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The Role of the Master in Improving Safety Culture Onboard Ships

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ABSTRACT: As a complex socio-technical system marine transportation is open to risks. Due to the efforts of international organisations, flag and port administrations, classification societies and ship-owners the safety record has steadily improved. However, marine accidents resulting from inadequate safety culture still occur. In this paper examples of recent accidents related to different dimensions of safety culture are provided. The role of the master in achieving an enhanced safety is emphasised.

1 INTRODUCTION

The functioning of marine transportation, a large-scale socio-technical system, affects humans, societies and natural environment globally. For such complex system, with a broad range of stakeholders located worldwide, safety performance is extremely important because exhibited failure modes can have severe consequences, as demonstrated by series of tragic events (Anderson 2003). Therefore, global maritime community put substantial efforts into preventing losses of life, ships/floating structures and damages to the environment. Historically, the maritime international regulatory bodies had attempted to improve shipping safety by regulations developed or amended as a response to accidents that have occurred. By adoption of the International Safety Management Code (ISM Code) by the International Maritime Organisation a shift from prescriptive and reactive approach towards proactive approach was determined. One of the requirements of the ISM Code is to improve safety by analysing accidents.

According to literature data, more than 80% of marine accidents are attributed to human failure. To reduce the probability of human failure it is vital to understand the factors that influence safety performance. Traditionally, accidents have been viewed as a result of inadvertent (slips, lapses, fumbles and mistakes) or deliberate (routine, optimising and situational violations) unsafe acts (Reason 2001). Considering human failure as a cause instead of a symptom of a problem deeper inside a system resulted with remedial actions focusing on controlling human behaviour with introducing or enforcing existing procedures and/or implementing new technological solutions (Dekker 2014). On the contrary, current approach to prevention of accidents includes looking for organizational decisions or policies, operational conditions and technological features that created situations in which human failure could occur.

Organizational safety culture is one of the key-factors that contribute to safety (Berg 2013). A strong safety culture is a barrier against psychological or behavioural factors that interacting in unanticipated ways lead to accidents. Several leadership characteristics and associated behaviours of masters can contribute to creating and maintaining a positive

safety culture and thus impact the ship safety. This paper reviews and discusses the role of the master in improving safety culture onboard ships. The paper is organised as follows. The second section briefly reviews the maritime safety culture. The third section describes connection between master`s leadership style and safety culture onboard ship illustrated by examples of accidents. The conclusions are presented in the final section.

2 MARITIME SAFETY CULTURE

Although there is a plethora of research related to safety culture there is no uniform definition of the concept in the literature. One of the definitions is: "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" (HSC 1993). One of the issues that have been debated among researchers is usage of terms safety culture and safety climate. According to Cooper (2000) safety climate is a psychological aspect of safety culture. Safety climate, i.e. values, attitudes and norms regarding safety can be measured by questionnaires or interview based methods. Two other aspects, behavioural and situational, include activities, actions and behaviour and policies, procedures, management system and practices controls respectively.

An effective safety culture requires leadership and commitment from management, effective two-way communication, employee involvement, existence of a learning culture and existence of a just culture (HSC 1993). Therefore, creating and sustaining a positive safety culture is a complex process in all safety-critical systems such as aviation, nuclear power plants and medical system. Several characteristics of maritime transportation additionally hamper the improvement of safety culture. The maritime transportation involves a broad range of stakeholders. It is a highly globalised industry, and they are usually located in different countries, with different administrative capacity and willingness to enforce legal requirements. Due to multicultural and multinational aspects of shipping it is difficult to achieve uniform values regarding safety culture. Cost reductions and efficiency demands, seen as necessity of sustaining competitiveness, also might compromise safety. A comprehensive understanding of working and living environment onboard is vital to develop an effective safety management system. Due to diversity of roles, tasks and conditions onboard it is necessary to engage all crew members. However, it is difficult to secure the involvement of heterogeneous and continually changing personnel. In addition to the high turnover of the labour force, relatively long distance between the ship owner and the vessel perplexes the development of safety management (Lappalainen 2010). A communication between stakeholders can be ineffective due to cultural and language differences (Berg 2013). Moreover, a hierarchical organisation of shipping, with steep authority gradient, may hinder communication. Various levels of competence of crew members, different cultural influences that affect learning and shortage of time complicate organisation and delivering of training courses. A proactive approach to safety is a prerequisite for learning in an organisation. Demanding aspects of shipping such as working and living onboard 24/7, periods of high workload, harsh environment onboard can obstruct collecting relevant information and willingness to introduce changes. Developing a just culture is a challenging task due to the fact that blame culture has existed for a long time. All these issues hamper not only achieving and sustaining a safety culture, but also design, execution, and interpretation of research studies that could contribute to improvement (Bergheim et al. 2015).

