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Safety management in shipping : an historical comparison to the state of the art

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SAFETY MANAGEMENT IN SHIPPING: AN HISTORICAL COMPARISON TO THE STATE OF THE ART

By

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DECLARATION

I certify that all the material in this dissertation that is not my own work has been identified, and no other material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views and are not necessarily endorsed by the University.

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ABSTRACT

TOPIC: **SAFETY MANAGEMENT IN SHIPPING: AN HISTORICAL COMPARISON TO THE STATE OF THE ART**

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The word in the shipping world always seems to be that safety management started when the IMO passed the ISM Code. Little is usually mentioned about the efforts of safety management before the ISM Code. It always appears as if the maritime sector was decades behind other industries in adopting management principles to ensure safety. There is also no established relation between the ISM Code and the human element in shipping. It is always taken at face value that implementing the Code by implementing a safety management system will "cure" the problem of the human element as a cause of maritime casualties. In addition, no efforts have been made to compare the safety management practices in other hazardous industries to conclude whether shipping is actually behind other industries in safety management practices.

Accident causation theories and how they have evolved are discussed together with how these are related to the resultant safety management approaches to avoid accidents. Initiatives of the shipping industry to manage safety before the Code are also discussed along with why these efforts might have failed. The reactive approach to maritime safety is mentioned and evidence is found in the literature showing that this was not something unique to the maritime sector.

In Chapter 3 the structure of occupational health and safety management system is analysed in comparison to the structure of the system that is to be implemented in compliance with the ISM Code. Conclusions on how these are expected to improve human performance are made in Chapter 5 together along with the prospect of integrating safety, health, and environment and quality management systems into one management system.

KEYWORDS: safety management systems, occupational health and safety, environmental protection, maritime safety, shipping

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LIST OF ABBREVIATIONS

BSI	British Standards Institute
DFT	United Kingdom Depart for Transportation
DNV	Det Norske Veritas
DOC	Document of Compliance issued under ISM Code
DPA	Designated Person Ashore
HSE	Health and Safety Executive of the United Kingdom
IAEA	International Atomic Energy Agency
IC	Internal Control Regulation in Norway
ICAO	International Civil Aviation Organisation
ICS	International Chamber of Shipping
ILO	International Labour Organisation
IMO	International Maritime Organization
INSAG	International Nuclear Safety Advisory Group
ISF	International Shipping Federation
ISM Code	International Management Code for Safe Operations of Ships and Pollution Prevention
ISMA	International Ship Managers Association
ISO	International Organisation for Standardisation
ISPS Code	International Ship & Port Facility Security Code
LR	Lloyds Register of Shipping
MARPOL	International Convention for the Prevention of Pollution from Ships 1973/78 as amended
MEPC	Marine Environment Protection Committee of the IMO
MLC	Maritime Labour Convention
MSC	Maritime Safety Committee of the IMO

NEA	Nuclear Energy Agency
OECD	Organisation for Economic Cooperation and Development
OHSE	Occupational Health, Safety and Environment
OHSEMS	Occupational Health, Safety and Environmental Management System
SEP	Safety and Environment Protection System from DNV
SMC	Safety Management Certificate issued under ISM Code
SMS	Safety Management System
SOLAS	The International Convention for Safety of Life at Sea, 1974 as amended
STCW	International Convention for the Standards of Training, Certification and Watchkeeping for Seafarers 1995 as amended
TQM	Total Quality Management

CHAPTER 1

1. INTRODUCTION

1.1 Background

On the 6th of March 1987, the Roll on/Roll off Passenger and Freight Ferry *The Herald of Free Enterprise* capsized killing not less than 150 Passengers out of the 459 who had originally boarded and 38 crew members out of the 80. A formal investigation was ordered three days later by the flag State (United Kingdom) of the vessel and was chaired by Hon. Mr. Justice Sheen. In his report, released in September 1987, Justice Sheen famously wrote, about the management of the vessel:

> The Board of Directors did not appreciate their responsibility for the safe management of their ships. They did not apply their minds to the question: What orders should be given for the safety of our ships? The directors did not have any proper comprehension of what their duties were. There appears to have been a lack of thought about the way in which the *HERALD* ought to have been organised for the Dover/Zeebrugge run. All concerned in management, from the members of the Board of Directors down to the junior superintendents, were guilty of fault in that all must be regarded as sharing responsibility for the failure of management. From top to bottom the body corporate was infected with the disease of sloppiness (Sheen, 1987).

With the above statement Justice Sheen set the maritime world in motion towards better management of ships. The International Maritime Organization (IMO) responded by passing Assembly Resolution A.596(15)[1] in November, 1987 which

[1] It is explicitly mentioned in this resolution that the tragic loss of the Ro – Ro passenger ferry is one of the reasons for this resolution.

called upon its Maritime Safety Committee (MSC) to develop guidelines concerning shipboard and shore-based management to ensure the safe operation of ro – ro passenger ferries. These guidelines were duly adopted in 1989 by Resolution A.647(16), which was later revised by Resolution A.680(17) as The International Management Code for Safe of Operation of Ships and for Pollution Prevention (ISM Code) and adopted in 1993 as resolution A.741(18). It has since been amended by circular MSC.104(73) which was accepted on 1st January 2002 and entered into force in 2002.

To many maritime practitioners the adoption of the International Safety Management (ISM) Code was the beginning of safety management in shipping. Most studies, discussions and papers on safety management in the sector are centred on and start with this Code and its implementation. Little is usually mentioned about the management of safety before the adoption of the Code, apart from the fact that the regime of maritime safety was prescriptive. In other words IMO enacted technical regulations aimed at improving safety and ship managers and owners complied with most of them. However, it would not be reasonable to assume that after implementing these prescribed safety regulations, ship managers or owners stopped there and did not care to try and manage the safety of their huge investments. Logic dictates that there must have been procedures and practices of work onboard and lessons must have been learned from incidents and major accidents.

In attempting to appreciate the regime of maritime safety in international maritime law it is usually advisable that one needs to study and appreciate the work of prominent scholars of the past, like Hugo Grotius (1609)[2]. In this vein it is prudent that, in order to appreciate safety management systems in the shipping sector, one should study safety management practices that dominated the shipping sector before the advent of the Code. Not only will it be of great help in trying to understand the

[2] This is the year when his book "Mare Liberum" was published in which he advocated for freedom of the seas.

present state of safety management, it can also be helpful in pinpointing practices that might be a throwback to the past. In addition it is worth mentioning that before the maritime industry developed the ISM Code equally or even more hazardous industries had used safety management systems for a number of years. After all the very concept of safety culture which the ISM Code is expected to initiate (O'Neil, 1999), has its origin in the aftermath of the Chernobyl nuclear disaster (Clarke, 2000; Cooper, 2000) though it was only a narrow concept then (Gherardi, Nicolini, & Odella, 1998).

Further, it is often mentioned that implementation of a safety management system and hence the ISM Code in conjunction with national implementation of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978 as amended in 1995 and 1997 (STCW Convention) will improve human performance and therefore decrease the significant number of accidents attributed to the human element (Kristiansen, 2005; Kuo, 1998; Winbow, 2000). While it is obvious that proper implementation of the STCW Convention would improve human performance, the connection of the ISM Code to this improved performance is not very clear. As recent as 2006, Mr Gronhult, a senior official at Det Norske Veritas has been reported as saying that the ISM Code does not adequately address the human factors and how they help improve human performance (Berkenkopf, 2006)[3]. Moreover, opponents of the Code argue that its implementation increases the paper work that has to be done in order to be in compliance and it is as a result seen as an additional task which cannot help the case of an often fatigued seafarer. To appreciate this fact a relationship needs to be established and explained between a Safety Management System (SMS) and the human element.

[3] Although a caveat has to be placed on this because he was trying to market a new system designed by his organisation and more so he does not give a reason why.

If the implementation of an SMS improves the performance of the human element, then accident investigations should be able to show that the contribution of the human element to maritime accidents has gone down. A general decrease in accidents may not suffice unless it can be attributed to the management systems and better performance from the human element. If it has not, then probably a new approach might be required. Also, other management systems like those on the basis of the International Organisation for Standardisation (ISO) existed before the ISM Code and the necessity of the Code needs to be put in context of these systems. It is also important to compare the safety management practices in the shipping sector with those of the other similarly hazardous sectors such as aviation, nuclear and process industries, which, it must be added, probably have more experience with these systems.

1.2 Objectives

From the above brief analysis, the main objectives of this dissertation can be stated as follows:

The first objective is to review safety management practices before the ISM Code comparing this with the practices in other similar industries like aviation and rail transport with a view of pinpointing the deficiencies in these practices so as to bring out the need for the Code.

Second, is to analyse in detail the system requirements of the Code with particular reference to the maritime sector but not limited to that and also the connection between the SMS and Human Element.

The third objective arises from the need to determine the relationship between safety management systems and safety culture.

Fifth, to discuss the possibility of implementing safety management systems in the maritime sector as part of quality management systems as a way of improving organisational performance.

Finally, an attempt will be made to point out areas of improvement in safety management in the shipping sector.

The overall result should be a clear understanding of safety management systems and how they foster human performance. This dissertation aims to give the reader an appreciation of the importance of safety management systems in improving safety performance and not for these to be seen only as a way of complying with the ISM Code.

1.3 Methods and Materials

The main method applied was a comprehensive literature search, review, analysis and synthesis. This is supplemented by electronic (email) interviews with prominent practitioners in the maritime field. Literature on the ISM Code is usually limited to methods of implementation in order to comply with the legal requirements. The requirement of an SMS is usually taken at face value without it being analysed further.

Primary methods of research have been limited by the time and financial resources allocated for this dissertation. Hence, this is an assessment of secondary research sources. Also, it should be pointed out that this is not a research about the state of implementation of the ISM Code or the methods to be used for implementation. Neither is it about the legal obligations under the Code or the steps that should be taken to implement it. It is a review of what a safety management system in the maritime field is expected to achieve and how exactly this achievement will be made.

CHAPTER 2

2 SAFETY MANAGEMENT BEFORE SAFETY MANAGEMENT SYSTEMS

2.1 Chapter Introduction

It is difficult in the present regime of safety management systems to differentiate them from safety management itself. Safety management does not have to entail safety management systems. Safety management systems are analogous to quality management systems that emerged in the 1980s, and it cannot be argued that products and services were not of the required quality before the advent of these systems. In the same vain despite the many accidents such as Chernobyl (1986) [4] and *Herald of Free Enterprise* that catapulted the emergence of SMSs, safety was still managed to a reasonable level; otherwise these failures would have occurred much sooner than they did. The aim of this chapter therefore is to explore the management approach to safety before the ISM Code and SMS became the norm.

There are probably as many definitions of safety management as there are organisations claiming to manage safety. The Nuclear Energy Agency of the Organisation for Economic Co-operation and Development (2006) defines safety management as those organisational measures applied to ensure that an acceptable level of safety is maintained throughout the life of an installation. In the Maritime Safety context this means the life of a ship. Safety Management would reasonably involve the entire spectre of the management process which includes planning, organising, leading, motivating and control. Interspersed between these are decision making, strategy, communication and measuring performance. It is because of the

[4] The Chernobyl nuclear disaster was the worst accident in the history of nuclear power when a reactor at the Chernobyl Nuclear Power Plant located near Pripyat in Ukraine exploded On April 26, 1986 at 01:23 a.m. (see http://en.wikipedia.org/wiki/Chernobyl_disaster).

belief that these management functions were not being carried out in managing safety that safety management systems came into existence.

2.2 Three Distinct Aims of Safety Management

Safety management can be direct at three distinct organisational aspects. First, there is occupational safety and health management aimed at protection of workers against work-related sickness, disease and injury (International Labour Organisation, 2001)[5]. The purpose is to prevent what Reason (1997) has termed individual accidents, which could damage or injure either the worker, group of workers or a localised piece of machinery[6]. These, in a shipping context, are those accidents that take place on board during normal operation affecting either the seafarers or the equipment on board. They also include such accidents like contact with another ship, groundings, small fires, heavy weather damage and machinery failure. The gist here is that they affect only that one ship and may not be catastrophic or "colourful" so to say.

Second, there is safety management aimed at the prevention of organisational accidents explained by Reason (1997) as those comparatively rare but often catastrophic events, with a multitude of causes, involving many people operating at different levels of the organisation. They usually have devastating effects on surrounding populations, environment and the organisation it self, e.g. *Exxon Valdez*. . If the safety and health of the work force are assured then the likelihood of organisational accidents will be reduced (not completely eliminated). In shipping, these accidents (organisational) often result from grounding, fire, capsizing, or explosion that leads to the total loss of the ship and crew or constructive loss of the ship.

[5] The International Labour Organisation is a specialised agency of the United Nations devoted to advancing opportunities for women and men to obtain decent and productive work in conditions of freedom, equity, security and human dignity (www.ilo.org).

[6] Though the machinery or equipment would not be a concern of the ILO.

A poor management strategy toward occupational safety and health will more often than not, at some stage result in the occasional catastrophic event or accident. Safety management should hence be able to cover both of these levels since they are not independent of each other and cannot be separated.

When dealing with manufacturing organisations there is another aspect of safety management concerned with the safety of the finished product. The borderline between this type of safety management and occupational safety management in service industries like shipping can be quite blurred since it is during “occupation” that the service is provided whereas for manufacturing entities this can easily be managed in a different way. If viewed in the sense that the finished product is the delivered goods or persons, then it becomes easier to visualise occupational safety as different from the safety of the finished product.

2.3 Evolution of Safety Management

Early forms of safety management[7] were based on safe work practices and human error reduction. For the regulators the primary focus was on ensuring that workers were provided with a safe work environment whereas for the employer the focus was on reducing human error to protect their assets and organisations to maximise productivity. This is what eventually led to government regulations such as the United States’ Occupation Safety and Health Act and the United Kingdoms’ Health and Safety at Work Act etc of 1974. The philosophy from then on was that of compliance with national and international regulations on health and safety at work.

Mainly driven by this regulatory framework, organisations adopted methods of safety management that have been clearly distinguished in the form of models by Lucas[8] (Reason, 1997) – the Person Model, Engineering Model and Organisational Model. Although Reason (1997) does not distinguish when each of them has been used, it is

[7] It must be noted that the term “Safety Management” was not necessarily used at that moment in time.

