An Analysis of Contemporary Issues in Maritime Safety from the Quality Management Approach

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ABSTRACT

This study identifies safety as an element of service quality in maritime transport and discusses contemporary issues associated with maritime safety in light of the quality management approach. This paper argues that safety is an element of service quality and it has also been revealed that there are five contemporary issues that have impacts on the management of safety in the maritime transport industry, namely, human factor, effective communication, safety culture, commerciality versus safety and chain of safety links. Safety culture, as part of the quality and organisational culture, is the most important factor and deemed to be the root of other issues. Factors affecting the contemporary issues of maritime safety are also discussed. It is argued that these issues, viewed from the quality management approach, are of critical importance to the management of safety and thus a clear comprehension in this respect will contribute to the cause of maritime safety improvement.

Keyword: service quality, maritime safety, maritime industry, quality management, safety culture

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1. Introduction

Maritime safety issues dates back to the dawn of trade by sea and men on boats. Today, although maritime accidents and casualties have relatively decreased, the magnitude of this issue retains its importance. Indeed, while international conventions like SOLAS are designed to ensure safer shipping, a uniformity of standards in safety is still far from being reached. Many contemporary issues of maritime safety thus need further investigation. It is proposed that safety, as an important element of quality of the maritime transport service, can therefore be effectively managed with the application of quality management philosophies and principles. In this respect, this paper aims at diagnosing and analysing the contemporary issues of maritime safety from the perspective of quality management in the shipping industry.

2. Safety as an element of service quality

With more than 90% of world trade by volume being transported by sea, maritime transport remains the backbone facilitating international trade and globalization (International Maritime Organisation, 2017). Maritime transport, as an important link in the total transport chain, is a service industry and the notion of service quality is critically important. A number of studies show that the quality of service in maritime transport is a critical factor which is essential in the customers' selection of shipping lines and port operators (Pearson, 1980; Brooks, 1985, 1990; Slack, 1985; Murphy *et al.,* 1989, 1991, 1992; Lopez and Poole, 1998; Frankel, 1993; Tongzon, 2002; Ha, 2003; Ugboma *et al.,* 2004; Pantouvakis, 2006; Thai, 2008; Cho, Kim and Hyun, 2010). Moreover, shipment safety is classified as one of the selection criteria and an attribute of service quality. Literature survey about quality dimensions in maritime transport suggests that the quality of maritime transport services is defined by a number of dimensions from both service providers' and service buyers' perspectives. A recent study (Thai, 2008) specifically built and validated the ROPMIS model of service quality in maritime transport which consists of six dimensions (*Resources,* such as equipment and facilities availability, etc.; *Outcomes,* such as shipment safety and security, etc., *Process,* such as staff's attitude and behaviour, etc., *Management,* such as knowledge and skills of management and operators, etc., *Image,* such as company's reputation for reliability in the market; and *Social responsibility*, such as environmentally safe operations, etc.). Clearly, safety is an essential element of service quality in maritime transport both from the perspectives of customers, service providers and the environment (Thai, 2008).

There have been numerous publications about quality in shipping, discussing quality that is broader than merely providing quality service. Hawkins (2001) pointed out that quality in shipping also means safety as safe maritime transport results in huge savings from accidents. Bengtson (2000) argued that there are three elements contributing to quality shipping, namely quality of ships, quality of people and quality

of management. MPA Singapore (2000) concluded from an international conference regarding quality shipping that a 'quality' ship or operation is one that is in accordance with the applicable international standards of the day as well as any other related or additional standards set and adopted by others. In this respect, they also acknowledge that 'quality' seafarers are fundamental to quality shipping. This aspect of safety as an element of service quality in maritime transport has been reflected consistently and repeatedly in many recent studies, such as European Maritime Safety Agency (2009), Thai *et al.* (2014), Yuen and Thai (2015), Thai (2016), Madar and Neacsu (2016), Yuen and Thai (2017), to name just a few.

