the implementation of the safety management system. Anderson identified certain common factors which describe the unsatisfactorily implemented safety management systems. Anderson found out that there was too much paperwork due to voluminous documentation; a typical situation when a company has bought an off-the-shelf safety management system. Many irrelevant procedures and irrelevant checklists are involved in these systems. In these cases, safety management was usually realized through paperwork exercises and the personnel could not develop any feeling of involvement in the system. The company did not provide support for the personnel. The vessels have suffered from a lack of resources and insufficient training for the new requirements of the ISM Code. So the motivation for safety management of the personnel is low. Also, Anderson paid attention to the turnover of the personnel. Anderson emphasized that establishing a safety culture is not easy when the turnover of the crew is high. The new employee has been familiarized too poorly too often (Anderson, 2003).

On the other hand, Anderson identified the success factors of a very well functioning safety management system which entail for example:

- Leadership and commitment from the top management i.e. from the ship owner
- The personnel have a sense of ownership of the safety management system and are empowered to safety
- Good communication between ships and office
- Paperwork has been reduced to manageable levels

Hahne et al. analyzed the prevailing safety culture in the late 1990s. In a study by Hahne et al. the safety attitudes of the shipping companies and maritime personnel towards the ISM Code were examined. The results of the study were published in 2000 (Hahne et al. 2000). The purpose of the study was to find out the problematic areas encountered with the implementation of the ISM Code. Researchers came to the conclusion that the main obstacle to the successful implementation of the ISM Code was the widespread resistance by the seafarers to the *obligatory* establishment of the safety culture. According to Hahne et al., the maritime industry was not ready for the ISM Code at that time (Hahne et al. 2000).

In order to uncover the benefits of the ISM Code to the Malaysian shipping companies, Othman carried out an evaluation of the effectiveness of the safety management system in the Malaysian shipping companies in 2003. Othman compared the compliance of the shipping companies' safety management systems with particular elements of the ISM Code. He detected that almost 80 per cent of the companies had effectively implemented the requirements of the ISM Code into their safety management systems (Othman, 2003). Othman observed that the major gap found between the implemented safety management system and the requirements of the ISM Code was related to system documentation. Over 40 % of the cases indicated that the documentation process was non-compliant with the ISM Code.

The Paris and the Tokyo MoU have conducted three Concentrated Inspections Campaigns (CIC) concerning the compliance of the implemented safety management systems with the ISM Code after the year of 1998 (Paris MoU, 2008). The previous campaigns in 1998 and 2002 focused on verifying that the safety management systems were created on board in compliance with the ISM Code. The last campaign in the autumn of 2007 focused on verifying that the safety management system is working effectively in practise and, moreover, the duty of the Port State Officers was to confirm that the safety management system was not mainly a paper exercise. The inspection officers paid special attention to the fact that the master was fully conversant with the SMS and that the crew was able to communicate effectively when executing their duties related to the SMS.

The results of the latest CIC of the Paris MoU were published in January 2008. The Paris MoU reported that 20 per cent of the inspections indicated non-conformities onboard of the inspected vessels. The study entailed inspections of 5 427 vessels (Paris MoU 2008). There were 1 031 ships where ISM deficiencies were found. 176 ships were detained due to major non-conformities with the ISM Code. The Paris MoU detected that the safety management systems were implemented poorly in the detained ships. The safety management systems were treated as dead letters although the documentation consisted of a mountain of paper. The Paris MoU reported that the most common non-conformities dealt with the following issues:

- effective maintenance of the ship and equipment
- emergency preparedness
- reports of nonconformities and accident occurrences

All three issues are considered as key areas in regard to the safety of the ship and its crew. Notwithstanding that the Paris MoU came to the conclusion that the safety management systems are gradually starting to work on ships. The Paris MoU realized that most of the shipping companies and the crews of their vessels understand the safety requirements and implement them. (Paris MoU, 2008a; Paris MoU, press release January 2008; Paris MoU, 2008b)

The Tokyo MoU published the results of the CIC in the beginning of 2009 as well (Tokyo MoU press release February 2008). The Tokyo MoU sets two major targets to the inspection campaign: firstly, it is studied whether the safety management system is

implemented effectively and secondly, whether the safety management system is actively maintained. The results of the Tokyo MoU were a little more optimistic than the results of the Paris MoU. The results indicated that for most ships and ISM operators the safety management system was functioning and properly understood onboard.

British Maritime and Coastguard Agency (MCA) carried out an assessment of the British fleet in the winter of 2007 - 2008. The primary goal was to study the influence of the ISM Code on the development of a safety culture in the commercial shipping industry (ReportISM, May 2008). The MCA found out that the there are *great* barriers to the development of the safety culture in maritime industry. One of the most significant factors is the transient nature of the work force hired onboard. Especially the turnover of the crew hired from a labour hiring company is high, which might cause difficulties when establishing the safety culture. The second factor recognised by the MCA was the distance of the asset owner from their ships. The MCA found out that the germ of a safety culture was growing where there was strong leadership. (ReportISM, May 2008.)