3 MASTERS SHAPE SAFETY CULTURE

It is widely acknowledged that leadership is a primary antecedent of safety climate, important aspect of a safety culture (Borgersen et al. 2013). Unique aspects of shipping contribute to the relationship between master as a leader and crew as followers. The master has ultimate responsibility and authority for navigation and the safety of the ship. Additionally, a vessel represents both working and living environment where workers interact which other more often than in other occupations. Therefore it could be expected that master´s attitude towards safety and level of his involvement in safety activities will shape the safety behaviour of the crew members.

For example, a study performed among sailors (n=244) working on high-speed crafts operating in the Norwegian passenger ferry industry demonstrated that there is a positive relationship between safety climate and shipboard safety (Fenstad et al. 2016). An analysis of the questionnaire survey, which included variables "My captain appreciates that the employees take up safety issues", "I am sure to get support from my captain if I prioritize safety in all situations" and "My captain sets a good example regarding attention to safety" showed that master`s safety orientation positively influences safety performance. Similarly, study indicates that the better the perceived quality of the regulatory activities (variables "The Norwegian Maritime Authority's inspection of seafarers' working and living conditions is good" and "The Norwegian Maritime Authority does a good job of motivating the industry to take responsibility for safety themselves"), the shipboard safety is more positive. On the contrary, ship-owners efficiency demands (variables: "The ship-owner compromises on safety to cut costs", "The ship-owner compromises on safety in order to keep to the timetable", "Owing to the ship-owners' demand for efficiency, we sometimes have to violate procedures" and "Following the safety procedures is not rewarded in the shipping company where I work" were a major contributor to negative safety climate.

The leadership qualities also affect safety culture. Research in safety-critical organizations show that followers´ perceptions, attitudes and beliefs related to safety are positively influenced by authentic leadership, characterised by relational transparency, moral perspective, balanced processing and self-awareness. A study conducted in a shipping company that trades internationally examined relationship

between authentic leadership and safety climate (Borgersen et al. 2013). The questionnaires were administrated to 499 all-male, Filipino crew and officers working on the 23 general cargo vessels. Respondents were asked to rate the current captain`s qualities regarding relational transparency (five items, e.g., "My captain admits mistakes when they are made"), moral perspective (four items, e.g., "My captain demonstrates beliefs that are consistent with action"), balanced processing (three items, e.g., "My captain listens carefully to different points of view before coming to conclusions"), and self-awareness (four items, e.g., "My captain shows that he or she understands how specific actions impact others"). The results indicated that authentic leadership was positively related to crew perceptions of the level of safety climate. However, according to Berg (2013) some current masters do not possess some of the several desirable characteristics: clear two-way communication, "tough empathy", openness to criticism, empathy towards different cultures, ability to create motivation and a sense of community, knowing the crew's limitations, being a team player. Therefore it could be expected that such leaders will negatively affect safety culture and consequently safety.

One example of the accident where poor safety culture played a role is grounding of a UK registered general cargo vessel, which resulted in sea pollution and a loss of ship (Marine Accident Investigation Branch 2015). In February 2015, *Lysblink Seaways* grounded when its sole watchkeeper, chief officer, lost situational awareness due to the effects of alcohol consumption. The investigation revealed a number of safety failures that could be traced back to organizational failures. The passage plan had not been prepared and implemented in a professional and precautionary manner and it had not been appropriately entered into the Electronic Chart System, used as principal means of navigation. Namely, some available safety features had not been set up, alarm for cross track error had been inappropriately set up and the audio alarm had been silenced. Also, the bridge navigational watch alarm system had not been switched on, contrary to the requirements of the Safety Management System (SMS). Intentional crew non-compliance regarding policies and procedures was normal practice onboard *Lysblink Seaways.* Despite the owner's zero alcohol policy, significant alcohol consumption by the crew, obvious from the frequent replenishment of the bonded store, had gone unchallenged.

The Bahamas registered passenger vessel *Hamburg* grounded in the Sound of Mull, Scotland in May 2015 because the bridge team did not recognise that she was approaching the buoy from an unsafe direction (Marine Accident Investigation Branch 2016a). Primary means of navigation were paper charts and the ship was equipped with a fully functional ECDIS, but both means of navigation were used inappropriately for route planning and monitoring and positioning. Namely, ECDIS safety features and tools were not set up or used although the officer of the watch (OOW) was relying on it and the passage plan on the paper chart lacked detail. Furthermore, fixing and chart work, conducted by the cadet, were substandard but remained unnoticed by OOW. Engrossment with the traffic situation by master and OOW, insufficient number of personnel on the bridge to properly monitor the vessel's navigation, and poor communication between present bridge team members with unclear specific roles resulted in poor situational awareness. Bridge resource management onboard *Hamburg* was ineffective due to shortfalls in additional important elements: shared mental model and challenge and response. For example, "Seven minutes before the grounding, both the OOW and the cadet plotted the vessel's position on the chart. Despite both plotted positions being incorrect, the cadet's fix did at least indicate that the vessel was running into danger. Unfortunately he did not feel empowered to challenge the OOW and chose to silently erase his own position, leaving the OOW's incorrect position on the chart"(Marine Accident Investigation Branch 2016a). Furthermore, a number of master´s decisions that were not in accordance with the company's SMS remained unchallenged by officers.