The concept of service quality in shipping encompasses the critical importance of safety and environmental protection in the overall dimension of corporate social responsibility. The fact is that shipping accidents are grand events and thus concerns for safety and environmental protection is likely to have impacts on the shipping company's image. When an oil spill occurs it is not only the shipping company's shareholders who suffer the loss of their properties, but also the stakeholders, for instance, fishery and tourism industries, who have to bear the consequences of such an accident. For example, the Exxon Valdez tanker accident in Alaska in 1989, which spilled more than 10 million gallons of oil, is still considered as the most damaging oil spill in US history, and it ranks as number one worldwide in terms of environmental damage. Approximately, the spill had an impact on 1,300 miles of coastline and caused the deaths of an estimated 250,000 seabirds, 2,800 sea otters, 300 harbour seals, 250 bald eagles, up to 22 killer whales, and billions of salmon and herring eggs. The clean-up effort cost Exxon $2.5 billion alone, and the company was forced to pay out $1.1 billion in various settlements (Walters, 2014). In addition to the upfront costs of the Exxon Valdez disaster in which the company expressed a slow response time and refusal to accept responsibility, the company's image was permanently tarnished. Angered customers cut up their Exxon credit cards while others boycotted Exxon products. Several years after the accident, 54% of the people surveyed in a study said they were still less likely to buy Exxon products (University of Florida, 2001).

Ruiter (1999) argued that the objectives of responsible participants in shipping and the objectives of public authorities are very similar, that is both want the rules to be complied with by everybody and both parties want to reward quality. Gratsos (1998) defined quality shipping as 'safe, efficient, reliable seaborne transport operated in an environmentally responsible fashion'. In defining quality shipping industry, Eliades (2002) also argued that:

> Quality shipping industry means the industry of the transportation of people and goods by sea whose basic features are respect of human life and property at sea together with a high regard and respect for the environment in which we all live; an industry where the prospect and the pursuit of economic return does not invalidate the commitment to the values just mentioned.

The Green Award, initiated by the Port of Rotterdam, is a typical example of the industry recognition with regards to the social responsibility dimension of quality in maritime transport (Green Award, 2004). It is indicated that the Green Award Flag can be awarded to vessels which are 'extra safe, extra clean' and meet high but manageable technical and managerial requirements. It is also noted that there have been increasing number of ports and nautical providers recognising the value of the Green Award and offer special rates and other advantages to Green Award vessels. In fact, the notion of social responsibility not only applies to shipping companies but also to ports. It is noted that a port community is always concerned with environmental issues that ports are dealing with in their operations and management, for instance, reception facilities for ships or interests in other environmental considerations. It is obvious that ports' behaviour towards and how they deal with these issues will certainly affect the perception of their shareholders as well as the stakeholders at large on the quality of their services, and subsequently their image and reputation. Today, more and more port entities recognise the importance of public opinion on business ethical issues, and strive for business objectives in a socially responsible manner. The Ecoports project whose main goals are to harmonise the environmental approach of ports in Europe and to exchange experiences and implement best practices on port-related environmental issues, is a typical example (Ecoports, 2004). Clearly, it can be seen from the above that service quality in maritime transport means not only *safe, reliable* (Service), *efficient* (Management) transport services but also *socially responsible behaviour and activities regarding safety and environmental protection concerns*. The latter is clearly an attribute of the social responsibility dimension of quality. Safety is thus illustrated as an element of service quality in the maritime transport industry, and the quality management application in addressing the contemporary issues of maritime safety shall result in effective safety outputs for the industry and for the society at large.

3. Contemporary issues of maritime safety

3.1 The human factor in maritime safety

The most important contemporary issue involving maritime safety is the human factor, which is defined as 'the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance' (International Ergonomics Association, 2017). In the context of maritime safety, this is commonly referred to as the "human element", which is explained as 'the people's ability and capability to deal effectively and safely with the complexity, difficulty, pressures and workload of their daily tasks, not only in emergency situations but also during routine operations' (UK Maritime & Coast-guard Agency, 2016). Numerous studies have shown that there are many contributing factors embedded in the human factor which can act

as pre-cursers to human errors and, in turn, maritime accidents or incidents. Nevertheless, the 12 most common ones, as synthesised by the UK Maritime & Coast-guard Agency (2016), are *fit for duty, situational awareness, alerting, communication, complacency, culture, local practices, teamwork, capability, pressure, distractions* and *fatigue.*