4.2 Maintenance of the safety management system

The safety management systems compliant with the ISM Code became compulsory for the most shipping companies in 1998. The rest of the shipping companies should have registered their safety management systems before the first of July 2002. The ISM Code requires that the management system itself should be continuously improved (IMO, 2008a).

According to Gray (2005), some shipping companies have not kept their safety management systems updated since the registration in 1998 or 2002. Typically, these companies have purchased an off-the-shelf set of safety management manuals by a consultant (Anderson, 2003). According to Anderson, the off-the-shelf documentation could cause problems in maintaining the safety management system, due to a massive amount of documents and unfitting procedures for the applying company. The IMO's Group of Expert, which studied the impacts of the implementation of the ISM, draw a conclusion that in order to update and maintain the safety management system more accurately, the shipping companies should involve more people, especially seafarers, in the compilation of the safety management system (IMO, 2005).

4.3 Improvement of maritime safety

The primary purpose of the ISM Code is to establish a maritime safety culture and continuously improve the safety performance of shipping companies and vessels (IMO, 2005). Therefore, the question is in what way the ISM Code has improved the maritime safety culture and how the improved maritime safety culture has enhanced the safety performance of the shipping companies.

Some international studies have been carried out to explore what the significance of the ISM code is to the safety culture in the maritime industry (IMO 2008b).

Doctor Phil Anderson investigated the impacts of the ISM Code in a wide international survey in 2002. The results of the survey were published in his doctoral thesis. The name of the published book was "*Cracking the Code – The relevance of the ISM and its impacts on shipping practises*" *(Anderson, 2003)*. Anderson found out that it is quite difficult to get objective evidence of the impacts of the ISM Code on maritime safety. According to Anderson, there is no relevant "hard data" on which the impact analysis could be based.

The second study was organized by the IMO. An Independent Experts Group has been established by the IMO Secretariat to study the impact of the ISM Code (IMO, 2005). The Group of Expert (IMO, 2005) attempted to get objective evidence (hard facts) of the ISM impacts on maritime safety. However, the Group found that difficult and so the Group could not draw comprehensive conclusions when determining the impact of the code. The Group tried to collect data based on Port State Controls and from IACS (International Association of Classification Societies) and P&I Clubs (Protection and indemnity, mutual insurance associations).

Both Anderson and the Group found it impossible to claim quantitative benefits gained by implementing the safety management system. Appropriate statistics and measures of safety performance of the shipping companies are unfortunately not available (Anderson, 2003; IMO, 2005).

Stuart Withington has considered the means of measuring the progress of the improvement of the safety management system (Withington, 2006). According to Withington, accurate reporting of incidents and defects could provide the fundamental basis for evaluating the effectiveness of the ISM Code. Unfortunately, he has recognized that in practice severe insufficiencies in the reporting of the shipping companies can be found, regardless of the requirements of the ISM Code that necessitate establishing a proper reporting system for incidents and defects. The level of the reporting varies significantly between companies, flag States and port States. He has noticed that neglected reporting is due to the fear of blame and criticism (Withington, 2006). Withington is seeking possibilities to a global measurement of the safety progress by utilising data provided by the ISM compliant safety management system.

With the intention of evaluating the tangible impacts of the ISM Code on maritime safety, the IMO Group of Experts suggested that further studies should be carried out in the future (IMO, 2005). The studies should take into consideration the causal links between the implementation of the ISM Code and a flag State safety record. Likewise, the relationship between PSC and ISM compliance should be thoroughly investigated in order to link improvements in detention and accident rates directly to the implementation of the ISM Code. According to the IMO Group of Experts, the links between the ISM Code and the Port State Control regime were complex and further work was required to fully understand them.

MCA's study was one of the latest evaluations of the impact and effectiveness of the ISM Code. The results of the research project were published during the meeting of the IMO Maritime Safety Committee in May 2008. The objectives of the study were as follows:

- How effectively the ISM Code has improved safety and safety culture while the ISM Code has reigned?
- To compare the effects of the ISM implementation between the UK Fleet and the other "white-listed" member states of the Paris MoU.
- To find out what other safety or quality approaches, such as the ISO 9001 or TMSA (Tanker Management and Self Assessment), are utilised in maritime industry in order to identify what improvements should be integrated into the ISM Code in future revisions.
- British Maritime and Coastguard Agency attempted to understand how the implementation of the ISM Code has enhanced maritime safety and the protection of the marine environment.