[8] These models are cited by Reason (1997) but it is not clear whether the following explanation of them is by reason or Lucas.

easy to relate each of them with a particular era of safety management evolution. Whether it is to prevent accidents at the individual level or organisational level the following approaches have been used

2.3.1 The Person Model

The Person Model approach to safety management focuses on the unsafe acts of individuals and has been around for a long time (Reason, 1997). According to Petersen (1996) safety practitioners have held a fundamental belief that the single largest reason behind accidents is people since 1931 when H. W. Heinrich first said so in his text *industrial accident prevention,* and that before then there was no thought – out concepts behind safety work. The basis of this model is the now common cliché of human error being the cause of most accidents. It is from this background that earlier safety management practices focused on ways of eliminating this "human error." In fact one could even go as far as saying the rapid advance in technology after the Second World War was partly driven by the desire by engineers to eliminate human error. There were also attempts to engineer the human being to perfection but this was ultimately a futile endeavour (Hollnagel, 2004)

2.3.2 The Engineering Model

In this model, safety is viewed as something that needs to be engineered into the system and, where possible, to be quantified as much as possible (Reason, 1997). It is like a development on the previous model in that the human is understood not to be totally at fault for failure in machinery but rather that the machinery has to be designed to fit human characteristics (ergonomics). In addition, systems are designed inherently stronger with various defences against possible accidents. Standardisation of most engineering products by the designers themselves is another example of attempts to improve safety of these products. Engineering standards are part of the structure that assures that all technological systems have some level of safety (Bahr, 1997, 2nd Ed.).

2.3.3 The Organisational Model

This is a more recent approach to safety management. It can be viewed as a legacy of historical disasters such as Flixborough (1974) [9], Bhopal (1984)[10], Chernobyl (1986), *Herald of Free Enterprise* (1987) and many more. In all these accidents, the official accident investigation reports pointed to organisational factors as the causes of the accidents. This model views human errors more as consequences than causes; they are symptoms that reveal underlying latent conditions in the system at large (Reason, 1997). These latent conditions exist because they have not been dealt with by the organisation. The Safety Management System is at the core in an effort to implement this model. It incorporates both the above models and is in fact not incompatible with them.

2.4 Safety Management and Accident Causation

Further evidence for the above approaches to safety management is found in the evolution of accident causation theories and attributed accident causes. Hollnagel (2004) explains that when investigating accident causation the focus has moved from technological (up to the 1950s), to humans in the form of human error and then to organisational causes. This attribution of causes to the different factors meant that the focus for safety management shifted accordingly. It is therefore of no surprise that with the current emphasis on human and organisational factors as causes of accidents, the focus for safety management today has shifted to humans and organisations. The theory then follows on that the safety performance of the human and the organisation as a whole is conditioned by the safety culture in the organisation. At the centre of achieving the required safety culture is the safety management system[11].

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[9] Flixborough was a chemical plant accident t that killed 28 people on Saturday 1 June 1974 at the Nypro (UK) site (see http://www.hse.gov.uk/comah/sragtech/caseflixboroug74.htm) .

[10] The Bhopal Disaster took place the morning of December 3, 1984, in the heart of the city of Bhopal, India, in the state of Madhya Pradesh. A Union Carbide subsidiary pesticide plant released 40 tonnes of methyl isocyanate (MIC) gas, immediately killing nearly 3,000 people and ultimately causing at least 15,000 to 22,000 total deaths (see http://www.bhopal.com/chrono.htm).

[11] In Chapter 4 the relationship between safety management systems and safety culture is discussed at length.

2.5 The Internal Control Approach to Safety Management

The concept of Internal Control (IC) in safety management has its origins in the Norwegian offshore petroleum industry (Hovden, 1998). The concept was part of the regulations issued through a Royal Decree on the 28th June 1985 under the Petroleum Act of 22nd March 1985 and the Norwegian Petroleum Directorate was delegated the authority for coordinating the practical implementation of the system (Vinnem & Hope, 1986). In 1992, it became a requirement for all land based enterprises and was also adopted in Sweden the same year. Internal Control[12] is defined as systematic actions to ensure and document that the activities[13] are performed in accordance with requirements stipulated in or pursuant to Acts or regulations and that the systematic actions shall be described in administrative procedures (Hovden, 1998; Saksvik & Nytro, 1996).

The regulation requires enterprises to comply with the following (Gaupset, 2000):

1. clarify aims, responsibilities and tasks for the environmental and safety activities
2. identify and assess risks and problems, and draw up agendas with measures
3. systematically monitor that the enterprise's activities are keeping with the aims determined by the enterprise

It also calls for formal documented procedures and satisfactory internal control systems based on structure and rational actors (Gaupset, 2000).

Of particular interest in this system is its similarity to the ISM Code. From the definition the systematic actions are supposed to ensure implementation of acts and regulations in Norway. These acts and regulations cover subjects like working environment, pollution control, product control, civil defence, fire and explosions, electrical installations and electrical equipment (Saksvik & Nytrø, 1996). The ISM

[12] This system is still in the Norwegian Regulations and applies to all sectors.

[13] The activities mentioned here do not cover only safety activities but almost the whole spectre of activities that an enterprise can be involved in.

Code calls for systematic implementation of mandatory IMO regulations and conventions and in this way is very similar to the above system of IC.

2.6 Evolution of Safety in the Maritime (Shipping) Sector

Safety has never ranked very high in the scale of priorities of those who own ships (Cahill, 1990, p.1). Their main priority has always and will perhaps always be making money by generating profit. Today's system for ensuring maritime safety is of relatively recent vintage although some elements of these provisions existed in the distant past (Kopacz, Morgas, & Urbanski, 2001). These elements are those that were established by the Lloyd's Register of British and Foreign Shipping, which was created in 1834, thereby institutionalising the concept of safety and risk analysis (Bahr, 1997). Since these rules were initiated by insurance organisations with the aim of ensuring that the ships were fit for purpose, Cahill (1990) argues that they often seemed to encourage ship owners to ignore operational safety considerations. The attitude therefore seemed to be *laissez faire*[14] in the knowledge that they were covered by their insurers.

All that changed when the now infamous *Titanic* sunk in 1912. This is a ship that had set sail with every one thinking it was unsinkable (Veiga, 2002), and yet it did. Consequently questions had to be asked about the design and safety provisions (in particular the life saving appliances on board) of the ship to begin with. In response, the international community at that time convened a conference and concluded an International Convention to determine uniform rules with respect to Safety of Life at Sea (SOLAS). This Convention covered areas such as safety of navigation, construction, radiotelegraphy, life-saving appliances and fire protection and its primary concern was safety of human life at sea (IMO, 1998). It initiated the widely known reactive and prescriptive approach to adoption of maritime safety regulations which is still in place and at the core of shipping safety today.

[14] This is an economic doctrine that advocates for minimal government interference in economics and business but is used in this context to mean non interference in affairs of others.

This approach has resulted in a multitude of regulations and the IMO is, today, the depository of more than 50 conventions regulating international shipping and 11 of them deal directly with Maritime Safety, as listed below. The IMO is a permanent international body capable of and competent to adopt legislation on all matters related to maritime safety. However, implementation and enforcement of the conventions is the responsibility of the member states. The following is the list of Conventions relevant to maritime safety:

- International Convention on Load Lines (LL) 1966
- International Convention on the Safety of Life at Sea (SOLAS) 1974
- Convention on the International Regulations for Preventing Collisions at Sea (COLREGS), 1972
- International Convention for Safe Containers (CSC), 1972
- International Convention on Standards of Training , Certification & Watchkeeping for Seafarers (STCW), 1978
- Special Trade Passenger Ships Agreement (STP), 1971
- The Torremolinos International Convention for the Safety of Fishing Vessels (SFV), 1977
- Protocol on Space Requirements for Special Trading Passenger Ships, 1973
- Convention on the International Maritime Satellite Organisation (INMARSAT), 1976
- International Convention on Standards of Training, Certification and Watchkeeping for Fishing Vessel Personnel (STCW – F) 1995; and
- International Convention on Maritime Search and Rescue (SAR), 1979.

Although other conventions regulating maritime safety are considered to be supplementary to SOLAS (Kopacz et al., 2001), which is widely regarded as the most important as far as safety at sea is concerned (IMO, 1998), another convention namely the International Convention on the Prevention of Marine Pollution from Ships 1973/78 as amended (MARPOL) classified by the IMO as dealing with marine pollution does contain provisions that set design standards for certain types of ships (tankers); to improve the safety of these particular ship types. It is worth noting that whenever a ship fails because of the safety hazards that it faces while at sea and sinks, or its shell is breached, it could in turn become a hazard to the marine environment by releasing pollutants into the sea. This makes maritime safety and marine environmental protection inextricably linked (Gold, 2006), or as Franson (2005) put it, a marine environment protection culture should be part of marine safety culture.

The common theme in all the above regulations is that they prescribe for the ship owner what to do in order to achieve required or minimum levels of safety. SOLAS and LL deal directly with the design of the ship. They have been at the core of safety management in the shipping sector for decades. This approach can best be associated with Lucas' Engineering Model[15] of Safety Management as explained above, though it results from regulations initiated by classification societies and individual governments and not by ship owners or ship managers. The standards are aimed at making the ships safer by designing safety "into" them.

It is a widely quoted maxim that historically each major accident leads to new regulations / requirements with the *Titanic* leading to SOLAS, *Exxon Valdez* leading to the Oil Pollution Act, *Amoco Cadiz* leading to MARPOL and STCW. All these new regulations and requirements usually contain provisions for more stringent ship design standards. This state of affairs shows that a wide range of regulations to prevent maritime accidents, though effective, have been adopted and passed without any systematic risk assessment as would be required of any proactive safety measures. Instead they have been a result of accident investigation reports and public outcry. The latter is of particular concern because it leads to a social amplification of the risk associated with shipping as envisaged by Kasperson et al. (1988). Essentially what happens here is that due to information processes, institutional structures and individual responses to an adverse event, the risk associated with a particular technology or industry can be amplified (Kasperson et al.,

[15] This Model was cited in Reason (1997) and has been discussed earlier in the text (section 2.3).

1988), thereby leading to more stringent regulation. Franson (2005) has pointed out some safety regulations which could have actually been adopted by the IMO due this phenomenon as outlined below:

- The ISPS Code contains regulations that serve their purpose well, but could have been made better without the enormous pressure after the 9/11 terror attacks on the USA
- Amendments to SOLAS in the wake of the *Estonia* disaster were made in record time.
- The Double Hull requirement after *the Erika* Oil Spill without sufficient justification given that the original design of Double Hull Tankers was to mitigate light collisions and light groundings and not to prevent ships from breaking up in a bad sea state.

This was given further credence when the then Secretary General of the IMO William O’Neil (1999) wrote that there was no doubt some of the legislation which was developed in the past was prompted by political rather than technical considerations

Irrespective of the above discussion this regime still exists and has provided significant improvement in the safety record of shipping. Nevertheless, as noted by Mejia (2005) it is characterised by heavy reliance on technological innovation. Moreover, it was called into question when, despite the increased stringency of international standards, the frequency and severity of maritime casualties kept worsening.

Furthermore, the prescriptive regulatory approach tends to provide more "answers” before all the “questions” have been posed because many ship operators will satisfy rules and regulations before all hazards have been identified (Kuo, 1998, p.27). This is in agreement with Boisson (1996) who has argued that the reactive approach encourages limited reasoning since it is based on failures and malfunctions; the resulting provisions do not cover all the relevant dangers.

It has to be added that, the above practice of prescribing regulations and technical standards after a major accident was not and is not unique to the maritime sector as some maritime authors would have you believe. As discussed above, the move to safety management across all industries was initiated by government regulations in the middle of the last century. And such incidents as Chernobyl (1986) and Flixborough (1974) contributed much to safety innovation and management in their sectors as did the *Titanic* and the *Herald of Free Enterprise* to the maritime sector. Also, many industries are dependent on the technical expertise for their very existence and it is hence unsurprising that technical thinking has a predominant role in determining the safety level of such industries (Waring, 1996, p.12). Therefore, the maritime industry through its technical regulations prescribed by the IMO should not be expected to be any different.

The reactive approach to safety in the maritime sector that has been so widely publicised is also not a unique “maritime sector trait”, but was also in accordance with the traditional approaches in other industries. It has always been a general trend in whichever sector because it is after a major incident the cost of the necessary safety measures can easily be justified and in case of governmental regulations, it is only then that safety can get the necessary attention. This is also evident in theory as Rahimi (1995) contends that, the traditional approach to safety had little control over the process by which hazardous conditions were systematically eliminated and top management was concerned with only minimum standards and regulations. Figure 1 is a schematic representation as presented by Rahimi (1995, p. 85) demonstrating how the reactive approach to safety was carried out.

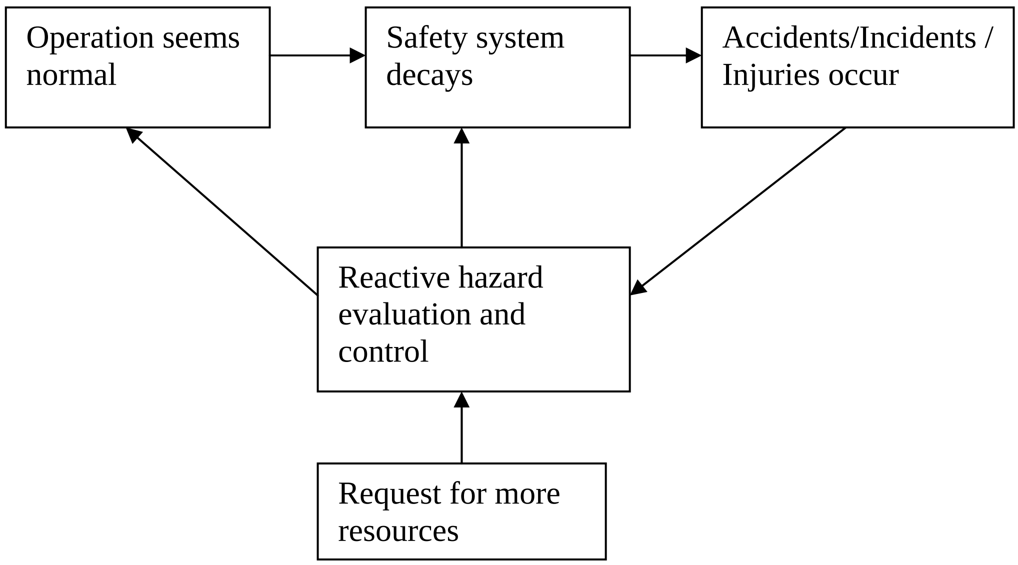

Figure 1: A schematic diagram showing sets of activities in traditional reactive safety management (Source: Rahimi, 1995).