It has been argued that in many cases the ship safety is closely related to human errors (Goulielmos and Tzannatos, 1997; Wang and Zhang, 2002; Heinz, 2013; Nicolae *et al.,* 2016). According to some sources, more than 80% of the causes of maritime accidents are attributable to human errors, and in the causation chain of shipping accidents they are found consistently to be responsible for four out of every five casualties (Mitchell and Bright, 1995; Kristiansen, 1995; Payer, 1995; Pelecanos, 1999; Grech *et al.,* 2008). In another study, the Transport Safety Board of Canada (TSB) also found that 200 out of 273 accidents involving vessels in Canadian pilotage waters were due to human errors (TSB 2004). More specifically, it was indicated by Rothblum (2000), cited in Berg (2013), that human errors contribute to 84-88% of tanker accidents, 79% of towing vessel grounding, 89-96% of collisions, and 75% of fires and explosions.

Studies about human errors in shipping have also indicated that there are several classifications of factors contributing to this issue. Findings from a report of the UK P&I Club revealed that about 65% of human errors are operational and the remaining 15% are associated with the ship design and construction (Goulielmos and Tzannatos, 1997). When discussing the human factor in pilotage, Pelecanos (1999) argued that there are two sets of factors affecting the performance of human being, namely, the physiological factors such as stress and fatigue and the psychological ones such as attitudes and behaviour and personality. Wang and Zhang (2002), in addition, indicated that there are four categories of components, competency, *organisation and methods, communication and design,* contributing to the human system on board a ship. They highlighted the importance of effective education and training, management, communication and design so as to reduce the human errors.

It is therefore obvious that the quality of people in shipping plays a critical role in achieving high level of maritime safety. Although the analysis from other reports argued that the human factor is accounted for more than 80% of causes of maritime accidents, the author's viewpoint is that this element is attributable to all errors in the system which leads to mistakes and disasters. Indeed, when we look at the maritime transport chain, it can be seen that the people are at the centre of all operation systems, from the ship design, construction to ship registration, operations and management, from offshore to onshore activities (See Figure 1). While there are many factors embedded in the human factor which may lead to accidents and incidents, these exist at both the core system (ship design and construction), to the inner layer, ship-based system (offshore ship operations) and to the outer layer, company-based system (onshore ship management). In this respect, one can argue that technical shortcomings such as an inherent vice or latent defect of equipment,

for example, an engine cylinder, may be the main factor contributing to the accident, and it is a technical shortfall. However, such equipment is a product and its quality is subject to the careful operations not only during the production but also from the design stage, in which people have the main input. While automation can be considered as the effective solution to eliminate human errors at the operational level, the issue remains its magnitude. It is strongly perceived that any system is only as good as its core, the human being, and this also applies to maritime safety. While one may argue that human errors are inevitable, we should strive for 'zero tolerance' behaviour for defects, an important quality management mandate which has been very much advocated by gurus such as Crosby (1980).

Figure 1. The human factor in maritime safety
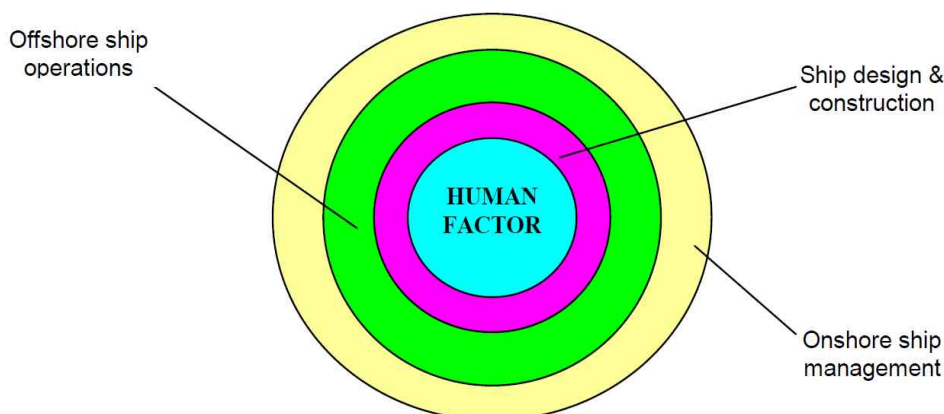
As Crosby (1980) stated that quality management is all about prevention, and quality and productivity always increase as variability decreases (Deming 1986), it is essential that the human factor be addressed at the roots of a good management system, in education and the process control by operating companies. Therefore, quality of education programs at institutions in which safety is part of the training, and harmonised standards of training among institutions in the world using international standards such as the STCW 1995/1998 as a base, are deemed extremely important in this respect.