The basic result of the MCA research was that the shipping industry is a safer and a more environmentally friendly industry than it was 12 years ago when the ISM Code became mandatory. The study indicated that there is a common consensus about the positive contribution of the ISM Code to the maritime safety although the direct effects and influences of the ISM Code could not be isolated very well from the other factors such as those established by STCW and MARPOL etc. Also these factors have made a contribution and brought improvements to maritime safety at the same time as the ISM Code has been prevailing (ReportISM, May 2008). The MCA attempted to provide an analysis based on the Port Sate Control statistics concerning ISM-related non-conformities and statistics of Port State Control detentions due to incompliance with the requirements of the ISM Code. The MCA found out that no meaningful results could be provided due to a lack of data from pre-ISM phase before 1998. Furthermore, the MCA discovered that only few detentions of the UK flag ships have occurred during the researched time period.

The MCA concluded that a self-assessment toolkit for assessing the safety culture on non-tanker vessels should be developed – similar to TMSA.

4.4 Developing safety performance indicators

When improving organizational quality or safety performance, one should be aware of the real performance of the present management system (Juran and Godfrey, 1998). This means that an organization should measure the performance in an accurate manner. The ISM code does not require any prescribed techniques for performance measurement as the ISO 9001 quality standard does. The ISO 9001 quality standard requires the use of statistical techniques for the measurement of the quality performance.

Although the ISM Code literally demands the implementation of the process of continuous improvement and a regular review of the performance of the improvement,

there is lack of numerical measures to confirm that the performance of safety management has truly improved. The real progress of the continuous improvement may fail and the management may not realize the business benefits of the safety management.

As early as in 2001, Max Mejia from World Maritime University proposed generic performance criteria for the evaluation of the ISM Code. Mejia carried out a literature review concerning the development of the performance criteria for evaluating the effectiveness of the ISM code (Mejia, 2001). Moreover, Mejia studied the different theories considering the performance measurement of various safety approaches such as OHSA.

Mejia could not find any studies which could indicate that the safety management system has direct influence on the safety performance. Mejia suggested that qualitative systems such as the safety management system should be qualitatively evaluated. Mejia started his analysis by specifying the concept of "effectiveness". Mejia described that the effectiveness means:

> *"the issue of whether desired results are actually achieved"*.

Hs studied the documented history of the establishment phase of the ISM Code. He attempted to describe what the desired results set by the co-founders of the ISM Code in the IMO were (Mejia, 2001). Mejia has adopted the concepts of output and outcome into his performance criteria approach from a policy analysis discipline. The outputs are referred to as policies, such as the ISM Code. The outcomes are referred to as goals, such as the positive effects of maritime safety. According to the IMO, the desired results of the ISM Code were as follows (IMO, 1995):

- provide safe practices in ship operation and safe working environment
- to establish safeguard against all identified risks
- continually improve the safety management skills of the personnel ashore and aboard, including preparations for emergencies related both to safety and environmental protection
- development of a safety culture

Mejia's next task was to identify performance criteria within the concepts of output and outcome. Output could be considered as a set of policies which attempt to ensure that the safety management systems of the shipping companies and vessels are compliant with the requirements of the ISM Code. Mejia suggested the performance criteria within the output category are as follows:

- Port state control detention due to non-conformities and deficiencies in regard to the requirements of the ISM Code
- ISM-related spot inspections carried out by the Flag State
- Re-inspections due to major non-conformities observed in connection with external audits performed by the administration
- ISM deficiencies and non-compliance reported by the ships' personnel

- Non-conformities detected by the auditors during annual and interim audits

Mejia was seeking a statistical indication that the quantity of the detention should decrease in the long run due to improvements in the safety performance of the ships. Various studies have attempted to analyse the data from the Port State Control statistics. Beforehand, the Port State Control statistics have been recognized as an important source of information with the intention to study the impacts of the ISM Code. Unfortunately, the Port State Control did not present any meaningful results. For instance, any downward trends could not be drawn of the ISM-related detentions. (Anderson, 2003; IMO, 2005; MCA, 2008).

An analysis of the Port State Control statistics shows that the detention rates have declined in the earlier years of the current decade. Unfortunately, the trend of the detention rate has been reversed and the detention rate has risen in the past two years. (Paris MoU, 2008b). Likewise, the quantity of the ISM-related deficiencies has increased slightly since 2005. The Paris MoU (2008b) reported the ISM-related deficiencies as follows:

	2005	2006	2007
ISM-related deficiencies	2940	3087	4657
% of all deficiencies	4,7%	4,7%	6,2%

Further analysis is needed in order to evaluate the feasibility of the Port State Control statistics as an indicator of safety performance.