In lieu of the above process, the IMO came up with three main initiatives: amendment of the STCW[16] Convention, introduction of Formal Safety Assessment (FSA) and adoption of the ISM Code (Mejia, 2005). These are meant to introduce a proactive approach to enhancing maritime safety. Much as O'Neil (2003, editorial) says the IMO took a conscious decision to shift the emphasis onto people by adopting these initiatives, writers such as Anderson (2005), Wang (2002) and Mejia (2005) have attributed these instruments(with sufficient evidence) to a catalogue of disasters, most prominent of which was the *Herald of Free Enterprise*.

2.7 Evolution of Safety Management in Shipping

It is debatable whether the above process of prescribing regulations can be considered as safety management. However, when viewed in the context of the engineering model as explained in section 2.2.2, one can consider the practice of prescribing ship construction standards as a way of managing safety. Apart from this

[16] It had been adopted many years before and was believed to be ineffective because the continuing accidents that were attributed to seafarer incompetence.

regime from the regulatory authorities, prudent shipping companies[17] had fleet regulations and standing orders as part of their efforts to manage safety (Bond, 2001) some of which were found wanting, for example in the case of *Herald of Free Enterprise*, (Sheen, 1987).

There are three stages that have been identified in the development of safety management in shipping (International Shipping Federation & International Chamber of Shipping, 1996; Kristiansen, 2005). In the first stage, management would look out for someone to hold responsible for any personal injuries, fatalities and damage or loss of ship and cargo, and environmental pollution. The idea was "to teach them a lesson" in order for the mistake not to be repeated again or to encourage safe behaviour. This approach is quite clearly consistent with the Person Model described in section 2.2.1. In the end, all it did was to breed a **culture of punishment.** Threats of dismissal and fines are some of the tools used at this stage.

The second stage consists of an attempt to control the known points of danger before they have actually happened. Though Kristiansen (2005) does not point out how this is achieved without being reactive, it is clear by his assertion that it leads to a **culture of compliance** to prescriptive rule, that these points of danger are only known after they manifest themselves in form of an accident and are dealt with by passing the prescriptive regulations. The resulting habit is that organisations comply with the minimum requirements of these regulations.

The third stage involves a proactive approach by the ship owners or managers or managers to manage maritime safety by establishing organisational goals with regards to safety and environment protection. It goes beyond the setting of externally imposed regulations and is expected to breed a **culture of self regulation.** This, he

[17] The phrases "shipping company" and "shipping organisation" are used interchangeably throughout this dissertation to mean the Company as defined in the ISM Code (the owner or manager or the bareboat charterer who has assumed responsibility for the ship).

contends, involves the development of company – specific or ship – specific safety management systems (SMS).

2.8 Safety Management Efforts in Shipping before the ISM Code

The regulatory process as explained in section 2.5 was focussed on developing measures to improve safety by improving what can be termed as the hardware in shipping (the ships, the way they are built and equipped, the way they are maintained) (O'Neil, 2003, editorial). Most shipping companies therefore sought to comply with these regulations to ensure maritime safety. But as Card (1998) has observed, government regulations cannot solve all our problems in trying to prevent accidents and they are only meant to set a regulatory floor as the basis for further safety and environmental actions; they should not be the ceiling as well.

The move to change this attitude probably goes back as far back as 1982 when the International Chamber of Shipping (ICS) and the International Shipping Federation (ISF)[18] jointly published the “Code of Good Management Practice in Safe Ship Operations” (McGuire, 1995). The entrance onto the market of various small players in the late 1970s and early 1980s necessitated the highly developed and organised shipping companies to distinguish themselves from this milieu of ship management companies by adopting quality management systems (Lang, 1998).

2.8.1 The ICS/ISF Code of Good Management Practice in Safe Ship Operation

This Code seems to have been the first attempt by any stake holder in the sector to come with good management guidelines. ICS / ISF are made up of national ship owners’ associations from different countries and the Code could have therefore been a good idea. However there seems to have been reluctance by the industry to adopt this Code until the capsizing of the *Herald of Free Enterprise* in 1987 and eventual adoption of Resolution A. 647(16) by the IMO in 1989. It recommended designating

[18] The International Chamber of Shipping (ICS) is a trade association for merchant ship operators and the International Shipping Federation (ISF) is the international employers' organisation for ship operators.

a person or establishing a department to cover the technical and safety aspects of ship operations the shore standpoint and it was not much different from the IMO resolution 647 (16) (McGuire, 1995). It was voluntary and given that ship owners are not necessarily the ones who manage the ships they own, the Code did not, it appears, to have had much application.

2.8.2 ISO Quality Assurance Systems

The idea of safety management systems emerged from the success associated with quality assurance systems. The quality movement that led to the formation of the International Organisation for Standardisation (ISO)[19] started after World War II. It started with quality control, then evolved into quality assurance and eventually to the present principles of quality management. A quality system is supposed to ensure complete customer satisfaction. It therefore ensures customer focus by the supplier, who could be a manufacturing firm or a service provider (e.g. maritime transport).

Originally written in 1987, the ISO 9000 series of standards were meant to be voluntary quality standards that companies could use to evaluate the quality management systems of potential suppliers (Taormina & Brewer, 2002). Although this series was revised in 1994, this revision only covered minor enhancements and clarification of ambiguities. A complete rewrite concluded in December 2000 (Taormina & Brewer, 2002).

This quality assurance standard (the 1994 version) entered almost every aspect of ship operations in the middle of the 1980s and by 1998 (when the first ships were expected to comply with the ISM Code) it became difficult to operate a ship unless some kind of quality assurance accreditation was in place (Lang, 1998). Some shipping companies implemented it as it was and received ISO accreditation while others sought to redefine it into Codes specifically targeted for the shipping industry.

[19] It has to be pointed out here that ISO is not an abbreviation for International Organisation for Standardisation but rather a Greek word meaning “equal” (www.iso.org).

One of the pioneers of this effort was the International Ship Managers Association (ISMA).

2.8.3 The ISMA Code of Ship Management Standards

The ISMA Code was probably the most widely known code of ship management, before the ISM Code. It was the cornerstone for the formation of the International Ship Managers Association and was adopted and published in 1991 (Spruyt, 1991). The members took the ISO 9002 model for quality and tried to interpret the standard in a way that would be general for all ship managers, this included requirements such as those in IMO resolution 741(18) or ISM Code, requirements of major oil companies, and functions of insurance and accounting (Lang, 1998). Originally initiated by a group of five ship management companies, the association expanded to a group of 35 ship management companies by 30th April 1991, the condition of membership being in compliance with the Code (Spruyt, 1991).

ISMA's goal was to have its membership managing over 65% of the world tonnage in the two years up to 1994 and it hoped that other companies having equivalent management standards would have about 15% of this tonnage which would leave 20% to either be encouraged to join or exit the industry (Underwood, 1992). Whether they achieved this or not is not clear. What is clear is that in a study by an IMO group of experts it was found that at least 27% of companies use the ISMA Code (IMO, 2005).

The scope of this Code is wide and encompasses all areas of ship management or any other business for that matter. Safety Management requirements are explicitly included in the form of a requirement to implement the ISM Code. This, however, can still cause the safety function to be over looked in favour of other constituent parts of the Code, since the management system so implemented is a quality management system and not a safety management system. Today the entry ticket to ISMA membership is a commitment to work towards ISO 9001:2000 compliance, after the ISMA President admitted in 2004 that the Code had been superseded by ISM, STCW and ISPS[20]"(ISMA Abandons, 2004).

2.8.4 Management Codes by Classification Societies

According to ISMA, they set an example that triggered a continuing quality movement of as yet unknown proportions, with classification societies introducing their own Codes. These Codes covered the same areas of safety and environment protection, however most of them were not widely adopted except for the Safety, Environment and Pollution (SEP) Code from Det Norske Veritas (DNV) (Lang, 1998). These rules were developed specifically to establish requirements applicable to safety management in ship operation recognising the principles of ISO 9000 and loss control principles developed by the insurance industry (Wright & Olbjorn, 1993). They were divided into four sections (Wright & Olbjorn, 1993) as follows:

- Section 1: Classification and Certification
- Section 2: Safety and Environmental Protection
- Section 3: Company Safety and Environment Protection (SEP) Management system
- Section 4: Shipboard (SEP) management system.

In reality the differences between the ISM and SEP are not readily identifiable by the industry and certainly not by clients (Lang, 1998, p. 161), still they were voluntary and although quality management systems have always been voluntary, their application was not wide spread. According to Lang (1998), they were most popular with Scandinavian ship management companies.

2.9 Reasons for the ISM Code

The ISMA Code, ISO 9002: 1998, or some other quality management system[21] were the ones in existence by the time the ISM Code became mandatory (Anderson, 2005). Some shipping companies operating these kinds of systems had effective safety

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[20] The International for Ship and Port Facility Security Code

[21] Like DNV SEP Code

control measures which had resulted in an impeccable safety record (Chauvel, 1997). This was possible because in as much as these were not “pure” safety management systems, it is difficult to see how a ship can provide quality service if not assured of safety. According to Gratsos (1998, p.53) quality shipping is safe, efficient, reliable seaborne transport operated in an environmentally responsible fashion. However, as noted by Bengtson (1992) all these Codes and standards together represented a variety of different requirements with which a particular ship owner or ship manager could have had difficulties coping.

It has often been emphasized by the IMO that shipping is an international business involving a host of players from different parts of the world, both developing and developed. This originated from the centuries old doctrine of the “Freedom of the Seas” (Nieuwpoort & Meijnders, 1998), and makes maritime safety management a global concern rather than it being a concern of only the big shipping companies. So despite all the best efforts of the shipping industry through ISMA and classification societies like DNV and Lloyd Register (LR) in leading the way by encouraging implementation of safety management systems, the IMO had to come up with a mandatory, uniform, and general standard to ensure every ship owner’s compliance.

In a quality management system, you say what you do, do what you say and show that you do what you say (Anderson, 2005). The problem arises when a shipping company’s standards for safety are not up to the internationally agreed standards, and yet this shipping company may have a quality assurance system in place. This follows from the fact that the concept of quality assurance does not guarantee similar levels of product or service quality but rather procedures aimed at consistent quality within the parameters specified by each producer of goods or services (Grastos, 1998). What makes it worse is that a cargo owner is not generally held responsible for knowingly choosing a ship that is not safe but slightly cheaper to decrease the freight charges on themselves (Nieuwpoort & Meijnders, 1998). A quality standard such as the present ISO 9001: 2000 leads to the manufacture of products and provision of services which are free from health and safety risks, but will not necessarily lead to good standards of health and safety in the production process (Health and Safety Executive, 1991). In other words, if a shipowner or manager avails to the customer a safe ship, it will not guarantee that the process by which the safe state of ship was attained is safe.

This entire perspective means that in quality management the focus is on the customer, whereas in safety management the worker is also given his due attention. ISO (2000) also recognises this by saying that "quality objectives complement[22] other objectives of the organisation such those related to growth, funding, profitability, the environment and occupational health and safety". With the ISM Code, however, the required technical standards for safety are already built in the regulations prescribed from the IMO.

The Code was also expected to encourage proactive safety management by requiring shipping companies to establish safeguards against all identified risks. This definitely calls for a periodic risk assessment of all the company's activities that would put the seafarer, property or the marine environment at risk. In other words, it is expected to discourage the reactive approach, when action is only taken after an accident or serious incident has taken place.

[22] As opposed to encompassing other organisational objectives.

CHAPTER 3

3 CONTEMPORARY SAFETY MANAGEMENT IN SHIPPING

3.1 Introduction

Present day safety management practices by ship management companies are centred on compliance with the ISM Code[23]. Just like any other safety certificate provided for in the various IMO conventions, safety management certificates (SMC) and documents of compliance (DOC) provided for in the Code are presented as sufficient evidence of compliance with the Code especially during port state control. These documents are issued on the understanding that the company and ship have a functioning safety management system in place. Yet, as noted earlier there is a tendency to comply with minimum standards as stipulated in regulations predominated the era of traditional safety management. Also Yu & Hunt (2003, p.211) have pointed out that in compliance – oriented SMS, safety measures that address different types of hazards are managed and executed by separated staffs often under different technical disciplines. They also add that technical requirements mandated by regulations and industry are usually too narrowly focused and lack the momentum for continuous improvement. It therefore seems a bit contradictory that the same method of compliance should be used to compel ship managers to implement safety management practices as contained in the ISM Code. Despite these arguments, Gunningham (1999, p.212) has concluded that "when used as a regulatory tool SMSs have considerable potential to stimulate self – organisation and self – regulation of business enterprises, which encourages internal self-critical reflection, continuous improvement, and cultural change".

[23] Throughout this dissertation, the reader is expected to have sufficient knowledge of requirements in as contained in the different sections of the ISM Code.

A safety management system involves monitoring safety performance of an organisation by ensuring that safety management is done in a **systematic, proactive** and **explicit** manner (International Civil Aviation Organisation, 2006). It is an explicit element of the corporate management responsibility which sets out a company's safety policy and defines how it intends to manage safety as an integral part of its overall business (United Kindom Civil Aviation Authority, 2002). Waring (1996, p.62) has defined a SMS as a structured, systematic means for ensuring that an organisation or a defined part of it is capable of achieving and maintaining high standards of safety. It comprises those arrangements made by the organisation for the management of safety in order to promote a strong safety culture which consequently results in good safety performance (International Atomic Energy Agency / International Nuclear Safety Advisory Group, 1999). The ISM Code itself defines an SMS as a structured and documented system enabling company personnel to implement effectively the company safety and environmental protection policy (IMO, 2002, p.6).

3.2 System Requirements in the Context of the ISM Code

A number of authors (e.g. Anderson, 2003; Kuo, 1998; Chauvel, 1997) have written about the ISM Code, its implementation and how the safety management system should be structured. All the sections or 13 chapters of the Code are usually very well explained by the various writers. However, in my opinion, all the literature available on the subject is geared towards compliance with the requirements of the Code, thus taking a narrow view of the requirements of an effective SMS. This, therefore, brings into question the possible achievement of self-regulation culture or safety culture if all the efforts are towards advising readers and practitioners on compliance. This would take us back to the culture of compliance (ICS/ISF, 1996; Kristiansen, 2005) as discussed in section 2.7.