3.2 Effective communication

The importance of communication as a critical success factor of quality management, both within different functional business units in an organisation and between an organisation and its suppliers and customers, has been widely discussed (Black and Porter, 1996; Ahire *et al.,* 1996; Flynn *et al.,* 1994; Sureshchandar *et al.,* 2001; Lakhal *et al.,* 2006; Yeh and Lai, 2015). In the context of maritime safety, poor communication between various agents involved in ship navigation has constantly been identified as one of the main causes of maritime accidents. For instance, in a recent report on navigational claims during the period of 2004-2013, the Swedish

Club revealed that many navigational claims still occur due to procedures not being properly followed by crew members, and officers not communicating with each other properly. In addition, poor communication between both vessels and bridge team members and a lack of situational awareness all play a part (Swedish Club, 2014).

Peters (1984) emphasised the strategic importance of communication in that 'the only things that the superstar companies understand is that the strategic distinctive competence of their institution is a strength borne of communication and implementation'. Studies about maritime safety have also highlighted effective communication as another important contemporary issue and this has been recognised by most maritime organisations around the world. From the standpoint that maritime safety should be viewed from a total system approach, communication is existent and represented in both horizontal and vertical dimensions as well as at both operational and management levels of the maritime transport network. Communication in the vertical dimension and at operational level includes that among players on board a ship such as between the ship master/watch-keeping officers and the pilot, or between the ship master/watch-keeping officers and the ship crew. At the management level, the communication is conducted between the players on board a ship and its operating/management company ashore. On another hand, communication in the horizontal dimension is illustrated through that between a ship and its operating/management company and other players in the maritime transport system. At the operational level, this is the communication between players on board a ship and the maritime safety related agencies ashore, such as the VTS (Vessel Traffic Service) and ATN (Aids-to-navigation) authorities or the Harbour Master and between a ship and other players beyond the ship such as the tug operator. At the management level, the communication relationship is represented between a ship operating/management company itself and flag states and port states, as well as at the higher level between the flag state where the ship is registered and the international organisations which have interests on maritime safety, such as the IMO. These maritime safety related communication relationships are illustrated in Table 1.

Table 1. The matrix of communication in maritime transport chain

Dimensions / Levels	Vertical	Horizontal
Operational	Communication among players on board a ship	Communication between players on board a ship and agents ashore or with players beyond the ship such as tug operator
Management	Communication between players on board a ship and its operating/management company ashore	Communication between a ship operating/management company and a flag state; and between a flag state and peak bodies/organisations

Source: Author

In practice, effective communication, in both dimensions and at both levels, has been proved as a critically important factor contributing to the improved maritime safety. The communication between a pilot and a ship's master/watch-keeping officers, for instance, is the most important of this type at the operational level. In this respect,

effective communication between these players is vital to the safe operations of a ship and to better understanding each player's duties and responsibilities. In fact, some differences may result from the fact that pilots and masters/ship officers do not share common ideas of what is required. While one group generally believes that it is providing adequate information, the other group might feel they are not getting enough information, and hence this is the question of effective communication. On the other hand, these groups sometimes do not even exchange the necessary information for the management of the ship's safety. For example, in the investigation of a maritime accident, the Transport Safety Board of Canada found that both the pilot and the second mate did their own calculations of the vessel's position, but they did not exchange and cross-check the information (TSB, 2004). This communication issue between pilots and the ship's master/watch-keeping officers is echoed again in a recent accident in November 2007 in which the 901-foot-long M/V Cosco Busan sideswiped the San Francisco-Oakland Bay Bridge, resulting in two fuel tanks ruptured and more than 53,000 gallons of fuel oil spilled into the San Francisco Bay (CBS News, 2009). In this accident which costs more than $70 million for oil spill clean-up, it was reported that there was a lack of communication between crew members, in that the ship's captain and pilot had little discussion about how the pilot planned to guide the ship through dangerous local waters.