In the literature, reporting of non-compliance and deficiencies by the ships' personnel has been seen as a significant indicator of a properly functioning safety culture (Anderson, 2003; IMO, 2005; Mejia 2001). According to Mejia, willingness to report is an indication of whether the ISM Code is functioning as it should. The main focus of the study by Anderson was to investigate how the incidents, near-misses and other hazardous occurrences were reported. In addition, Anderson emphasized the further analysis of and willingness to learn from the incidents, near-misses and other hazardous occurrences in his study. According to Anderson, a properly working reporting process indicates the cycle of continuous improvement in an outstanding manner.

Notwithstanding, the Paris MoU (2008a) reported that one of the most common ISM-related deficiencies was the lack of reporting nonconformities, accidents and hazardous occurrences. Also Anderson (2003) discovered that the reporting of incidents was quite insufficient within the seafarers. Especially the minor incidents were not regularly reported. Particularly, Anderson was surprised that most of the seafarers were more or less reluctant to report the incidents. In this case, the no-blame culture did not prevail. In order to utilise the statistics of incident reporting as an indicator of the safety culture, these barriers should be overcome first.

Mejia suggested that the time series of the non-conformities found in connection with the audits and re-inspections due to ISM-related non-conformities should be utilized as

safety performance indicators. The statistics of the non-conformities and the re-inspections should be provided by the administrations.

Mejia (2001) described that the performance criteria under the outcome/goal category should indicate whether the safety management system is producing the intended results, for example, a reduced death toll, less injuries and damages. To the outcome category Mejia suggested the following performance criteria:

- Accident rate and injury frequency
- Mortality rate
- Lost time injuries
- Vessel off-hire/delay
- Crew repatriated or sent ashore for retraining
- Insurance premiums and claims level
- Active commitment of management to safety
- Safety culture

Accident rate and injury frequency, mortality rate and lost time injuries are notable because these performance indicators are comparable with the other industries. These indicators are commonly utilised in safety science but not utilized in any evaluation of the ISM Code (Mejia, 2001).

Vessel off-hire or delay in voyages due to material damages could cause the loss of income and even the loss of long-standing customers. Vessel off-hire time could be caused by the Port State Control detention, on-going accident investigation, reparations of the vessel etc. The recurrence of the off-hire and delay could be an indicator of poor safety performance level of the vessel or the shipping company. (Mejia, 2001).

Mejia does not provide any direct method to evaluate the safety culture or management commitment. The performance criteria presented above describes safety performance merely consequentially. How do these criteria authenticate the likelihood of the vessel to be a subject of an accident?

Also Deming saw that the absolute quality was challenging to measure (Deming, 1986). Deming supposed that a more sensible way to measure the progress of the quality is to measure the performance of the management system. In that view, the presented performance criteria should be carefully dissected. Particularly the performance criteria which are targeted to measure the safety culture need further development.

4.5 Evolution of the ISM Code

When comparing the ISM Code with the ISO 9001 and ISO 14001 standards the ISM Code is written in a much more straightforward way. Also, the ISM Code is considered to be very flexible. The ISM Code includes 16 short and generic sections. The flexibility of the ISM Code enables that it is applicable to all kinds of shipping companies and on ships of all kind (IMO, 1993, Anderson, 2003).

Unfortunately, the generic nature of the Code could bring about difficulties when assessing the compliance of the safety management system objectively. The auditors of the administrations or classification societies could interpret the Code and the IMO guideline diversely and even an individual auditor could have his/her own benchmark of what is acceptable compliance (Anderson, 2003). Also the MCA found it problematic that there is a lack of standardization in the interpretation of the requirements of the ISM Code in practise (ReportISM, 2008). The MCA found that depending on the external auditor the interpretations about the requirements of the ISM Code differ. These differentiations could cause problems to the shipping companies when preparing for an audit or a port state control. The respondents of the MCA study were asking for clearer guidance and uniform instructions for the practice of the ISM Code.

The ISO 9001 and the ISO 14001 have been under development through their lifetime. The fourth version of the ISO 9001 quality standard is going to be published at the end of this year. Also, the current version of the ISO 14001 environmental management standard is comparatively new. The contents of the ISO 9001 and ISO 14001 standards have advanced substantially.

No new version of the ISM Code has been published after the first version in 1993. The need for renewing the ISM Code has been recognized. The Group of Experts which studied the impacts of the implementation of the ISM code came up with some suggestions for updating the Code (IMO, 2005). The Group recommended that further studies should be conducted on whether textual changes in the requirements of the Code could make compliance easier and lead to an improved safety culture.

5 SUMMARY AND CONCLUSIONS

5.1 Arguments for the Project

The maritime traffic is rapidly growing in the Baltic Sea which leads to a growing risk of maritime accidents. Particularly in the Gulf of Finland, the high volume of traffic causes a high risk of maritime accidents. In addition, the hard navigation conditions of the Baltic Sea present extra challenge for the maritime traffic.