The objectives of the ISM Code of continuous improvement in safety management should establish the climate in which a well trained, healthy seafarer can properly adopt a safety culture necessary to the successful completion of any maritime adventure (Winbow, 2000). This can only be achieved with the proper understanding of the SMS, not being a means of complying with legal obligations (under ISM) but rather as a tool to ensure safe and quality ship operations which make good business sense.

In addition, very little is available on occupational safety in shipping and how it is connected to the Code, despite the Code clearly stating it as one of it objectives. A safety and environmental protection policy does not and should not exclude occupational safety. If an argument is put forward that occupational safety is beyond the realm and mandate of the IMO, it might require a different system to manage occupational safety to be implemented, say, in accordance with the recently published ILO (2001) guidelines. It is also not right to compare the ISM Code and the STCW convention, because the convention is just like any other convention save for the fact that it is implemented mainly by the Flag State. Chauvel (1997) discusses and compares ISO 9002, ISM Code and STCW convention, but does not touch on ISO 14000 for environment management systems. It has to be pointed out here that the STCW convention is not even a management standard in the same way as ISM Code and ISO 9000 series or ISO 14000.

This fragmented analysis only shows that there is no holistic approach irrespective of what arguments may be presented about the existence of a body of knowledge on the Code and its required management system. A holistic approach should encompass occupational health, safety and environmental protection. This implies taking into consideration provisions from the ISM Code, ISO 9000 series, and ISO 14000 series to implement the prescriptive regulations and recommendations from IMO and ILO. Land based industry has had standards on occupational safety for a number of years, though there is a lack of an international standard as is the case for other quality and environmental management systems since land based industries are governed by national standards.

For this reason therefore, despite the fact that the ISM Code literally calls for the implementation of a safety management system, what it actually calls for is the implementation of an Occupational Health, Safety and Environment Management System (OHSEMS). This is particularly borne out in sections 1.2, 1.4 and 6 of the Code. The standards to which these three functions of an organisation are supposed to be managed are set out in various IMO conventions and the International Labour Organisation's (ILO) conventions. So the shipping organisation does not set its own minimum standards. It would not be visible to expect separate implementation of different management systems to comply with the conventions from the two international organisations or any other recommendations from any stakeholder, hence the OHSEMS.

From the context of looking at the required system in the Code to be an Occupational Health, Safety and Environmental Management System (OHSEMS), the definitions in 3.1 are narrow and misleading for this particular purpose. In fact, not including human health in the definition of the SMS is one the main reason why discussions on the Code are usually centred on the safety of the ship and not necessary seafarer health and safety. A new definition (taking into consideration the above definitions and explanations) has therefore been provided here as:

> An OHSEMS[24] is a systematic, structured and documented system to ensure that occupational human health, the environment and safety are managed in a proactive and explicit manner in accordance with the company health, safety and environment protection policy.

This type of management system combining all these three organisational functions has successfully been implemented in the oil and gas industry. The system however started safety management systems to manage safety, even prior to the Piper Alpha

[24] From here on in the two abbreviations of OHESMS and SMS will be in reference to this definition of the system and will be use interchangeably.

accident, successfully and this was later extended to include occupation health and environment management (Hudson, 2007).

3.3 System Concepts

Any discussion of safety management systems without an understanding of the concept of a system would be incomplete; especially so since it is a word that can be used in many different ways, for all kinds of purposes and intents. Curtis & Cobham (2002, p.14) have defined a system as a collection of interrelated parts that taken together form a whole, such that the collection has some purpose and a change in any of the parts leads to or results from a change in some other part(s). The same definition has been alluded to by Waring & Glendon (1998, p.49) when saying that all systems share a common theme, namely that of a whole consisting of components which are interconnected in an organised way for a given purpose (Waring, 1996). A slightly different definition has been given by Hoyle (2007, p.64) who has said " a system is an ordered set of ideas, principles and theories or a chain of operations that produce specific results and to be a chain of operations, they need to work together in a regular relationship." The slight hitch with this particular definition is the use of the word "chain" which is associated with a chain of events or operations being sequential in occurrence. However, defining a system as an ordered of set of "ideas, principles and theories" seem to find agreement with Waring & Glendon (1997) when they argue that a system is a "perceptual" construct and not a normative incontestable truth. For this reason therefore it is safer to think of a system as an idea or metaphor than as a thing (Waring, 1996).

Any system will have a set of inputs that go through a process to get outputs. This process is easy to visualise in a physical system for example a production system but not so easy in case of a management system and especially a safety management systems since safety results are among the most difficult to measure. According to Waring (1996) and Waring & Glendon (1998) perceived systems might be categorised as natural systems (e.g. weather, disease patterns), abstract systems (e.g. computer programs, signing systems), engineered or designed systems (e.g. process plants, transport hardware), human activity systems (e.g. relating to work organisations, safety committees) and information systems (e.g. safety manuals, safety cases). Waring (1996) adds that safety management systems should in essence be human activity systems. This is helpful when trying to establish the connection between an SMS and the human element in accident prevention.

The basic understanding of a system is that it produces outputs from a set of inputs. These outputs are then measured against the targets that had been set and if they do not meet these targets the necessary adjustments are made and the process repeated again. A simple illustration is given in Figure 2.

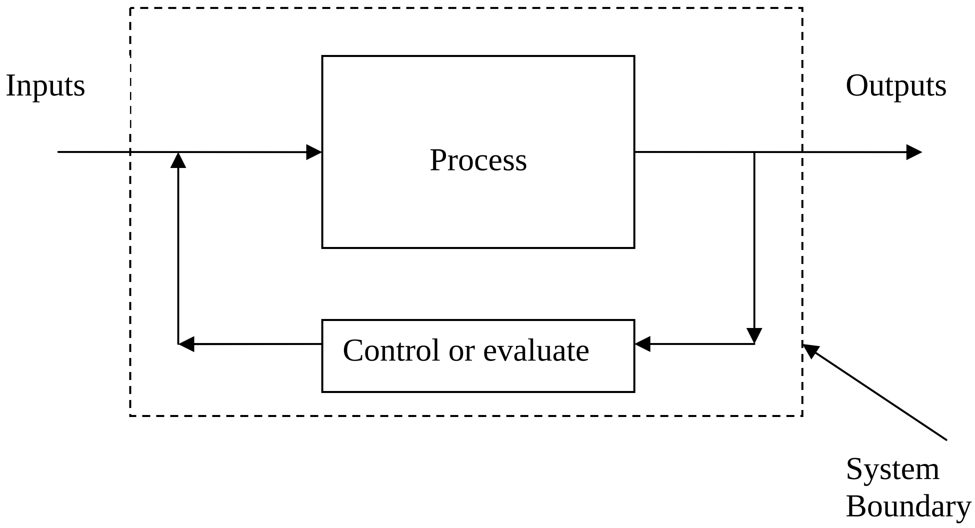

Figure 2: Simple illustration of a system

The system boundary is important in determining the internal and external environment of the system or what has been termed the internal context and external context (Waring & Glendon, 1998). Such systems are usually very easy to visualise if the outputs are a physical product like a piece of electronics or a ship. In the next section the visualisation becomes a bit more difficult for human activity systems that management systems are.

3.4 Management Systems

Management systems in general emerged and became popular after ISO released the ISO 9001, 9002, 9003 series of management standards. As touched upon earlier, these standards described requirements for quality management systems as a way of ensuring customer satisfaction. Within 7 years of the 1994 revision of ISO series, over 200,000 companies around the world had been accredited to this quality management system, a success story which was somewhat surprising (Larsen & Häversjö, 2001).

A management system has been defined by ISO (2000) as a set of interrelated or interacting elements to establish policy and objectives and to achieve those objectives. It also notes that such a management system in any organisation can include a quality management system, a financial management system or an environmental management system. The best presentation of these different systems and how they fit into an organisation has been given by Hoyle (2007, p.66) and reproduced in Figure 3.

From the illustration in Figure 3, it is clear that the multitude of management systems that any organisation (shipping or otherwise) may be required to implement can breed confusion and apprehension. This has resulted in a call for the integration of management systems which will be discussed later in Chapter 5. In light of the ISM Code, it is clear that to a large extent implementation of a system in compliance with the Code would capture two of the systems in Figure 3, i.e. Health and Safety Management System and Environmental Management System.

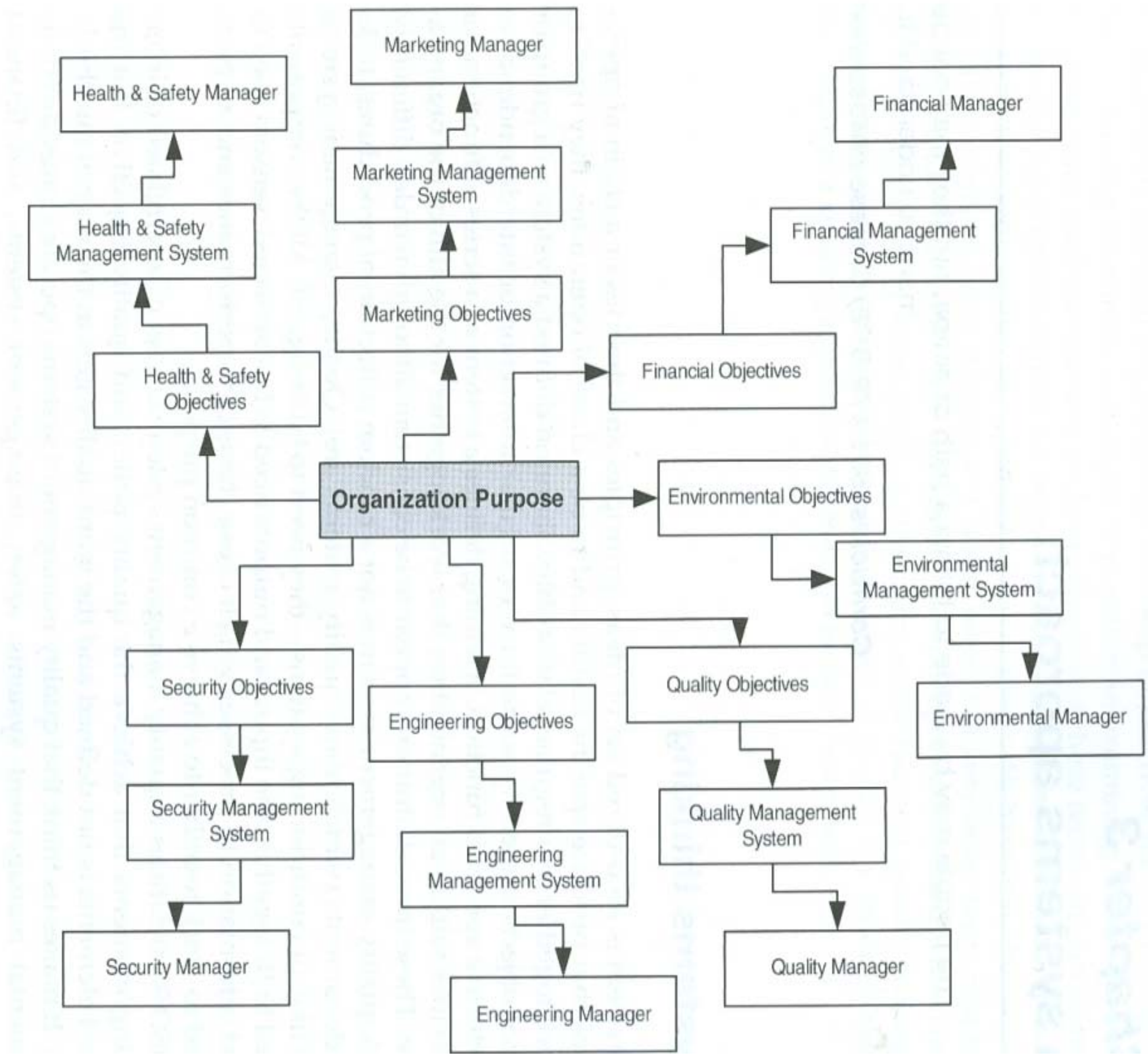

Figure 3 Multiple Management Systems (Source: Hoyle, 2007)

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It is also clear from the above illustration that the different management systems are a means by which the different functional objects in an organisation can be achieved. Thus health safety and environmental objectives are achieved through a health, safety and environmental management system. A simple illustration is given in Figure 4.

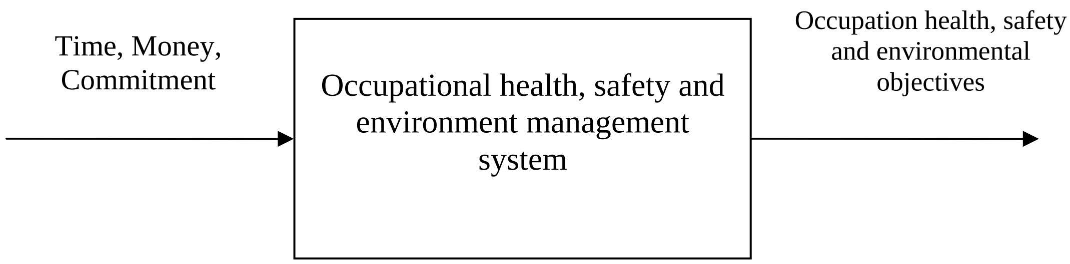

Figure 4 simple illustration of OHSEMS

The biggest problem with visualising OHSEMS is that the objectives or expected outputs are difficult to quantify. Accident statistics have been used before to try and quantify the results of safety but these might not be sufficient in some cases since they may not capture the whole picture.

3.5 OHSEMS and the ISM Code

There is evidence to show that something is not right about the systems that have been implemented to comply with the Code. The following extracts from accident investigation reports from the Marine Accident Investigation Branch (MAIB) of the UK illustrate the point:

> "… although the owners had implemented an ISM compliant SMS on board *the Calypso*[25]*o* to satisfy regulatory requirements, it was not applied in a way which generated an effective safety culture within the company's staff ashore and afloat" (MAIB, 2007a, p.60)
>
> "The failure to routinely ensure the safety of the ship at anchor, and a number of significant departures from the ship's onboard SMS identified during the investigation, indicate that the safety management of the vessel was not meeting the objectives of the ISM Code. These departures included: the chief officer leaving the bridge unattended when the ship was underway at night;

[25] There was an Engine Room fire

> not providing an additional lookout on the bridge when underway during darkness; the consumption of alcohol on board when prohibited; the employment on board of an unqualified deck rating, and; the failure to log and report accidents to the ship. While none of the above could reasonably have been expected to have been observed during the Flag State's interim ISM verification audit, some or all of them would have been evident during the subsequent initial ISM audit" (MAIB, 2007b, p.22)

It is clear from the above two excerpts that despite a ship being in compliance by having an SMC and DOC on board, the SMS /OHSEMS may not be functioning. The apparent simplicity of Occupational Health and Safety Management (OHSM) regulations (like the ISM Code) should not be taken to mean that they are less restrictive and easy to comply with because they actually demand documented management systems of the employer and this calls for extra work (Frick & Wren, 2000).