A study about Maritime Safety Management System (MSMS) was conducted by the Australian Maritime College (2005) as a project for the International Association of Maritime Universities (IAMU). As part of the research methodologies, a survey questionnaire was sent out, during January – May of 2004, to 157 maritime organisations addressing the person in charge of safety. These organisations include port authorities/harbour masters, port operators/stevedoring companies and key actors in the aids-to-navigation (ATN) activities such as VTS (Vessel Traffic System) authorities, lighthouse authorities, etc. The targeted respondents are members of the International Association of Ports and Harbours (IAPH), the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) and global port operators ranked by Drewry Shipping Consultants. By the cut-off date, fifty three returned questionnaires were received, representing a 34% response rate. The majority of responses came from port authorities/harbour masters, followed by marine ATN/lighthouse authorities, maritime administrations and port operators/stevedoring companies. In terms of international representation, all continents are represented with prevailing responses from Europe, followed by Asia and others. This reflects the maritime dominance in each continent.

This study clearly showed that effective communication is a critical success factor of maritime safety (AMC 2005). When respondents, consisting of port authorities/harbour masters, port operators, VTS managers, ATN authorities in the international shipping community, were asked to indicate the importance of communication relationships among players in the maritime safety chain, 87% of them stated that the communication relationship between pilot and ship master/officers as 'very important', 13% as 'important' and ranked this as the most important relationship,

followed by the one between the players on board the ship and the VTS manager which was considered as 'very important' by 79% of respondents. The ranking of these communication relationships is presented in Table 2.

Table 2. The importance of communication relationships in the maritime transport chain

Relationships	Mean	Standard deviation	Rank
Between Pilot and Master/Ship officers	4.87	1.10	1
Between ship staff and VTS manager	4.75	1.66	2
Between Master and Ship officers	4.62	1.81	3
Between ship staff and Harbour Master	4.53	2.06	4
Between Master/Ship officers and crew	4.40	2.03	5
Between ship staff and tug operator	4.21	1.72	6
Between ship staff and port staff	4.08	1.88	7
Between port staff and independent contractors/visitors	3.57	2.49	8

Source: Australian Maritime College (2005)
Note: relative ranking based on factors' mean scores; 1=not at all important, 5= very important

In addition, when asked to state the view on the communication relationships among players at the management level, nearly 87% of respondents also considered these as the key communication relationships which affect safety environment. Furthermore, about 60% and 40% of respondents respectively expressed their view as 'strongly agree' and 'agree' to the statement that the effective communication among players at operational and management levels is viewed as very important in the management of safety. It has been illustrated that communication has a vital role to play in the management of maritime safety, and effective communication at all levels and in all dimensions will have great positive impacts on the cause of reducing human errors, and thus greatly contributing to the safety improvement of maritime transport operations.

3.3 Safety culture

Safety culture, as another contemporary issue of maritime safety, can be considered as the root of other factors which affect the management of safety. In this respect, in order to understand the importance of safety culture in improving safety of maritime transport, one needs to first understand the implications of organisational culture to the business practices of any organisation. The term culture refers to basic assumptions and beliefs that are shared by the members of an organisation, that operate unconsciously, and define, in a basic 'taken for granted' fashion, an organisation's view of itself and its environment (Schein, 1985). Peters and Waterman (1982) and Hofstede *et al.* (1990) argued that shared value and perceptions of daily practices are the core of an organisation's culture. Van, Dirk and Sanders (1993) defined culture as 'something collective and not a characteristic of individuals', and 'as a mental software and therefore invisible and intangible'. These authors, in their research of measuring the organisational culture within the perspective of quality management, concluded that the organisational culture supports dimensions of quality like reliability

and durability through the strong emphasis on rules (process orientation). In this respect, an organisational culture is to some extent a set of traditions, values, perceptions and beliefs, an unwritten set of guidelines for all employees in that organisation to follow. From this perspective, it is quite understandable that an organisational culture differentiates one company from another even when they are operating in the same type of business and it is a dominant factor in the business environment. There is no doubt that a strong organisational culture is not only vital but also the key factor in success. In another perspective, it is perceived that an organisational culture can sometimes be the main cause of difficulties that a company may face as it can make the senior management extremely conservative and thus not receptive to new and creative ideas, as well as the changing business environment. In such cases, a change of culture is deemed the critical factor. Although a culture change is always perceived as very difficult due to its characteristics as mentioned above, it is also believed that such a change is inevitable for the vital existence of any organisation.