Economic trends in the maritime industry challenge the maritime safety as well. The various ways of internationalizing the ownership of the shipping companies keep on developing (Karvonen et al. 2008). The vessels of a shipping company fly various flags and the personnel are more and more multinational. There is a strong possibility that the members of the crew are coming from such nations where the educational facilities are poor and thus the risk of having no common language for communication between the crew members increases (Pun et al. 2002). The Finnish shipping companies suffer from a lack of labour force. The shipping companies are captive to hire foreign personnel, and they consider it also as a safety problem (Karvonen et al. 2008).

The growing risks give us good reasons for implementing the research project concerning maritime safety and the effectiveness of the safety measures, such as the safety management systems. In order to eliminate or reduce maritime safety risks, the safety management systems should be further developed. The METKU Project has been launched to examine the improvements which can be done to the safety management systems.

5.2 Establishment of the ISM Code

Human errors are considered as the most important reason for maritime accidents. According to Hänninen (2007), the fundamental reason for the accident of the ro-ro ship Estonia was the prevailing bad safety culture. Hänninen saw that the prevailing safety culture hindered the maritime industry from preventing the occurrence of erroneous behaviour. Hänninen urged that the maritime safety culture should be transformed in a revolutionary way in order to decrease human errors.

Even before the accident of Estonia, other fatal accidents have awakened the international maritime community to consider the reasons for such accidents. Thorough accident investigations showed that the reasons for the occurrence of accidents were more often human than technological. The results of the investigations showed that problems were arisen due to a lack of a management system in regard to safety issues, poor specifications of responsibilities onboard and ashore, poor communication and unwillingness to report and to learn about incidents and near-misses (Anderson, 2003). All these problems could be seen as elements of the organizational culture (Anderson, 2003; Hänninen, 2007).

The international safety management code (the ISM Code) has been established to cut down the occurrence of human errors by creating a safety-oriented organizational culture for the maritime industry. The ISM Code came into operation in worldwide shipping in 1998. The ISM Code provides the requirements of the safety management system needed in a shipping company. The ISM Code requires that a company should *provide safe practices in ship operation and a safe working environment and establish safeguards against all identified risk.* The fundamental idea of the ISM Code is that companies should continuously improve safety. The continuous improvement could be obtained by training and regularly practising the personnel onboard and ashore. The commitment of the top management is essential for implementing a safety-oriented culture in a company. (Anderson, 2003; IMO, 2008a).

5.3 How to evaluate the maritime safety culture?

The purpose of this study is to recognize whether the safety culture has been initiated due to the ISM Code and evaluate the impacts of the ISM Code on maritime safety.

According to Schein (2001), transformation of the organizational culture is very complicated. Schein considered that changing the organizational culture presumes the adaptation of a new cognitive framework. Undoubtedly, the shipping companies which have successfully implemented their safety management systems have adopted the new cognitive framework provided by the ISM Code. The role of the top management is essential when adapting the new cognitive framework. The top management is required to act as a role model in terms of admirable safety attitudes. This way the top management is able to manifest its commitment to safety. The top management encourages and supports the personnel to eagerly report incidents and near-misses and the top management gives positive feedback on safety initiatives made by the personnel. The personnel on all levels of the organization are willing to learn from incidents, near-misses and accidents (Schein, 2003; Anderson, 2003; IMO, 2005).

Schein (2001) proposed that one solution for the assessment of the organizational culture is to analyze the contradictions or inconsistencies between the manifested values and policies and actual operations.

Mejia (2001) proposed that the evaluation of the effectiveness of the ISM Code should be based on whether the desired objectives of the ISM Code have been achieved. According to Anderson (2003), the main objective of the ISM Code is to establish a safety culture for the maritime industry. In order to recognize that the safety culture exists we are required to specify the indicators used in the evaluation. Various lists of indicators have been presented in literary works dealing with quality and safety management (Deming, 1986; Juran and Godfrey, 1998; Mejia, 2001; Wiegmann et al. 2002; Anderson 2003).

For the purpose of evaluating the maritime safety culture we should base the evaluation on the intention set by the maritime community itself. The ISM Code provides the indicators for recognizing whether the safety culture exists in the maritime industry.

These indicators are going to be utilized as the criteria for the forthcoming evaluation. The chosen indicators are listed below.

1. established and actively working process for continuous improvement
2. commitment from the top management of the company
3. motivated and encouraged personnel onboard to actively initiate safety improvements (personnel empowerment)

5.4 Findings of the literature review

The ISM Code has brought a significant contribution to the progress of maritime safety in recent years. Shipping companies and ships' crews are more environmentally friendly and more safety-oriented than 12 years ago. This has been showed by several studies which have been analysed for this literature research (Othman, 2003; Anderson, 2003; IMO, 2005; Paris MoU, 2008; ReportISM, May 2008).