A common factor appearing in these two accidents was intentional non-compliance with the company's SMS. In both cases masters were directly responsible for an inadequateness of voyage planning and ignorance of bridge watchkeeping best practice. Moreover, they did not apply tools of effective bridge team management such as briefing with the bridge team and encouraging open communication which enable team members to raise any concern anytime. Therefore nobody challenged voyage planning or reported alcohol intoxication. Due to poor leadership and management by the masters, available knowledge and resources were not used properly. Because the masters lead by example, it is vital that they don`t adopt "Do as I say, not as I do" attitude. The importance of acting consistently and applying safety standards should be underlined during education and training.

The company´s management could contribute to the development of situations in which the master makes wrong decisions or behave against his/her knowledge, experience and feelings due to bad communication between them, disagreeable environment or pressure.

Capsize and sinking of the Cyprus registered cement carrier *Cemfjord* that resulted in loss of 8 lives occurred in January 2015 in the Pentland Firth, Scotland (Marine Accident Investigation Branch 2016b). *Cemfjord* capsized in extraordinarily violent sea conditions created by gale force winds opposing a strong ebb tidal stream. Because such conditions are commonly experienced within the Pentland Firth, they were predictable and passage through the Pentland Firth should not have been attempted. However, the master decided to proceed through the Pentland Firth. The investigation concluded that several factors could have contributed to his decision: poor passage planning, inaccurate calculations, an underestimation of the environmental conditions, over-confidence in the vessel's handling characteristics and his recent experience of a dangerous cargo shift while attempting to abort an approach to the Firth in heavy seas. Fatigue or tiredness were also identified as possible factors influencing poor decision making as the master and the chief officer worked a 6 hours on /6 hours off

watchkeeping routine in the 72-hour period prior to the accident. Additionally, industry and commercial pressures, evident by challenging charterer's planning schedule, managing company´s inclination to repeatedly request SOLAS exemptions and put *Cemfjord* to sea with substantial safety deficiencies and Flag State administration`s non-informed decisions to issue SOLAS exemptions, in combination with his personal determination to succeed probably affected his decision-making process. The master had a reputation as a hard-working, confident, experienced and competent person. On the other hand, apart from the master, the crew members had no previous experience of cement carrying vessels and six of them were serving onboard *Cemfjord* on their first contract, thus lacking experience and competence to be fully aware of the situation and/or challenge his decision. The investigation also revealed that another dimension of safety culture, learning culture, was deficient: advices on passage planning, weather avoidance, cargo management and stability arising from analysis of previous incident onboard *Cemfjord* in October 2014 were issued only in January 2015.

In July 2014 the roll-on roll-off passenger ferry *St Helen* suffered a mezzanine deck collapse when its inboard steel wire ramping rope suddenly parted due to excessive mechanical wear, corrosion and fatigue that resulted from lack of service lubrication, long-standing maintenance failure (Marine Accident Investigation Branch 2016c). The investigation found out that due to manager`s gradually policy changes maintenance management had deteriorated. The lack of proper maintenance of the mezzanine decks had been subject of SMS non-conformance report raised by master 2 years earlier. However, proposed corrective action was not implemented because it would have required allocation of resources. Internal SMS audits and external ISM Code audits identified the maintenance shortcomings, but appropriate actions by inspection body and regulator were not taken, thus enabling ignoring the problem by the management team. Furthermore, an observable deteriorated condition of mezzanine deck was not identified during daily and monthly crew inspections (on the day of the accident an operational status of mezzanine deck was categorised as 'Operational') and six-monthly thorough examinations by appointed surveyor who also should have bring shortcomings to the attention of the regulator.

Attitude towards safety could be gradually changed due to poor relationships between the master and company`s management. If the masters feel forced to disregard safety procedures to comply with company`s requests due to time and resource constraints or to be perceived as efficient they can make wrong decisions. Because the master has to assess and prioritize different and often competing demands in order to organise work and complete tasks it is necessary that he is able to communicate with management effectively to present and clarify problems due to efficiency-thoroughness trade off.

Poor communication could play a role in poor safety culture. If the masters feel ignored and not listened to by the company´s management when they demonstrate concern regarding safety issues gradually they can develop a negative attitude and eventually they will not provide important information or even use their knowledge. Concurrently, they might stop asking for information from the crew members. Such situation, where attention to the safety issues diminishes, may lead to accidents. Managers` participating in a communication skills training courses can help improving safety culture.

4 CONCLUSIONS

In the maritime transport seafarers are faced with notable hazards. Therefore it is important to address varies issues within maritime safety, one of them being safety culture. Studies show that despite substantial efforts at all levels there are still barriers and challenges to a positive maritime safety culture.

The leadership characteristics and associated behaviours of the masters influence safety culture onboard ships. Therefore these issues should be addressed and emphasised during Bridge Resource Management courses to enhance these important non-technical skills that otherwise can contribute to accidents.

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