When it comes to safety, it is strongly perceived that a culture in this respect should be created and maintained in the company, and safety culture should become a part of the quality culture of the organisational culture. Safety culture has been defined as 'a series of belief, norms, attitudes, roles and social and technical practices which are established to minimise the exposure of employees, managers, customers and third parties to hazard' (Dyrhaug and Holden, 1996). Weick (1987) also indicated the safety culture concept as 'a clear understanding of the system and its safety features, positive attitudes towards safety measures, and an incentive system that encourages safety in operations'. In this respect, it is perceived that if there is a paradigm shift to include safety in the organisational culture, the management of safety will be greatly improved, since a culture of safety, as an organisational culture, will play a critical role in shaping the operations and management practices involving the safety issue. It is argued that while safety culture may not be the only determinant of safety in organizations, it plays a substantial role in encouraging people to behave safely (Berg, 2013), and thus accidents and incidents can be avoided considering that a large proportion of their causes is related to human errors, especially in the maritime safety context.

The safety culture involves two main elements, namely 'management commitment' and 'employee involvement'. These appear to be the two most important dimensions in the creation of safety culture. It can be then perceived that good safety performance involves much more than simply the preparation of well-structured company safety procedures and standards, since it is empirically illustrated that many safety problems have their roots in poor management attitude towards safety, and thus safety culture is very much an 'attitude of mind'. A safety culture instilling a learning approach to accidents and injury is necessarily inspired and fostered by the management level and then communicated to operational level. It is also necessary that safety culture is inspired among sectors of the maritime transport chain, since a sector without safety culture can let the others down and thus affect the whole chain.

In the study about MSMS conducted by the Australian Maritime College (2005), when asked to indicate their views on key safety issues, 66% and 34% of respondents respectively 'strongly agreed' and 'agreed' that a positive safety culture is a key determinant of a successful MSMS; 68% and 30% of them 'strongly agreed' and 'agreed' that there should be high level of commitment from senior management and involvement of all employees in order to inspire the safety culture throughout the organisation; and 68% and 32% of respondents 'strongly agreed' and 'agreed' that the safety culture should be inspired and communicated to all sectors within the MSMS. Moreover, 62% and 38% of respondents respectively indicated inculcation of a safety culture and minimisation of the effect of human factors on risks as 'very important' and 'important', and ranked this as the most important factor to the success of a good maritime safety plan. Clearly, the safety culture as part of the organisational culture has a critical role to play in the management of safety, and success in maritime safety will only be achieved as this culture is inspired and maintained as a way of doing business (Blome and Ek, 2014). Three key components to developing an effective safety culture include *commitment from the top, measuring current performance and behaviour,* and *modifying behaviour* where required so that company's employees 'believe in safety, think safety and are committed to safety' (International Chamber of Shipping, 2013). In so doing, many accidents simply will not happen because virtually all so called "accidents" are in fact preventable (International Shipping Federation, 2017).

3.4 Commerciality versus safety

While it is necessary to promote safety in maritime transport operations, the question is how to remain focussed on safety whilst operating in a commercially responsible manner. The safety provisions are usually considered to be a cost burden dictated by law, and thus a necessary evil. There has always been a certain conflict between commercial efficiency and safety, indicating the fact that resources, which are available for safety, should be spent in the most cost-effective way. This can be done, taking into consideration the preventative measures policy, through the Formal Safety Assessment (FSA) with the application of risk management and cost-benefit assessment (CBA) techniques. FSA is a process which involves hazards identifications, risk assessment, studying alternative ways of managing those risks, carrying out cost-benefit assessment of alternative management options, and finally, making decisions on which option to select (IMO, 2004).

A study by Grote and Kunzler (1996) found that conflict between safety and commerciality can more likely be solved in favour of safety in organisations where safety is understood as an integral part of the primary task of the work system ('positive safety culture'). However, this by no means indicates that the commercial issue is downgraded in such organisations. The main question is to incorporate safety as an indispensable part of the operation systems whereas commerciality and safety are treated on equal footing, especially in the maritime industry where the profit margin is slim and safety plays a vital role. In addition, it is strongly perceived

that the relationship between commerciality and safety is only compromised as every employee in the company thoroughly understands the co-existent status of the two issues, and that improved safety will prevent productivity loss and cut costs in the long run. In this respect, it is important that safety should be built into organisational management, and managers should clearly understand the hidden costs of accidents, comprehend that 'good management is good safety', so as to inspire this to their employees (Pater 1990).