Othman (2003) states that most of the (80 %) Malaysian shipping companies have implemented their safety management systems effectively according to the requirements of the ISM Code. The member states of the Paris MoU conducted a Concentrated Inspection Campaign (CIC) which focused on the effectiveness of the ISM Code. The Paris MoU discovered that most of the shipping companies and the crews of the vessels understand safety and implement it (Paris MoU, 2008). The Tokyo MoU conducted a CIC simultaneously with the Paris MoU. The result of the CIC showed that the safety management systems operate and function effectively onboard most of the ships and the ISM operators (Tokyo MoU, 2008).

Nevertheless, the direct effect and influence of the ISM Code on maritime safety could not be isolated very well. No quantitative measurement (statistics/hard data) could be found in order to present the impacts of the ISM Code on maritime safety (Mejia, 2001; Anderson, 2003, IMO 2005, ReportISM, May 2008).

In the light of the performance criteria set in the previous chapter, there are major shortcomings concerning effective safety management in the maritime industry.

Continuous improvement

The referenced studies show that near-misses are not perfectly reported. Some mariners are still reluctant to express their mistakes (Withington, 2002; Anderson, 2003). The Paris MoU (2008) reported that one of the most common deficiencies in the safety management systems concern the reporting of the nonconformities and occurrences of accidents. Hence, there is still room for improvement in the reporting of the deficiencies and non-conformities in the maritime industry. The proper reporting of the deficiencies and non-conformities establishes a basis for continuous improvement.

Furthermore, Anderson (2003) uncovered that in certain cases further analysis and corrective actions of the reported incidents were not properly carried out. Under

these circumstances, the successful cycle of continuous improvement could not function.

Management commitment

Some shipping companies prefer short-term profits at the expense of maritime safety (Anderson, 2003). The Paris MoU reported as a result of the CIC that 176 ships were detained due to serious deficiencies against the requirements of the ISM Code. The reasons for the detentions were that the maintenance of the ship and its safety equipment were badly neglected. The status of the emergency preparedness was poor as well. (Paris MoU, 2008; ReportISM, May 2008). Evidently the top management of the badly performing shipping companies are not committed at all to the safety issues.

Personnel empowerment and motivation

Pun et al. stated that the high turnover of the labour force could prevent the establishment of the safety culture in the maritime industry (Pun et al, 2002). Also Anderson emphasized that establishing a safety culture is not easy when the turnover of the crew is high (Anderson, 2003). British Maritime and Coastguard Agency expressed the same concern in their study in 2008. The transient nature of the workforce with a relatively long distance between the ship owner and the vessel complicate the progress of safety management (ReportISM, May 2008).

In this study I have discovered that safety culture has emerged and it is developing in the maritime industry. Even though the roots of the safety culture have been established there are still serious barriers to the breakthrough of the safety management. These barriers could be envisaged as cultural factors preventing the safety process. Even though the ISM Code has been effective over a decade, the old-established behaviour which is based on the old day's maritime culture still occurs. In the next phase of this research project, I will concentrate on analysing these cultural factors in regard to the present safety culture of the maritime industry in Finland. The analysis will be based on the criteria presented above.

6 FURTHER RESEARCH

The aim of this research project was to study if the goals of the ISM Code have been achieved during the last 10 – 12 years. The major goal of the ISM Code was to establish a safety culture in the shipping industry (Anderson 2003). The safety culture can be seen established if the criteria presented in Chapter 5.3 are fulfilled.

In the next phase of this project, empiric evaluations concerning the impacts of the ISM Code on Finnish shipping companies and Finnish-owned vessels will be performed. During the study, the experiences and impressions of the ISM Code will be collected by interviewing the personnel of the Finnish shipping companies. Particularly the crew and the officers of the vessels will be interviewed.

As a part of the empiric study, the researcher will participate in several internal and external ISM audits carried out by a company or an administration. The purpose of participating in the audits is to find out implications of any contradictions or inconsistencies between the opinions expressed during the interviews and the reality observed during the audits.

The results of the interviews will be compared with the performance criteria of the maritime safety culture. The results of the interviews will be utilized by authenticating whether a maritime safety culture has transformed. The main questions are:

- Can we see continuous improvement onboard and in the shipping companies as a result of willingness to report and learn from near misses or are the marine personnel still reluctant to admit that they have made a mistake?
- Is the top management sincerely committed to the company's manifested safety and environmental policy by providing accurate resources for safe operation?
- How deeply are the personnel of the vessels engaged in the safety management?

Interviews will be carried out by in-depth interviews. A structured questionnaire is provided in order to examine the research area comprehensively. The purpose of the questionnaire is to assist the interviewer and function as a reminder. The interviewees will be buoyed up to express themselves freely and in their own words.