There is also seems to be evidence to show that other industries have successfully applied quality management systems and safety management systems successfully, mainly judging by their popularity. In most cases, especially for quality systems, the implementation has been voluntary. It can consequently be recommended that despite the ISM Code being in the general form that it is, a ship manager should take the approach of voluntary implementation since these voluntary standards such as HSG (65) from the HSE and BSI 8800 from the British Standards Institute (BSI) are often more specific on what should be done and how the OHSEMS should be structured. Shipping is often viewed as being unique from other industries, but, as true as this might be, the fundamentals of management systems including those for safety are still the same. Besides, some very similar industries such as offshore oil and aviation use these standards.

3.6 Elements of OHSEMS

The ISM Code is expressed in general terms (preamble) because of the recognition that no two shipping companies are the same, so no specifications are made on the contents or elements of an effective OHSEMS. The general elements of an SMS have been detailed and structured by various organisations (e.g HSE, 1991; ILO, 2001; BSI, 2004[26]). They all more or less agree on the elements of an effective system as policy, organising, planning and implementation, measuring performance and the audit as shown in figure 5.

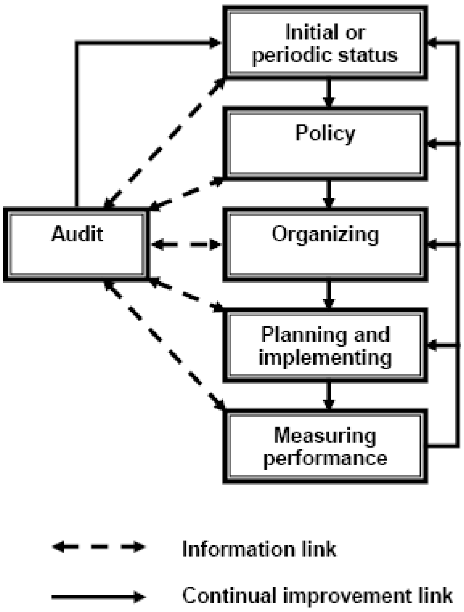

Figure 5: Commonly cited elements of an SMS (BSI 8800: 2004)

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This model however creates the illusion of being an implementation process or model, which is understandable since it is from organisations and institutions whose business, is to help other organisations with implementation.

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[26] The standard exists and the latest BS 8800 was released in 2004, however attempts to get a hard copy of this have failed save for bits and pieces like this one from the URL : http://www.rsc.org/images/OcHH_tcm18-38058.pdf

A better picture of the elements is therefore given in Figure 6. It shows the relationship an organisation such as the IMO, Administration[27] and other stakeholders would have with the OHSEMS. The first and most important element of an OHSEMS is top management commitment to safety (as well recognised in the preamble of the ISM Code). This commitment has to be rooted in the philosophy of the Shipping Company before it is translated into an appropriate policy. The management philosophy establishes safety as the primary criterion in decision making and commits to continuous development and improvement of processes supporting safe operation and improvement of ship safety performance (OECD/NEA, 2006). This means that, it is not only given priority after accidents and during periods of good financial performance.

[27] The term is used here in same context it is usually used by the IMO – National Governments of member states.

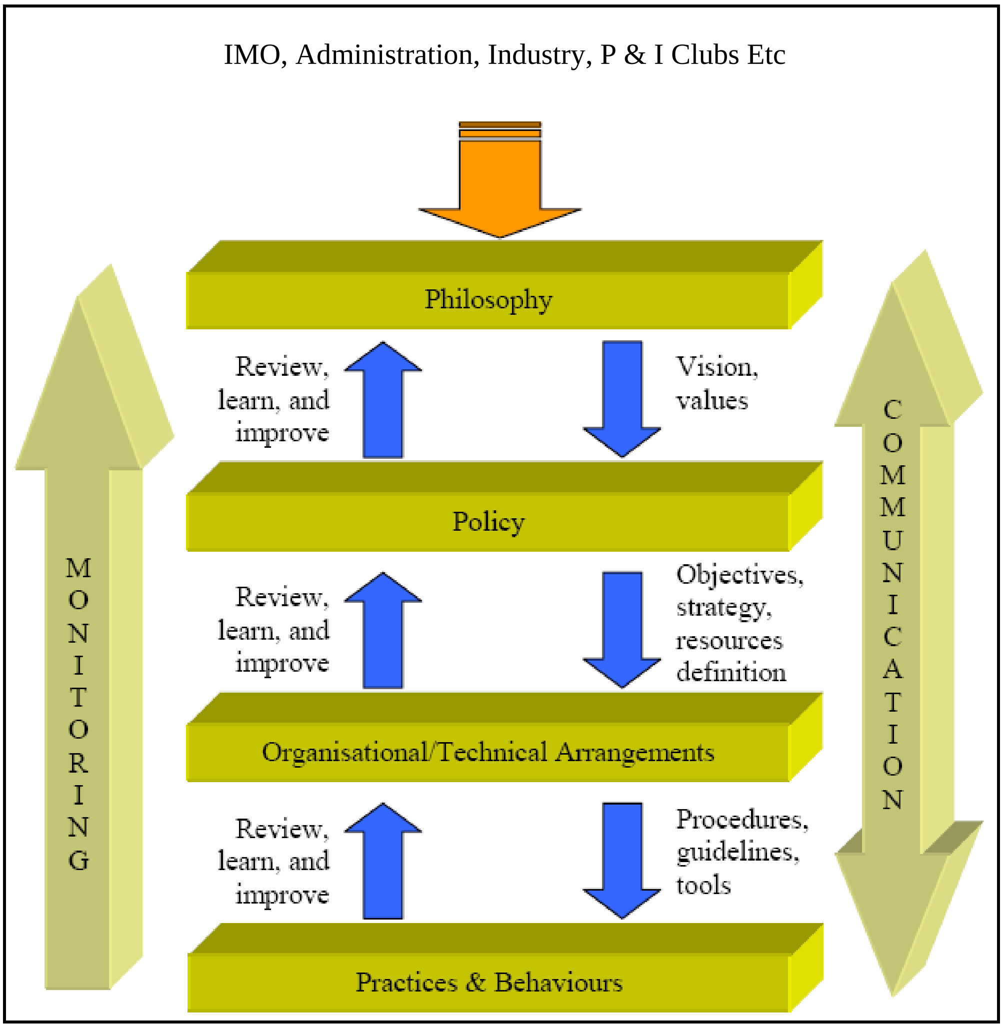


Figure 6 Elements of a successful health and safety management systems. Source: Adopted from (OECD/NEA, 2006)

Viewed as a system with inputs and outputs and in the context of the ISM Code an OHSEMS can graphically be represented as in Figure 6[28]. The inputs to such a system would consist of time especially on the part of senior executives of the shipping company and appropriate financial resources which are required for the purposes of training and necessary equipment. The outputs then would be as required

[28] Though this figure is from a different source, it contains the same basic elements as in figure but with a more appropriate physical presentation for this purpose of attaching inputs and outputs.

by the ISM Code (section 1.2.2), thus: safe work practices and work environment, safeguards against all identified risks and continuous improvement.

Figure 7: Graphical representation of an OHSEMS (Adopted and modified from ILO, 2001)

3.6.1 Occupational Health, Safety and Environmental Protection Policy (Section 2 of the Code)

It is usually expected that an organisation has to follow through with its policies since organisations are managed by policies. They are the laws and regulations of the business entity. Whether all organisations follow through with them is a matter for organisation theorists. For this purpose, suffice it to say that, with a policy in place, a shipping organisation would have shown the first sign of top management commitment to the health and safety of their assets and protection of the environment.

The policy is a way of translating the philosophy of the Shipping Company into a statement describing how the Occupational Health, Safety and Environmental Protection objectives will be achieved (ISM Code Section 2.1, OECD/NEA, 2006, ICAO, 2006) and serves as a reminder as to "to how we do business here" (ICAO, 2006).

In addition it should be able to provide for supporting human resource development, minimisation of financial losses due to avoidable events, recognition that safety is the responsibility of the management and not individual workers or employees, a culture supportive of health and safety, systematic approach to identification of risks and allocation of resources to control them and continuous improvement (HSE, 1991).

It is also recommended by ILO (2001) that workers (seafarers) are fully involved from this stage of policy formulation. Not only will this show that they are valued as the policy should indicate but it will also make them feel like they "own" the system. They are usually at the sharp end of incidents and accidents and therefore have more knowledge of the circumstance surrounding an accident than the top managers in the organisation. The policy so formulated should have the same standing in the shipping company as other policies like for instance financial policies. It sets out the direction for the organisation with regard to occupation safety, health and environment protection.

3.6.2 Organising for OHSEMS (Section 4 of the ISM Code)

This element, together with the next one (planning and execution of plans) form the components classified as Organisation / Technical arrangements in Figure 5. Any shipping organisation faces unique challenges when it comes to organising safety and health as compared to other land based industries because top management is usually widely separated from the real workers of the company – the seafarers who operate the ships. The ISM Code deals with this by requiring the appointment of a designated person ashore (DPA). His responsibility and authority are set out to 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 (ISM Code, Section 4).

This position is what is referred to as the safety manager in the ICAO manual of safety management in aviation (2006). He/she is meant to be the focal point (champion) as the driving force for changes necessary to effect safety across the entire organisation and should have no other responsibilities apart from safety (ICAO, 2006). The DPA provision in the ISM Code does not provide for this, but it should be recommended unless the shipping organisation is a small one. Clear reporting lines are established in the organisation structure both onboard and ashore.

The safety organisation is designed to establish and maintain management control of safety within the organisation, promote cooperation between individuals, safety representatives and groups (aboard each ship) which make health and safety become a collaborative effort, ensure the communication of necessary information throughout the organisation and secure competence of seafarers (HSE, 1991). Ensuring competence requires planning and recruitment of competent seafarers trained in accordance with the STCW Convention.

3.6.3 Planning and Execution of Plans

Planning and implementation covers a wide range of issues. In any planning process, the first step is to set the goals and objectives of the organisation. Maritime safety management is supposed to fulfil the objectives as they are in the ISM Code but in addition more objectives can be set. As stated earlier these would be the expected outputs from the system and the company would be expected to design its own plans for achieving these objectives, since the Code does not provide details on this.

The plan should therefore show how these objectives will be reached, with what resources and over what timetable (Waring, 1996). The timetable is of particular importance during initial implementation, otherwise the whole process is supposed to be continuous, one financial year after another. Every year should have its own safety objectives all which should help in maintaining compliance with the specific objectives in the ISM Code. The plan should cover maritime hazard identification, risk assessment, risk control, emergency preparedness and response (section 8 of the Code). It also includes a specific plan for the implementation of all mandatory IMO conventions and procedures for dealing with guidelines that are not mandatory.

Implementation of an OHSEMS can be as hard as when a child first takes the first steps to walk. Smooth implementation depends to a great extent on how the planning was done.

3.6.4 Measuring Performance / Monitoring (Section 12 of the ISM Code)

Measuring the safety performance of an organisation is one of the more difficult tasks that can be faced by any entity, maritime or otherwise. Accidents statistics, ill health and port state control detentions in the maritime sector are what HSE (1991) termed reactive measurement systems and they would seem to be in conflict with the whole philosophy of OHSEMS. Active systems are those which monitor the achievement of plans and the extent of compliance with maritime conventions and standards (HSE, 1991) and these should be emphasised more than the reactive systems. Active monitoring provides essential feedback before an accident, ill health or an incident and its primary focus should be to measure success and reinforce positive achievement by rewarding good work, not to penalise failure (HSE, 1991). That is not to say that reactive monitoring is not important because it can also provide vital information for general improvement in the safety performance of the shipping company.

3.6.5 Reviewing performance and action for improvement (Section 12 of the ISM Code)

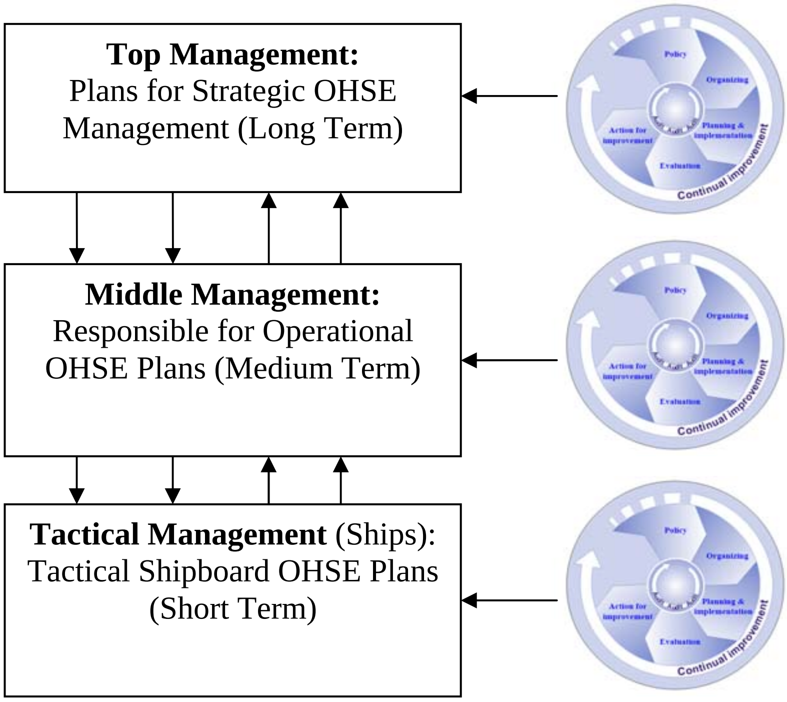
This component of the system provides the cornerstone for the continual improvement philosophy and is a result of effective monitoring. Because no matter what the safety performance might have been, more likely than not there will be room for improvement. It is usually done towards the end of the planning cycle when new safety targets are being made. One of the biggest challenges at this stage is setting new targets when the performance has been relatively good; "it is easy to forget to fear things that rarely happen" (Reason, 1997, p.6). The paradox here is that because of the improved safety performance, the company will probably get more business and unless the safety resources are proportionally increased, the risk of an accident will increase. The other way of looking at it is that the workers (seafarers) will get more work and become more tired and fatigued thereby endangering their health and safety of both the persons and the ship.