In the study of Australian Maritime College (2005) regarding MSMS as mentioned previously, 53% and 45% of respondents expressed their view respectively as 'strongly agree' and 'agree' with the statement that safety and commerciality issues should be treated on the equal footing in the maritime industry because safety is an indispensable part of all operation systems; 60% and 40% of the respondents also 'strongly agreed' and 'agreed' respectively with the key safety issue that safety should be a part of the work practice in every operation of the organisation. It is thus safe to state that safety is as critical as the commercial pressure and the right perception and implementation of business practices towards this issue will lead to positive impacts on the bottom line of an organisation.

3.5 The chain of safety links

It is said that the safety of a system is affected by various factors such as design, manufacturing, installation, commissioning, operations and maintenance (Sii *et al.,* 2001). In the case of maritime transport, a ship's safety is substantially affected by many technical factors, including shipowner management quality, crew operation quality, enhanced survey program, degree of machinery redundancy, fire-fighting capability, navigation equipment level, corrosion control, preventive maintenance policy etc. (Burton *et al.,* 1997). Moreover, it can be seen that these factors involve a number of organisations in the shipping industry such as port states, flag states, classification societies, maritime institutions etc. with their peak bodies being international organisations such as the International Maritime Organisation (IMO), International Association of Classification Societies (IACS), International Association of Maritime Universities (IAMUs) etc. Maritime safety thus cannot be achieved without international cooperation among various organisations involved in ensuring maritime safety. In this respect, the responsibilities of these organisations can be likened to links in a chain, and it is obvious that a chain is as strong as its weakest links (Mitropoulos, 2002). The most important link in the maritime safety chain is the shipping company (Swedish Ship-owners Association, 2004), in which the human element – seafarers – is the most important component (Bowring, 2006).

From the commercial perspective, the operations of a ship involve collaborative working relationships with many other stakeholders during shipping transactions such as port operators, port authorities, charterers, marine underwriters, financiers etc. Their role in maritime safety, including the safety of the ship, her crew, her cargo and operations, cannot be neglected since their inputs will either directly or

indirectly contribute to maritime safety. For example, the commercially safe operations of a ship lie in the hands of a bareboat charterer during the charter period, while the safety of the ship, her crew and cargo is also dependent on how a common shipper exercises his due diligence in declaring his cargo's characteristics. It was also found in a recent study which examined stakeholders involved in a novel system for enhancing maritime safety that the participation of market players such as charterers, crewing agencies, equipment manufacturers, icebreaking assistance, pilot vessels, shipping agencies etc. is crucial (Wolejsza, Thombre and Guinness, 2015). Indeed, maritime safety-related legislations can only be successful if supported and implemented by the industry as a whole, including these market players, and it is them in the industry that offer the greatest potential to accelerate the process of quality shipping, and the eventual demise of substandard shipping (Mykoo, 2003).

As safety is an element of service quality in maritime transport and because of the above characteristics, it is important that the management of safety should be conducted from a broader perspective of Group-Wide Quality Control (Ishikawa, 1990) or Total Quality Management, whereas the line of safety management is extended up to the suppliers and down to the customers, or in other words, to all stakeholders of the shipping company (see Figure 2).

**Figure 2.** The maritime safety chain

Source: Author

While one link in the chain can be claimed as the main responsible player for maritime safety, it is strongly believed that an increased effort or investment in establishing and maintaining high quality operations by only one link in the chain

is of little use without commensurate effort by all the others involved (Mitropoulos, 2002). This is understandable as the management of safety in maritime transport is closely governed by all links in the chain and they are strongly related to each other as far as safety issue is concerned. Being in the same safety chain, it is necessary that all links need not only to measure up their responsibilities but also work collectively for the common aim of safe and efficient maritime transport. In this respect, effective communication across levels within a link and among links is very essential. Transparency of operation and the free exchange of information are key elements in building and maintaining the cooperation and mutual trust required to strengthen the safety chain (Mitropoulos, 2002). Moreover, it is critically important that standards and protocols should be consistently used among various organisations across the maritime safety chain in order to achieve effective cooperation through shared mutual trust in each other works. This has been indicated by professionals as the key safety issue in the maritime industry. Result from the Australian Maritime College's study mentioned previously affirmed this as 38% and 60% respectively of respondents 'strongly agreed' and 'agreed' that consistency in all sectors of the maritime transport is essential to achieve an effective MSMS. Clearly, together with other contemporary issues, strengthened and effective chain of safety links is a critical issue that needs to be achieved in order to have a safe and efficient maritime transport industry, as illustrated in Figure 3.