As the previous international studies referred to in this literature review have showed some shipping companies perform their duties better than others. Hence, the empiric study attempts to clarify what kinds of obstacles and difficulties have occurred during the development, implementation and operation of a safety management system in a shipping company. And vice versa, it is important to collect successful experiences from the better performing companies.

TERMINOLOGY

International Safety Management (ISM) Code

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

Company

- The owner of the ship or any other organization or person such as the manager, or the bareboat charterer, who has assumed the responsibility of operating the ship from the ship owner and who, by assuming such responsibility, has agreed to take over all duties and responsibilities imposed by the ISM Code.

Designated Person Ashore (DPA)

- To ensure the safe operation of each ship and to provide a link between the Company and those on board, every Company, as appropriate, should designate a person or persons ashore having direct access to the highest level of management. The responsibility and authority of the designated person or persons should include monitoring the safety and pollution-prevention aspects of the operation of each ship and ensuring that adequate resources and shore-based support are applied, as required.

Administration

- The Government of the State whose flag the ship is entitled to fly.

Safety management system

- a structured and documented system enabling the Company personnel to effectively implement the Company's safety and environmental protection policy.

Document of Compliance

- a document issued to a Company which complies with the requirements of the ISM Code.

Safety Management Certificate

- a document issued to a ship which signifies that the Company and its shipboard management operate in accordance with the approved safety management system.

Source: IMO, 2008

REFERENCES

Accident Investigation Board Finland (2008), *Factors contributing to fatigue and its frequency in bridge work*, Accident Investigation Board of Finland S3/2004M, Helsinki

Anderson, P. (2003), *Cracking the Code – The Relevance of the ISM Code and its impacts on shipping practices*, The Nautical Institute, London.

Arola, T. Jalonen, R. & Kujala, P. (2007) *Meriliikenteen paikkatiedon tilastointi ja hyödyntäminen Suomenlahden meriturvallisuudessa*, Helsinki University of Technology, Espoo

BSI (2007), OHSAS 18001:2007, *Occupational health and safety management systems, Requirements,* The British Standards Institution, London

Bureau Veritas (1995), *Manual for the Introduction of Managements systems in Shipping*, Bureau Veritas, Amsterdam

Deming, W. E. (1986), *Out of the Crisi*s, MIT Press, Cambridge, MA USA

Finnish Maritime Administration, (2008), *Statistics on Shipping between Finland and Foreign Countries*, Statistics from the Finnish Maritime Administration 5/2008, Helsinki

Gray, J. (2005), "*Missing the point – the failure of regulation. So back to basics."* Conference proceeding, IFSMA 31st general assembly source: http://www.inserve.org/The%20Failure%20of%20Regulation.pdf

Hahne, J. Baaske, G. Rothe, R. Schulte-Strathaus, R and Quas, O. (2000) *Assessment of deficiencies in the organisation of work in shipping*, Wirtschaftsverlag NW Verlag für neue Wissenschaft GmbH , (Schriftenreihe der Bundesanstalt für Arbeitsschutz und Arbeitsmedizin: Forschungsbericht, Fb 835),

Hänninen, H. (2007), *Negotiated Risks: the Estonia Accident and the Stream of Bow Visor Failures in the Baltic Ferry Traffic*, Helsinki school of economics, Helsinki

IMO, (1993), *Resolution A.741 (18) - International Safety management Code for Safe Operation of Ships and for Pollution Prevention (International Safety Management (ISM) Code),* International Maritime Organization, London

IMO, (1995), *Guidelines on the Implementation of the International Safety Management (ISM) Code*, Annex to IMO Assembly Resolution A.788(19), International Maritime Organization, London

IMO, (2002) *Resolution A.913(22)Revised Guidelines on implementations of the ISM Code by Administrations, revokes resolution A788(19),* International Maritime Organization, London

IMO (2004), *SOLAS – Consolidated edition 2004e*, International Maritime Organization, London

IMO (2005), *Role of the Human Element – Assessment of the impact and effectiveness of implementation of the ISM Code*, International Maritime Organization, MSC 81/17

Jalonen, Risto and Tirkkonen, Ari, (2007), *Selvitys englannin kielen käytöstä linjaluotsauksessa*, Finish Maritime Administration (FMA) (Unpublished report)

Juran, J.M. and Godfrey, A.B. (Editors in chief) (1998), *Juran's Quality Handbook*, fifth edition, McGraw-Hill, New York

Karvonen, T. Keltaniemi, A. Sundberg, P. Tikkanen, R. Nyman, T. Porthin, M. & Sonninen, S. (2006), *Merenkulun turvallisuuden hallinta*, Merenkulkulaitoksen julkaisuja 6/2006, Finnish Maritime Administration (FMA), Helsinki