3.6.6 Communication (Section 9 & 11 of the ISM Code)

All the above elements are underpinned by clear lines of reporting and communication of information. Internally generated OHSE information should be designed and disseminated according to the needs and particular requirements of the recipients taking account of the processes and activities in which they are involved, tasks and responsibilities, hazards encountered, skill level, reading ability, native language (Waring, 1996). The system should support both formal and informal communication between all employees at all levels.

3.6.7 Application of the System

It is important to visualise these elements of an OHSEMS taking place at every level of the organisation. This is the only way the system can be genuinely understood to remedy accidents throughout the organisation as a whole, decisions made at every level matter as Figure 6, shows.



At every management level the cycle of continual improvement in the safety management system is implemented.

Figure 8: Interaction of the OHSEMS with the three organisational levels

Communication has to be both top–down and bottom–up which will show commitment throughout the whole organisation and especially the commitment of top management. The process even makes sense on a personal safety level. If for every job onboard a simple system to manage personal safety is used by the worker or seafarer then personal safety would improve. This is what procedures are meant to achieve – a personal OHSEMS, in other words.

The system should apply throughout the organisation and the safety management systems on board would be nested within the whole system used by the entire organisation. It should also be possible to the ships operating under the same management company to have the same OHSEMS.

3.7 Human Error, Human Factors or Human Element and OHSEMS

There appears to be no general agreement on the definitions for human error, human factors or human element. Reason (1990, p.9) has given a psychological definition of human error as:

> "a generic term to encompass all those occasions in which a planned sequence of mental or physical activities fails to achieve its intended outcome, and when these failures cannot be attributed to the intervention of some chance agency" (Reason, 1990).

Human factors on the other hand can be understood to mean the interaction between man and technological systems. One of the initial studies into the human element in shipping by the Marine Directorate of the Department for Transport of the UK, DFT (1991), concluded that the use of the term human error was misleading because it treats the human being as one system component amongst many others; human error thus being one an example of a component failure. It goes on to add the human factors and human element are more appropriate terms because they do not input a sense of failure and transgression on the part of the human being. The human element can therefore be understood as the human part of the socio-technical system[29] which makes up the organisation. Of all the three however, human error seems to be the most simplistic term attached to the fallibility of the human being because as Dekker (2006, p.3) has put it "under every simple, obvious story about error, there is a deeper, more complex story".

Irrespective of the above argument, suffice it to say that no matter what the phenomenon might be called (human error, human factors or human element); the human being is at the centre of it, just like he or she is at the centre of many marine systems and installations. Dekker (2006, preface) compares the new and old views of

[29] The socio-technical system consists of external subsystem such as laws and regulations, the internal subsystem such as the organisational climate, the personnel subsystem, the technology subsystem and the organisational design or task specification

human errors in Table 1. The new view in Table 1 is what Reason (1990, 1997) generally refers to as latent errors and conditions.

Table 1: The Old and New Views of Human error (Dekker, 2006)

The old view of human error on what goes wrong	**The new view of human error on what goes wrong**
Human error is a cause of trouble	Human error is a symptom of trouble deep inside the system
To explain an failure, you must seek failures (errors, violations, incompetence, mistake)	To explain failure, do not try to find where people went wrong
You peoples inaccurate assessments, wrong decisions and bad judgements	Instead find how peoples assessments and judgements made sense at the time, given the circumstances that surrounded them
Old view of Human Error on How to Make it Right	**The New View of human error on how to make it right**
Complex systems are basically safe	Complex systems are not basically safe
Unreliable, erratic humans undermine defences, rules and regulations	Complex systems are tradeoffs between multiple irreconcilable goals (e.g. safety and efficiency)
To make systems safer, restrict the human contribution by tighter procedures, automation, supervision	People have to create safety through practice at all levels of an organisation and training

One of the reasons that have been given on several occasions for the adoption of the ISM Code is that it will, in conjunction with the STCW convention, improve the performance of the seafarers. If the STCW convention is taken out of the equation and an assumption is made that it is delivering on its purpose of availing competent and well trained seafarers, justification is still needed for the connection between the Code and the human element. Especially because some have argued that the procedures and documentation required of an SMS often take a lot of time on board and sometimes this plays a part in making the seafarers fatigued. Yet, these procedures are not to be skipped if the system is to work.

The Code has three provisions in direct reference to human resources involved in ship operation and management. Section 1.2.1: one of the objectives of the Code being to prevent human injury or loss of life. Section 5: dealing with master's responsibility and authority. Section 6: dealing with resources and personnel. It would have helped if the functional requirement of a safety and environmental protection policy would have been formulated as an occupational health, safety and environmental protection policy. This may seem trivial but one has to look at the plethora of literature on the Code to understand that occupational health is not considered part of the system. Most of all, maritime safety in the "world of the IMO" seems to indicate safety from collisions, groundings, stranding etc (basically accidents involving the whole ship) as compared to safety in most other industrial sectors which often refers to occupational safety of the workers.

3.7.1 Occupational Health and Safety of Seafarers

Seafaring is a unique profession, one of a kind. It is not comparable to any other. Human beings not only spend a great deal of time away from home in the middle of the ocean but they are exposed to the perils of the sea and have no access to emergency health services afforded to other land based professions. Work and non–work activities are, for the duration of a spell of duty spent in the same constrained environment with only long term oscillation between home life and life/work at sea, which creates psychosocial issues that in the end affect their health (Carter, 2005). A serious injury while at work or serious illness has to be treated by those on board with professional help not arriving for a number of days, if at all it does. Despite all this, the provisions in the ISM Code do not sufficiently deal with this matter. As Sagen (1999, p.94) has noted it only scratches the surface. An argument might be made that they are not within the legal jurisdiction of the IMO, but then would a ship owner be expected to implement a completely different management system for their implementation?

Health and safety on board is governed by ILO conventions. These conventions and the number of states that have ratified them, in Table 2, is a good indication of the seafarer's plight when it comes to occupational health and personal safety. The new Maritime Labour Convention (MLC) has, as of today July the 6th 2007, been ratified by only one State - Liberia. One may therefore be forgiven for thinking that it might never come into force. This is in spite of the fact that according to Mejia ILO thresholds for enabling conventions to enter into force are lower than those of the IMO (personal communication, August, 2007). This means that even if it did enter into force it might not have the same global effect and level of compliance as IMO conventions because of the low rates of ratification.

Table 2: Maritime Labour Conventions and their ratifications as at 6th July, 2007 (Source: www.ilo.org/ilolex/english/newratframeE.htm)

ILO Maritime Convention	Number of States that have ratified
Convention 73, Medical Examination Seafarers (1946)	46
Convention 134, Prevention of Accidents (1970)	29
Convention 147, Minimum Standards Convention (1976)	55
Convention 163, Welfare at Sea and in Port (1987)	16
Convention 164, Health Protection and Medical Care (1987)	14
Convention 165, Social Security for Seafarers (1987)	3
Convention 166, Repatriation of Seafarers Revised (1981)	13

From Table 1 the number of conventions itself means a piecemeal approach to the regulation of seafarers' personal safety. This, despite the fact that a study by Li & Wonham (2001) found that 90% of seafarer mortality is caused by personal accidents and vessel casualties. This should call for more attention from the IMO since IMO conventions have a higher ratification rate as compared to ILO conventions (Li & Wonham, 2001). Maritime states even tend to ratify other ILO conventions dealing with the shore industry and not those dealing with the maritime industry (Sagen, 1999). Some major flag states like Panama and Liberia have not even ratified these conventions.

Be that as it may, an OHSEMS should make compliance with this convention or the other maritime conventions from ILO as much a priority as all the conventions from IMO. It is from this point that the systematic management of the health and safety of seafarers will foster improved performance of the human element as a whole, thereby reducing shipping casualties. The STCW Convention, which is often cited as contributing to the performance of the human element, plays most of its role before a person is deployed on board. It provides a competent, medically fit seafarer but is powerless in ensuring that the working conditions are what they should be.

3.7.2 Human Error Management as part of the OHSEMS

Acknowledging that errors made by humans in safety critical systems are not of their own making but a result of wider management and organisational factors does not mean ignoring them. If an understanding of the role played by OHSEMS in improving human performance is to be gained, one has to start at the ways in which human error should be managed. Error management should aim at error reduction and error containment (Reason, 1997) because eliminating it completely would be an unachievable goal. Dekker (2006) has listed 8 mechanisms by which human performance gets in trouble:

I. Cognitive fixation

II. Plan continuation
III. Stress
IV. Fatigue
V. Buggy or inert knowledge
VI. New technology and computerisation
VII. Automation surprises
VIII. Procedural adaptation

These are situations a seafarer would find themselves in before committing an error. The fact that they are in this situation is not of their own making but of the system in which they work. As an example, take new technology and computerisation. The fact an existing seafarer whose ship management company has installed new technology onboard without training for it to be used, is basically setting them up for an error during operation of this equipment.

The basic premise of the assertion that the effect of the human element on maritime accident causation will be reduced by implementation of the ISM Code and its requisite SMS seems to be that human errors are a result of other factors which are usually before the accident/incident. The system is expected to eliminate or at least reduce these latent conditions and errors, thereby reducing the likelihood of the human erring during ship operations. In terms of risk management, the SMS should be able to keep all failure probabilities in the fault at the lower ends of their intrinsic bounds and anticipate all significant risk scenarios, design measures to reduce them and provide robust control of them (Hale, 2005).

3.7.3 Justifying Health, Safety and Environmental Protection

Linking safety and environmental protection in the maritime sector is quite easy. Disasters such as *the Exxon Valdez, the Erika*, and *the Prestige* have shown that the two are almost inseparable. The safety of a well and safely designed and constructed ship starts with the seafarer. If an assumption is made that the seafarers are trained and certificated in accordance with the STCW Convention, whatever they do from then on is hugely influenced by the organisation for which they work. This can be represented as in Figure 7 (Cox, 2007).

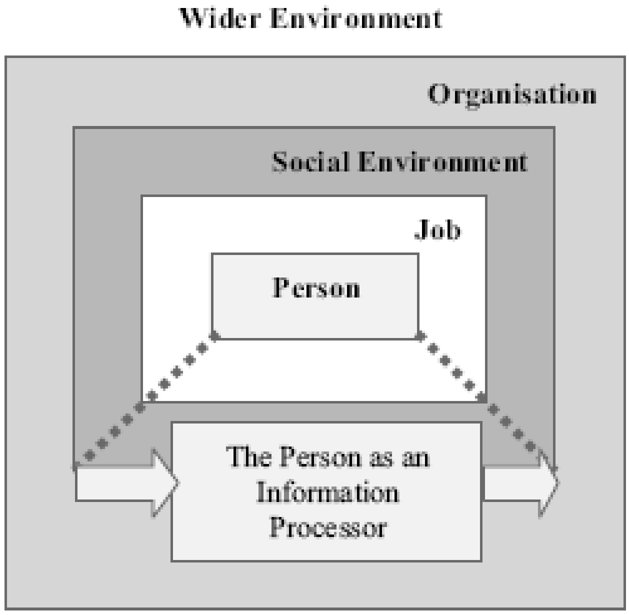


Figure 9: People – related issues: a broader view, source: Cox, 2007.

The person doing the job has to be healthy, both mentally and physically; otherwise they become susceptible to errors, in judgement or otherwise. As previously highlighted, seafaring is not like any other profession. The psychosocial pressure and health in which they work affect their performance and yet almost all jobs at sea to a greater or lesser extent are safety – critical (Carter, 2005). Consequently, the starting point of error management of seafarers should be by ensuring their mental and physical health, during operation or tours of duty and not only for certification purpose in accordance with STCW. From this perspective a healthy seafarer is less likely to commit errors, which in turn leads to less onboard accidents; and if other organisational issues such as fatigue are well managed, then errors during navigation are also reduced. This (in my view) is the starting point of the ISM Code as a whole.

3.8 Challenges to Implementation of Safety Management Systems in Shipping

The biggest challenge is the culture of compliance. As long as SMSs are implemented for the sake of complying with the Code and to avoid Port State Control detentions, the narrowest interpretation of the ISM Code will always be taken, and this is detrimental to the original intentions of the Code as espoused by the IMO.

The ISM Code obligates a shipping company to establish safeguards against all identified risks. Without explicit requirements on risk assessment methods, shipping companies employ different approaches to risk assessment. Some companies let their managers do it while others employ external contractors to do the risk assessment and produce a book of risk assessment for those on board to refer to without even consulting (Anderson, 2003). This of course does not do justice and does not give a good record of all identified risks since it is only the seafarers on board who face these risks during normal execution of their duties. It originates from the need to comply by showing all necessary documentation to either Flag State Control officers or Port State Control officers. As noted by Bond (2001) an internally generated system where the employees have participated in the risk identification process will be the sum of all the companies' knowledge and experience up to the time of being issued.

Another potential challenge, especially in shipping, is to make sure that that the SMS is not a paper chasing exercise. This is even noted in the IMO (2005) report on the effectiveness of the ISM Code. This will of course be a problem in the initial stages of implementation, but as the OHSEMS is used, unnecessary procedures can be eliminated and paper work reduced. However, this should not be done arbitrarily but systematically with top management involvement.

Perhaps the most significant challenge is in the form of management commitment. Shore side top ship management should be able to show the sea going staff that above all else, they are committed to the SMS and as a consequence, safety comes first before expediency on tight sailing schedules. The perception of management commitment by the workers (seafarers) will ensure that in times of pressure to meet deadline, they do not take shortcuts. Managers must check whether their safety commitment is being transmitted to others by the use of safety climate surveys to measure workforce perceptions of managers' attitudes and behaviours; the more immediate influence of managers on safety can be tested by using an upward appraisal survey (Flin, 2003).

These challenges are not insurmountable for a prudent shipping company that values the safety of its crew and property and also that of the marine environment. There are a myriad of approaches to risk management including the formal safety assessment procedure as proposed from the IMO, and the lack of specification in the Code of any one particular method is a way of letting the organisation use what fits it best. Though the initial stages of implementation might breed a culture of compliance, it would be reasonable to expect a shipping company to move on from this stage once the benefits of the system have become clear. There should also be verifiable ways of proving management commitment. For example when organising training for safety, top management can take the training first to ensure that they show there safety commitment to all the employees. Finally the current level of information technology develop should provide a good tool in an effort to reduce the "paper chase".