Figure 3. Contemporary issues of maritime safety
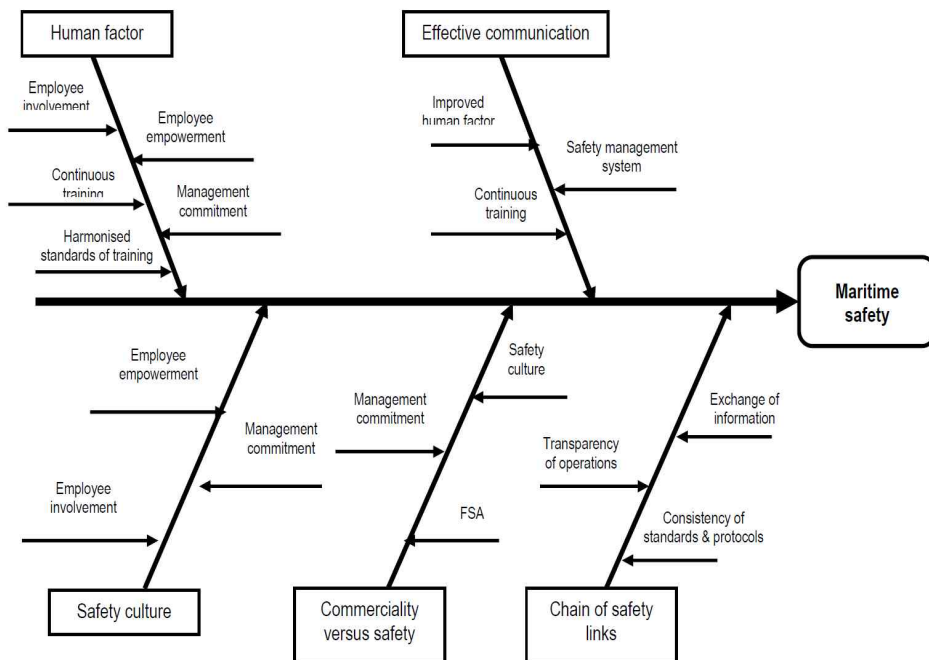
Source: Author, based on Australian Maritime College (2005)

4. Conclusion and policy implications

In this paper, contemporary issues of maritime safety have been reviewed and discussed. The quality management approach to contemporary issues of maritime safety, namely, human factor, safety culture, communication, commerciality versus safety and chain of safety links is necessary to identify the core factors affecting these issues and thus contribute to the improvement of safety management in maritime transport. It has also been revealed that the inculcation and inspiration of safety culture within an organisation and among organisations in the maritime transport chain play a critical role as a pre-requisite for any safety management system. In this respect, management commitment, employee involvement and empowerment, continuous training, harmonised and consistent standards, among others, are essential factors for effective and sound planning and management of safety in the maritime transport network. Besides, relevant organisations in the maritime safety chain also need to pay attention to other important aspects such as the human factor and effective communication, among others, since they contribute to the effective (ineffective) management of maritime safety.

These contemporary issues of maritime safety should be addressed at either micro (organisational) or macro (governmental) policy levels, or both, since some issues have their magnitude of importance spanning across both levels. For example, while the issue of human factor i.e. awareness, skills, etc. of seafarers and shore-based staff can be ideally tackled at the organisational level i.e. shipping companies, at the same time it should also be dealt with at the governmental and inter-governmental/international level, especially when it comes to establishing a harmonised standard of seafarer training and education. This, in turn, requires the coordination and support of not only shipping companies, but also other stakeholders in the maritime industry such as flag states, class societies, etc. Clearly, this also involves the chain of safety link, which is another contemporary issue of maritime safety. The effective management of maritime safety therefore requires both quality management and even supply chain management approaches, since it relates to the involvement of all parties who are at the upstream and downstream of shipping companies which jointly make safer seas and cleaner oceans.

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