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Local management and its impact on safety culture and safety within Norwegian shipping

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ABSTRACT: This paper addresses safety culture on tankers and bulk carriers and which factors affect the safety culture onboard vessels. The empirical setting for the study is the Norwegian shipping industry. Safety management is a challenging issue within shipping for several reasons. First of all, life and work onboard a vessel is a 24 hour activity and the crew has few possibilities of interacting with the surrounding society. Secondly the geographical distance between the on-shore organization and the vessel may affect both the quality of those systems and plans developed on shore and their implementation on the vessels. The ship management is thus identified as a key factor to a sound safety culture along with the on shore crewing strategy.

1 INTRODUCTION

In this paper we will discuss the safety culture within the Norwegian shipping industry with tankers and bulk carriers, and identify which organizational factors may affect this particular safety culture.

In Norway, shipping has for several centuries been the principal trade, and Norway as a maritime nation has roots way back in the Viking age. Today Norway is one of the five largest shipping nations in the world, after Greece, Japan, Germany and China. In the third quarter of 2007 the Norwegian foreign-going fleet comprised 1,795 ships, the highest number ever in Norwegian history, of which about 49 percent are flying under the Norwegian flag (Nærings- og handelsdepartementet 2007). The remaining 51 percent may register in any of the world's more than 150 flag states. Norwegian shipping companies employ some 57,000 seamen from more than 60 different nationalities and of which about 30 percent are Norwegian Nationals (Norwegian Shipowners' Association). The crew may be recruited and managed by the shipping company itself, or by one of the world's many professional crew hiring companies. Within the Norwegian fleet, most sailors are contract-employees working on different vessels during each enrolment, which results in continually shifting working groups. The situation today is a result of a structural change dating back to the 60s and 70s when technical development allowed for bigger vessels with more automation and monitoring, along with the need for reorganization to improve efficiency. This resulted in a cut in the crewing level. Later in the 80s a global recession caused further structural changes; flagging-out, use of external crewing agencies and signing on crew from developing countries and lower wages (Bakka, Sjøfartsdirektoratet 2004). However, the shipping industry is today facing new manning related challenges as there is a global shortage of manpower, this is due to three main challenges: First, it is less attractive nowadays to work in the shipping industry. Second, the recruitment for ship crews has been slow. This has resulted in the third situation where the liquefied natural gas (LNG) shipping sector is drawing crew from the tanker industry, and the tanker industry in turn is drawing people from the dry bulk sector.

In 1894 the British Board of trade carried out a study which showed that seafaring was one of the world's most dangerous occupations, and it still is (Li, Shiping 2002). Regulations in order to reduce the risk at sea were introduced about 150 years ago. These regulations initially encompassed measures to rescue shipwrecked sailors, and further requirements for life-saving equipment, seaworthiness and human working conditions. Traditionally the safety work has focused on technical regulations and solutions even though experience and accident statistics indicate that most of the accidents at sea somehow were related to human performance (Bakka, Sjøfartsdirektoratet 2004). However, a few very serious accidents at seathat

occurred in the late 80's resulted in a change towards how safety was organised, and more focus was given to the human barriers and how the seafarers' working conditions were affected by organisational and managerial factors—both on shore and at sea. Along with this the term safety culture started to gain a foothold also within shipping. The idea of safety culture within shipping was officially introduced on the 4th November 1993 by the adoption of a new resolution, the present SOLAS Convention 1974 Chapter IX, entitled "Management for the Safe Operation of Ships and for Pollution Prevention", also known as the International Safety Management Code (ISM Code) (Le Meur 2003).

Hence, the main purpose of this paper is to elaborate the following questions:

– What characterises safety culture on tankers and bulk carriers?
– Which factors affect the safety culture on board vessels?

With reference to shipping, this article will more concretely analyse crewing strategies such as outsourcing of crewing management and the extended use of contract employment instead of permanent employment. Our hypothesis is that these conditions may contribute to an unfavourable and error-inducing working environment, i.e. poor communication between shore management and the ship management and the remaining crew, unworkable procedures, lack of loyalty to the organisation, dysfunctional interaction, fear of reprisals, which again counteract the development of a safety culture.

2 APPROACH TOWARDS SAFETY CULTURE

There seems to be no clear consensus concerning the ontological, epistemological, and methodological questions related to the topic of safety culture. The main differences seem to be

1. Definition of the scope of safety culture and the relationship between culture and climate.
2. Which methods are regarded as most suitable for measurement.
3. The relationship to other organisational (safety-related) aspects (Cooper 2000, Guldenmund 2000, Neal, Griffin & Hart 2000, Peterson, Ashkanasy & Wilderom 2000, Sorensen 2002, Yule 2003).