CHAPTER 4

4 OCCUPATIONAL HEALTH, SAFETY AND ENVIRONMENTAL MANAGEMENT SYSTEMS' LINK TO SAFETY CULTURE

4.1 Introduction

There seems to be conflicting theories on the relationship between safety culture and safety management systems about which comes first. The IMO (2002), in the revised guidelines on the implementation of the ISM Code[30] says, "the ISM Code (and hence the SMS or OHSEMS) should support and encourage the development of a safety culture in shipping". Veiga (2002) agrees when asserting that it is one of three instruments[31] that should lead to a shipping safety culture. Mejia (2005) has used the existence of a safety culture as one of the parameters to measure the effectiveness of the Code. On the other hand ICAO (2006) contends that "before an organisation can implement an effective SMS, it needs an appropriate safety culture". ICAO then goes on to explain the salient features of a safety culture, all of which are similar to the requirements of the ISM Code. The relationship will be analysed further in the following.

The problem however seems to be a matter of definition. By understanding that safety culture does not have to have a positive effect on safety performance, then even organisations with a bad safety record can claim to have a safety culture – poor safety performance culture. Consequently the existing safety culture in an organisation will actually affect how well it implements the ISM Code and the SMS (Ek & Akselsson, 2005). It is usually taken for granted that safety culture means an effective safety culture as used in Reason (1997) or positive safety culture as used by HSE (1991).

[30] Resolution A.913(22)
[31] The others being the STCW Convention and Formal Safety Assessment

4.2 Understanding Safety Culture

The term "safety culture" was formulated after the Chernobyl accident, it incorporates principles of leadership and value-sharing, enhanced communications and organizational learning, and knowledge about the factors which shape individual and group behaviours (Baram & Schoebel, 2007). The first definition of safety culture was given by the pioneers of its use, the International Nuclear Safety Advisory Group (INSAG) of the International Atomic Energy Agency (IAEA) in 1991. It was defined as "**that assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, nuclear plant safety issues receive the attention warranted by their significance"** (IAEA, 1991, p.4)**.** This definition has been termed a "motherhood" statement (Reason, 1997) and has since been redefined and refined by various writers, authors, organizations and experts. According to the HSE (2002) the most used definition is the one provided by itself in 1993:

> The safety culture of an organisation is the product of individual and group values, attitudes, perceptions, competencies and patterns of behaviour that determine the commitment to, and the style and proficiency of, an organisation's health and safety management .

However, all definitions that attempt to capture the essence of safety culture are bound to be inadequate because each of its many manifestations are extensive, complex and intangible (Lee & Harrison, 2000). There very many ways in which it can be conceptualized, for example as overt behaviour; as a groups' climate; as a system of symbols and understandings; as physical artefacts; as values and norms; or as fundamental unwritten assumptions ascribed to by a group or society (Pidgeon, 1998).

Whatever explanation is given, the most important thing is that because of this "culture" that employees share, they do their work in a safe manner, sometimes even subconsciously. This in my view comes from repeatedly doing something over a period of time to an extent that it becomes part of the individual. For example, it is almost impossible to convince some car passengers or drivers to sit in a car without wearing their seatbelts. It comes automatically when they enter a car; the next thing is to fasten the seat belt before anything else. This is the simplest example of a safety culture. In other words, the safety first habit is in the subconscious.

4.3 Relationship of OHSEMS to Safety Culture

There is no doubt that for good safety performance, a shipping company needs both an OHSEMS and an effective or positive safety culture. But this then begs the question: Is it possible to have one without the other? In a theoretical proposition, Clark (2000) suggests that the quality of the SMS is directly related to the safety culture of the company; workforce experience of the SMS (safety training, safety rules and procedures, provision and maintenance of safety equipment, accident reporting and safety representatives and committees) will influence the safety climate. "The effectiveness of a safety management system depends on how well it permeates in the fabric of the organisation—'the ways in which things are done'—so that a positive safety culture is generated and maintained in an ongoing manner" (Gill & Shergill, 2004).

As previously mentioned every organisation has its own culture and safety culture. Whether this translates into good safety performance is a question of outcomes. The introduction of occupational safety, health and environmental management systems in any shipping organisation should result in doing work in a systematic proactive manner. Implementing an effective OHSEMS requires a set of repeatable procedures. Year after year this process is repeated to achieve the continuous improvement required. If an organisation already has a positive safety culture, this will be relatively easy. If it has a "negative safety culture", it will be difficult but not unachievable. Therefore, the introduction of an OHSEMS should lead to the development of a positive safety culture if it does not exist and to the further enhancement of it, if it does.

This is best expressed in a model put forward by the OECD / NEA (2006) of the relationship between SMS and safety culture, (Figure 9). The artefacts and espoused values are the visible elements in the form of SMS and guiding principles and values. The basic assumptions are the inner core of the safety culture, and if these are negative then the survival of an SMS will be difficult. This is usually reflected in the first stages of implementation of the OHSEMS. For example, the basic assumption that accidents are an opportunity for learning, would end up being reflected in the OHSEMS that has processes and procedures that promote open reporting of all types of accidents (OECD/NEA, 2006). On the other hand, the opposite of this (accidents are punishable) would make open reporting quite difficult and consequently OHSEMS implementation becomes onerous, but not impossible.

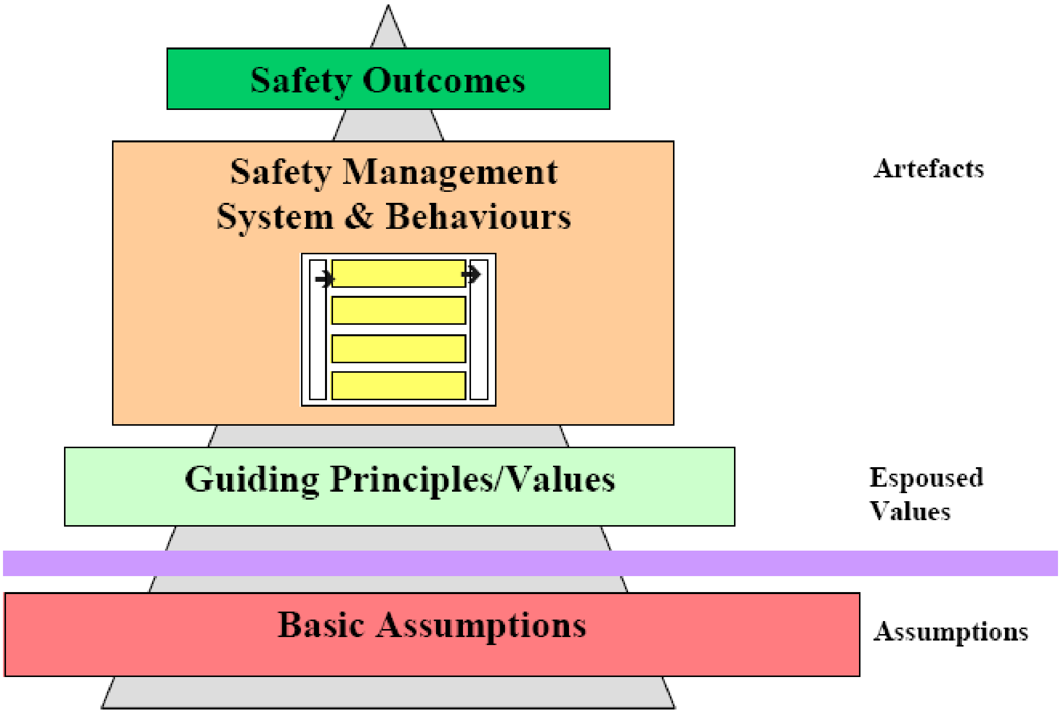


Figure 10: Model Safety Culture, Source: (OECD/NEA, 2006)

The five constituents of safety culture espoused by Reason (1997) are: informed culture, reporting culture, just culture, flexible culture and learning culture. These elements of culture do not just come about, but have their roots in the SMS. Thus, there is a *reporting culture* being initiated by clear reporting lines as required in the ISM Code. An *informed culture* starts from establishing a safety information system (Reason, 1997), which itself should be part of the wider OHSEMS. By not seeking to punish all incidents that have been reported but only those that are extreme, a *just culture* can be established. A *flexible culture* emanates from effective emergency procedures as required in the ISM Code. Finally, a *learning culture* is achieved by the continuous training and continuously learning from a functional safety management system.

This process has been represented in graphical format by Hudson (2007). When all tools of system safety and management systems haven been employed, accidents rates are bound to reach a plateau at which point the intrinsic motivation typical in a positive safety culture is the only way to reduce accident rates further (Hudson, 2007).

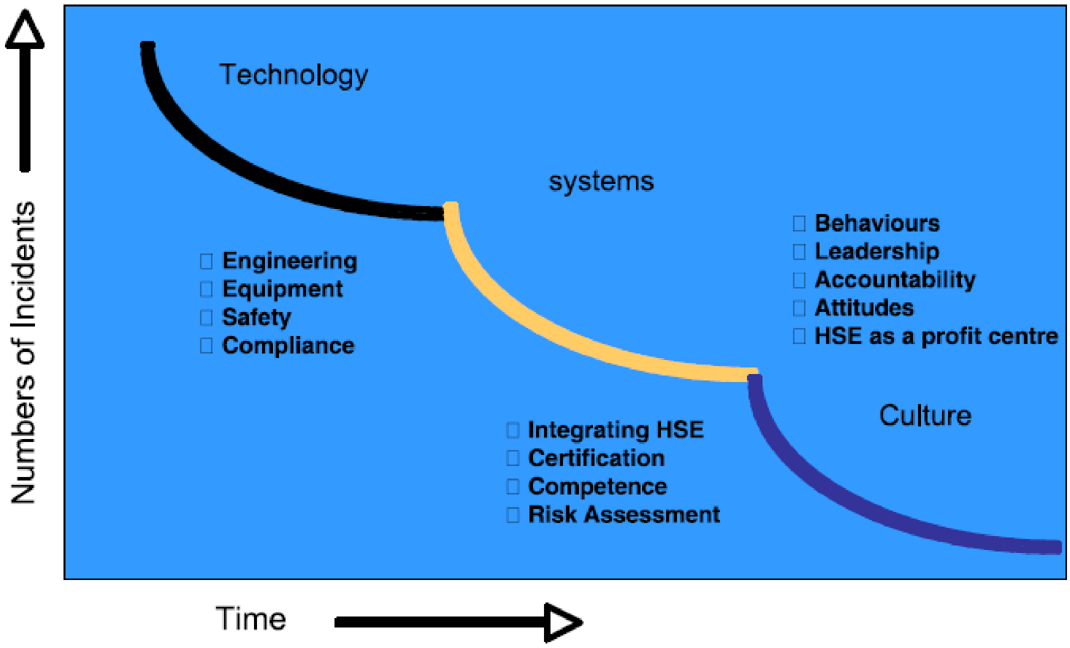


Figure 11: The developmental line – culture becomes the next wave after safety systems (Source: Hudson, 2007).

The IAEA / INSAG (1999, p.2) seems to believe in this philosophy since according to its definition: "The safety management system comprises those arrangements made by the organization for the management of safety in order to promote a strong safety culture and achieve good safety performance". It goes to say that one of the purposes of the SMS should be "to foster and support a strong safety culture through the development and reinforcement of good safety attitudes and behaviour in individuals and teams so as to allow them to carry out their tasks safely" (IAEA/INSAG, 1999). In addition, it has recognised three general stages in the development of a safety culture (IAEA, 1998), thus:

Stage 1: Safety is solely based on rules and regulations (cf. Maritime Sector Pre – ISM Code

Stage 2: Good safety performance becomes an organisation goal (cf. implementation of the ISM Code)

Stage 3: Safety performance can always be improved (this is the attitude of an organisation with a positive safety culture).

Another representation of the relationship has been done by Glendon & Stanton (2000) after a case study. Figure 11 is a summary of this study and the relationships between Risk Management, Safety Management, Systems and Safety culture.

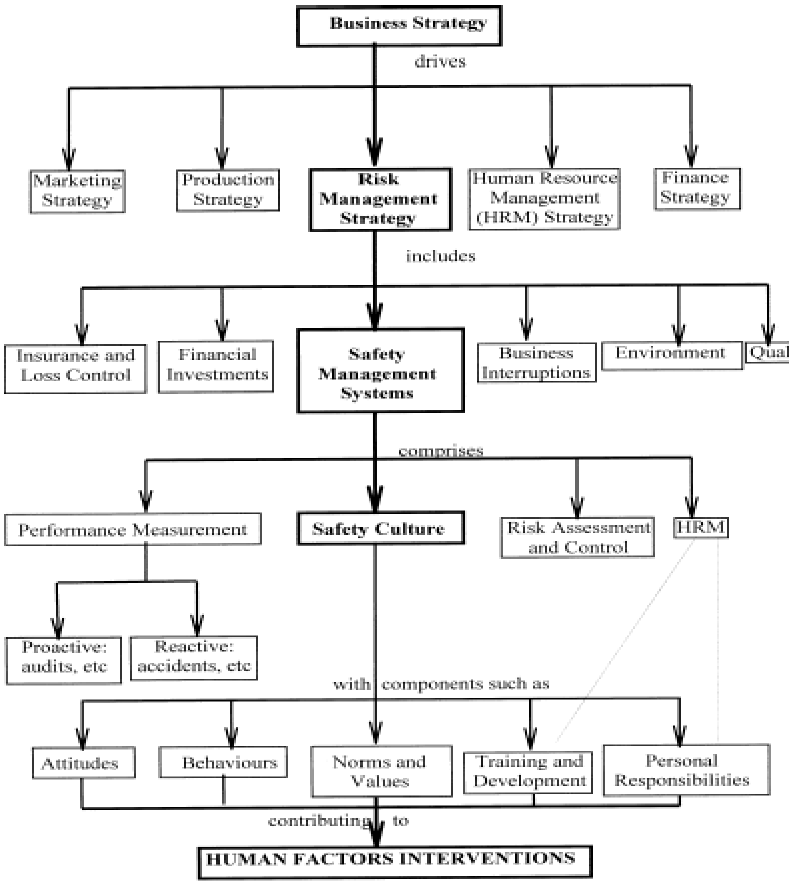


Figure 12: Risk Management, SMS and Safety Culture, Source: Glendon & Stanton (2000).