Karvonen, T. Vaiste, J. and Hernesniemi, H. (2008), S*uomen merikulusteri 2008 (The Finnish Maritime Cluster 2008)*, Tekes, Tekesin katsaus 226/2008, Helsinki

Kristiansen, S. (2005), *Maritime Transportation – Safety management and Risk Analysis*, Elsevier, Amsterdam

Lanne, M (2007), *Yhteistyö yritysturvallisuuden hallinnassa (Co-operation in corporate security management)*, VTT, VTT Publications 632, Espoo

Mejia, M (2001), *Performance Criteria for the International Safety Management (ISM) Code.* Proceedings of the 2nd General Assembly of IAMU International Association of Maritime Universities 2 / 5 October 2001 – Kobe, Japan

Mitroussi, K. (2003), "The evolution of the safety culture of IMO: a case of organisational culture change, *Disaster Prevention and Managemen*t, Vol. 12 No. 1 pp. 16 - 23.

Mitroussi, K. (2004), "Quality in shipping: IMO's role and problems of implementation", *Disaster Prevention and Managemen*t, Vol. 13 No. 1 pp. 50 -58.

Paris MoU (2008), *Evaluation CIC on ISM in 2007,* Paris MoU on Port State Control, Port State Control Committee 41st session, 19-23 May 2008 Loutraki, Greece

Paris MoU (2008a), *Annual report 2007*, Secretariat Paris Memorandum of Understanding on Port State Control, Hague

Pun, K. Yam, R. Lewis, W. (2003), *Safety management system registration in the shipping industry*, International Journal of Quality & Reliability Management; Volume 20, Issue 6, 2003

Othman, M. R. (2003), *Effectiveness of Safety Management Systems (SMS) BY Malaysian Shipping Companies in Compliance to the International Safety Management (ISM) Code*
http://www.ismcode.net/research_projects/wmd_2003_paper.pdf

Roughton, J.E. and Mercurio J.J. (2002), *Developing an Effective Safety Culture*, Butterworth – Heinemann, Woburn

Schein, E. (2001) *Yrityskulttuuri, selviytymisopas; tietoa ja luuloja kulttuurinmuutoksesta*, Laatukeskus, Helsinki

SFS, (1995), *Laatujärjestelmät: SFS-EN ISO 9000 -standardisarjat*, The Finnish Standards Association SFS, Helsinki

SFS, (1997), *SFS-EN ISO 14000 -standardit: ympäristöjärjestelmät, ympäristöauditoinnitt*, The Finnish Standards Association SFS, Helsinki

SFS, (2001), *SFS-EN ISO 9004 Laadunhallintajärjestelmät, suuntaviivat suorituskyvyn parantamiselle – Quality management systems. Guidelines for performance improvement*, The Finnish Standards Association SFS, Helsinki

SFS, (2004), *SFS-EN ISO 14001 Ympäristöjärjestelmät. Vaatimukset ja opastusta niiden soveltamisesta – Environmental management systems. Requirements with guidance for use*, The Finnish Standards Association SFS, Helsinki

Wiegmann, D. Zhang, H. von Thaden, T. Sharma, G. and Mitchell, A, (2002), *A Synthesis of safety Culture and Safety Climate Research*, Aviation Research Lab Institute of Aviation, University of Illinois, Savoy

Withington, S. (2006), *ISM – What has been learned from marine accident investigation?*
Source: http://www.he-alert.com/documents/published/he00475.pdf

Electronic sources:

HELCOM, (2008), http://www.helcom.fi/helcom/en_GB/aboutus/

IMO, (2008), *International Convention for the Safety of Life at Sea (SOLAS), 1974*, Available from http://www.imo.org/HumanElement/mainframe.asp?topic_id=182, accessed April 24, 2008

IMO (2008a) International Safety Management (ISM) Code 2002, (http://www.imo.org/HumanElement/mainframe.asp?topic_id=287), International Maritime Organization, accessed Sept 8 2008

IMO (2008b), *Information resources on the international safety management code*, (http://www.imo.org/includes/blastDataOnly.asp/data_id%3D21592/ISMCode_12May2008_.pdf), International Maritime Organization, accessed Sept 8 2008

IMO (2008c), *Particularly Sensitive Sea Area*, International Maritime Organization, (http://www.imo.org/Environment/mainframe.asp?topic_id=1357), International Maritime Organization, accessed Sept 8 2008

ReportISM, May 2008, http://www.consultism.co.uk/ReportISM_May_2008_PDF.pdf

University of Turku
CENTRE FOR MARITIME STUDIES
Veistämönaukio 1–3
FI–20100 TURKU, Finland

http://mkk.utu.fi

TURUN YLIOPISTO
UNIVERSITY OF TURKU