By showing safety culture as part of safety management systems, Figure 11 is more in line with the theory that a safety culture is generated after the establishment of an SMS

4.4 Safety Culture in Shipping

Achieving a positive safety culture was one of the aims for implementing the ISM Code in conjunction with the STCW Convention and Formal Safety Assessment procedure. Also, from the foregoing discussion it is evident what part the ISM Code is expected to play in achievement of this culture. To study the state of safety culture in shipping would require an extensive questionnaire survey and interviews over a long period of time. Secondary data sources, however, can help indicate the state of safety culture in the shipping industry.

At the forefront of the industry's fight to achieve acceptable safety standard is and has always been the IMO[32]. Driven by this leading role, the IMO as an organisation has shown that safety and marine environmental protection are the very reasons for its existence. Virtually everything that IMO has done since it was established has been designed to improve the safety of international shipping and the quality of the marine environment (O'Neil, 1999). It has espoused values shared by all its members; an underlying philosophy that serves and reflects its core mission; and this is its organisational culture which translates into a safety culture because of the attitude to safety (Mitroussi, 2003). The same however cannot be said of the industry which IMO regulates. If this attitude shown by the IMO was to be cultivated into the ship owner / managers, the industry would have an impeccable safety record.

There is not much in way of reported research on safety culture in shipping. Ek & Akselsson (2005) have conducted a safety culture survey on board six Swedish passenger ships (including Ropax and High Speed Craft). Nine aspects of safety culture were used in the survey, thus:

Working situation: this involves items such as cooperation, support, appreciation of work, fatigue, adequate training in work practices, staff sizes and having influence in design of work. This basically measures an individual's attitude to his occupation health and safety

Communication: this measures the level of communication to determine information flow between employees.

Learning, reporting and flexible: these are evidently taken to represent part of Reason's (1997) elements of safety culture.

Attitudes towards safety: this is meant to measure the attitude of employees and management towards safety by evaluating such aspects as appreciation of safe work, whether education and training are deemed necessary.

[32] At least for the last five decades

Safety – related behaviours: these constitute both individual and organisational behaviours in relation to safety.

Risk perception: contains items about the belief that work is carried out safely, the size of the risk for the individual getting injured on the job or that ones work could lead to others being injured.

The results of the study revealed a generally good safety culture in the passenger shipping in Sweden for all the above nine dimensions with the "attitudes toward safety" and "safety related behaviours" receiving the highest scores while "learning", "Justness", and "Flexibility" received the lower scores (Ek & Akselsson, 2005). The caveat to place on this study is that it is no way representative of the maritime industry as a whole. The ship types cover a small portion of the industry and are in a particular geographical region, though it might be representative of the safety culture condition in Northern Europe passenger shipping.

Another research was carried out by Håvold (2005) in a Norwegian shipping company in which 15 ships were surveyed, but he did not draw any conclusions on the state of safety culture in shipping. Significantly though Håvold (2005) concluded that perception of safety issues across occupations (galley, deck and engine crew, officers and masters) are not shared to the same level and that perceptions of safety are not even the same across the different nationalities on the different ships managed by the same company. It seems safe to conclude that the level of culture is low. This is a challenge peculiar to the shipping industry in the present age of globalisation and crews being recruited from all over the world.

In any one large shipping company there might be a number of different nationalities operating in different parts of the world under different conditions. If safety culture is believed to share many of the features of the "parent" organisational culture (Clarke, 2000; Glendon & Stanton, 2000), then developing it in a maritime setting may pose significant challenges. In addition, seafarers are hired from different parts of the world, sometimes on short contracts; and yet a safety culture takes a while to develop; also, national cultures have been found to affect seafarers' perceptions of safety (Håvold, 2005). One can conclude that a homogeneous safety culture is still a work in progress for shipping.

It is worth pointing out however, that safety culture is treated as independent of safety management systems in most the available and there seems to be no agreeable relationship between the two. What has been expressed here is a deduction after reviewing the theoretical framework of both SMS and safety culture.

CHAPTER 5

5 FUTURE OPTIONS AND CONCLUDING REMARKS

Despite the often quoted assertion that the maritime community was reactive in its nature of dealing with accidents, this phenomenon is not unique to shipping. It is common to all human endeavours. Accidents like adverse events provide the spark for action in whatever industry. Laws have been enacted through out the world to deal with the threat of terrorism due the events of September 11 2001. Even the current strength of the United Nations arose from the experience of the two World Wars. The human being is always (in most cases at least) reluctant to implement new measures that would disrupt the status quo and unless they are absolutely convinced that these measures will improve the status quo. Therefore the maritime community was not and is still not the only sector in the world that reacts to adverse events by enacting measures to prevent them from happening again.

5.1 Relationship between Human Performance and OHSEMS

At the beginning of this manuscript it was stated that one of the most unclear arguments is how a safety management system as contained in the ISM Code is expected to improve human performance and thereby reduce the accidents that are attributed to the human element. An exploration of the general concept of safety management in shipping and other shore based industry has been done and the following concluding remarks can be made.

The starting point is to understand the SMS as required by the ISM Code to be an OHESMS as detailed in the foregoing chapters. This is because the starting point[33] should be a healthy, fit and an assured seafarer. This point cannot be over emphasized. In the section 1.4 of the Code this aspect of the SMS is not clearly stated among the six functional requirements, though 1.4.2 mentions instructions and procedure for safe operation of ships and protection of the environment which is wholesome statement and can be interpreted to include procedures and instructions to ensure health of seafarers.

[33] Assuming the seafarer is competent in accordance with the STCW Convention.

This requirement will also be found in section 6.2 of the Code. What this means is that there is a legal basis for the implementation of an OHSEMS that actually includes ILO requirements.

The inclusion of occupational safety and health as part of the system under the Code will require implementation of the various ILO conventions providing for this. A shipping company might choose to include these conventions irrespective of whether the flag state has ratified them or not. They are vital for ensuring an effective system. It is in this area of safety management that shipping seems to differ from shore based industry. Shore based industry is mainly concerned with occupational safety and health of its employees and workers, whereas shipping always appears to be more concerned with safety of the ship as a whole. The discussion in this dissertation shows that the safety of a ship should be a result of a safe and healthy seafaring workforce that will be less susceptible to making human errors.

Hence, a safe workforce leads to a safe ship which in turn leads to a protected marine environment. A simple illustration is as shown in the Figure 13.

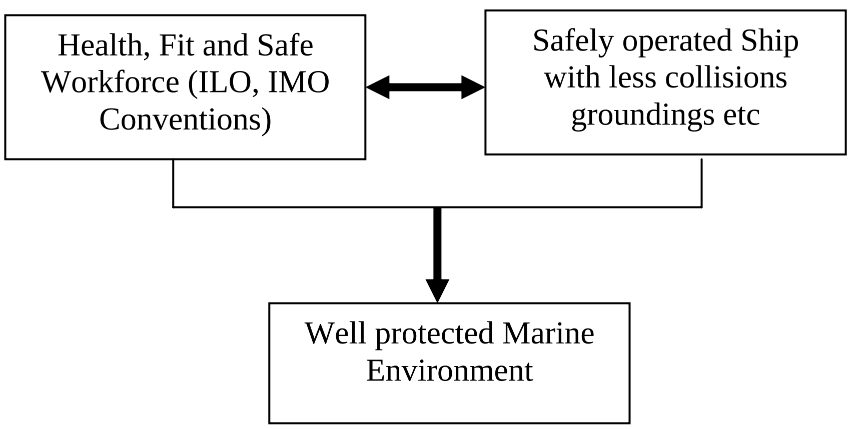


Figure 13: Expected relationship between occupation health, safety and environment protection

Most of the existing standards in safety management have been designed with the shore based industry in mind. This means that they are designed with occupational health and safety as the predominant concern. As a result it is reasonable to conclude that an effective SMS in accordance with the ISM Code was also expected to deal with occupational health and safety in addition to ship safety. After all most of the ideas about safety management in shipping have been adopted from the shore industry.

At the lowest level in an organisation i.e. the individual it is important to think of an OHSEMS as in Figures 6 and 7. A seafarer has to work as an individual sometimes and by following this procedure plan-organise-implement-evaluate-improve on a consistent basis, they will be able to implement it with no problems when working as part of team or when they are given the task of managing a given undertaking. From this personal awareness the system is transmitted throughout the organisation and is expected to produce the necessary improved results as far as safety is concerned.

5.2 Safety Culture and OHSEMS

It is also evident from the discussion in the previous chapter that a management system for safety is the one that fosters a safety culture and not vice versa. Whatever culture an organisation might have in place with regards to safety practices is its own. But the required positive safety culture can only be achieved after years of working with an OHSEMS. This conclusion is drawn from the understanding that the term culture in whatever sphere is it is used refers to certain practices of a given group of people. These are things that they and only they do repeatedly. By following safe procedures and practices as contained in an OHSEMS, workers in any organisation whether on board a ship or ashore develop there own unique way of carrying out there duties safely. This eventually becomes the culture of the organisation. The routine of plan-do-check-act as implied by organisational management systems becomes a personal tool for the employee or seafarer.

5.3 Future Options for Safety Management in Shipping

Shipping has not been that far behind other industries with regards to safety management despite what might have been written. It realised the importance of proactive safety management at about the same period of time as other industries as the emergence of the ISMA Code and other codes as discussed above has shown. The only hindrance that shipping encounters arises from the fact that it is an industry regulated at the international level. This implies regulations take longer to come into effect and because of this it always seems like shipping is lagging behind.

5.3.1 Integration of Management Systems

A closer look at the Code suggests that what is required is an integrated management system for safety and marine environment protection. Bearing in mind that the code was enacted in 1994 and came into force in 1998 for the first type of ships, it would appear that the IMO showed foresightedness. Wilkinson & Dale (1999a) have indicated that integration became an issue from about 1996 onwards. This implies integrating ISO 9001, ISO 14001 and the different safety standards such as OHSAS 18000. This has grown out of the realisation that there is a need to satisfy every stakeholder as far as the activities of the organisation are concerned. Hence the term quality has expanded to include health and safety and environmental protection. Today it is not enough to meet the needs of the customer but also employees, the local and global community, investors and society in general should be satisfied (Karapetrovic, 2002). It is a world where an organisation has to address the needs of everyone who has a direct or indirect contact with it (Karapetrovic, 2003).

For any shipping organization, dealing with separate management systems covering quality, environment and safety and other issues, and ensuring that they align with the its strategy, can prove difficult (Wilkinson & Dale, 1999b). In spite of this, the tendency for shipping organizations at present and in future is to integrate quality with the requirements of the Code i.e. safety and environment protection. Hoyle (2006) has argued the tendency to separate safety, environment, quality and any other management system is pointless since quality can only be assured by managing all the organization functions in the same process approach that is the essence of management systems. In other words if a shipping organization is providing an unsafe service then it is not providing a quality service.

5.3.2 Benefits of Integration

Linking occupational health, safety, environment and quality can provide its benefits. Some of which are explained in this section. Kemp & Blansch (2000) point out that integration fosters synergy by providing solutions to the problems within the different fields because of looking at them comprehensively. Integration can also ensure that none of the three fields of quality, safety and environment is ignored in favour of the other since it should not be possible to look at one of them without the other.

Shipping in particular would benefit from integration of these three aspects of organisational management. A compromise on ship safety would lead to damage of the marine environment and this would not be a quality service under any circumstances. Though the Code does not mention quality at all, integrating it into the system that is used for the implementation of the Code is only a good idea to ensure a collective management system that would achieve more than the legal requirements of the code. It also a proven that problems in the fields of safety, environment and quality originate from the same technological developments – choice of materials, equipment and work organisation (Kemp & Blansch, 2000).

Simplification of standards and requirements for management systems, reduction of auditing and registration costs by dealing with one single system, alignment of objectives, processes and resources in different functional areas and improved system effectiveness and efficiency are other additional advantages expected from the integration of management systems (Beckmerhagen, Berg, Karapetrovic, & Willborn, 2003).

A good practical example of integration could be a procedure for welding, where the quality demands for the welding process are described together with the way in which waste is handled and also what kind of health and safety rules and equipment the employee has to apply (Jorgensen, Remmen, & Mellado, 2006, p.717).

5.3.3 Options for Integration

The options available for integration of management system arise from the systems theory as discussed earlier. That is to say every system must have inputs going through a process to produce outputs whose quality is then control by a feedback loop. Also every system must have a defined boundary and all subsystems within the bigger system boundary must be compatible and function towards a common goal. The literature (e.g. Jorgensen, Remmen, & Mellado, 2006; Karapetrovic, 2003; Wilkinson

& Dale, 1999a; Wilkinson & Dale, 1999b) suggests two main approaches to achieve integration and still fulfil the above two conditions of a system.

The first approach is to align the individual systems of quality, environment and health and safety. The basis of this alignment is the similarities of the various standards (ISO 9001, ISO 14000 and the various safety standards). Separate procedures for each organizational function and goals are continued but placed in one manual (Jorgensen, Remmen, & Mellado, 2006). Harmonization then becomes necessary because without it the documentation becomes more rather than less complex (Wilkinson & Dale, 1999a)

The second approach is that of full integration in all relevant procedures and instructions and is referred to as a Total Quality Management (TQM) approach with focus on employees, customers and continuous improvements by Jorgensen et al. (2006). This should be the ultimate aim of any efforts towards integration. At the "core" is a harmonized system that is certificated and audited as one single system with the same boundary for each subsystem and these subsystems are not independent (Wilkinson & Dale, 1999a).

Clearly there is still a lot of research to be done on integration of management systems and it is to this end that I leave it here as a pointer to any interested research into safety management in shipping. There is no doubt that integration is the way forward and for the maritime sector in particular it has the necessary mechanism in the form of the system required by the ISM Code. The objective of future research should therefore be how to integrate the mandatory requirements of the Code with the voluntary requirements of quality management and social accountability.

5.4 Final Conclusion

The ISM Code, while not a prescriptive standard in the same manner as the ISO Series or the BS 8800 health and safety standard or even the ILO guidelines, has the necessary provision as discussed in Chapter 3 to enable implementation of a system that would be in tandem with the state of the art. Moreover as emphasized throughout this dissertation it goes beyond the current national standards on safety management by actually providing the necessary basis for integration of health, safety and environmental protection systems into one system that as briefly discussed above would improve efficiency. The Code provides a functional framework and practical guidelines. The onus is on the ship owner or manager to implement a working system.

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