However, it is not the scope of this paper to problematise the concept of safety culture. As a point of departure we will apply Schein's definition of organisational culture:

> "*A pattern of shared basic assumptions that the group learned as it solved its problems of external adoption and internal integration, that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think and feel in relation to those problems"*(Schein 2004).

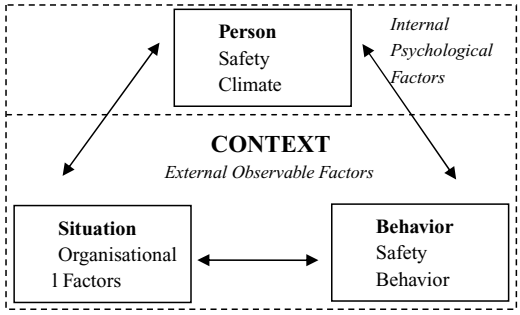

Figure 1. Reciprocal safety culture model (adopted from Cooper, 2000).

Further we have decided to use a methodological framework presented by Cooper (2000), and the application of this framework will be discussed below. Cooper (2000) introduces a reciprocal model of safety culture that allows the multi-faceted and holistic nature of the concept to be fully examined by using a triangular methodology approach, depicted in Figure 1.

Cooper's (2000) model contains three elements:

1. The subjective internal psychological factors i.e. attitude and perceptions.
2. Observable on-going safety related behaviour.
3. The organisational situational features.

According to Cooper (2000) these elements reflect those accident causation relationships found by a number of researchers, such as John Adams, Herbert William Heinrich and James Reason. The investigation of several serious shipping accidents such as Herold Free Enterprize (Department of Transport 1987), Exxon Valdes (National Transportation Safety Board 1990) and Scandinavian Star (Justis- og politidepartementet 1991) is also congruent with their findings. The Herold Free Enterprize accident was partly caused by members of the crew not following best practice, but was also due to managerial pressure from the organization's upper level to sail as early as possible, along with other mistakes made by the on-shore management. Two years later when the US tanker "Exxon Valdes" grounded, the accident investigation determined several probable causes linked to human errors induced by managerial faults in the upper levels of the organisation. At the vessel, the third mate failed to properly manoeuvre the vessel, possibly due to fatigue and excessive workload. The master failed

to provide a proper navigation watch, possibly due to impairment from alcohol. At the onshore part of the organisation, the shipping company fails to supervise the master and provide a rested and sufficient crew for the "Exxon Valdez". In addition to this effective pilot and escort services were lacking. The following year, in 1990, there was a fire on the passenger liner "Scandinavian Star". In the aftermath of this accident the investigation brought into focus organisational and managerial faults with regard to a lack of competence and training, but also weaknesses in the wider social-technical system. These weaknesses consisted of ownership separated from management, unsatisfactory control routines by the flag state and, in general, an overall maritime system with a lack of transparency. Further, Cooper's (2000) three elements will be outlined more in detail, starting with safety related behaviour.

2.1 *The importance of safety related behaviour*

Herbert William Heinrich work (published in 1931 Industrial Accident Prevention) is the basis for the theory of Behaviour-Based Safety (BBS), which holds that as many as 80–90 percent of all workplace accidents are caused by human error and unsafe acts (Tinmannsvik, 2008). Schein's (2004) definition of culture does not clearly address observable behaviour patterns, but behaviour is regarded to be partly determined by a person's perceptions, feelings and thoughts. However, Schein (2004) regards behavioural patterns as a manifestation of a culture existing at a higher level in the organisation, and not as culture itself. When it comes to BBS, the current theories posit that safety culture, and a reduction of accidents may be achieved through continuous attention to three domains:

1. Environmental factors such as equipment, tools, physical layout procedures, standards, and temperature.
2. Person factors such as people's attitudes, beliefs, and personalities.
3. Behaviour factors, such as safe and at-risk work practices, referred to as the Safety Triad (Geller 2001).

When adopting this approach humans are seen as a cause of accidents, whereupon interventions to enhance safety are aimed at changing attitude or behavior (i.e. poster campaigns, training, procedures and so on, or changing the technology they operate). This orientation towards risk and safety management has traditionally been and still is adopted from the majority of the shipping companies. The BBS-approach has been criticised for placing too much responsibility on the people operating the systems, assuming that they are responsible for the outcome of their actions (Dekker & Dekker 2006). An alternative view is to recognise human error not as a cause of accidents, but as a consequence or symptom of organisational trouble deeper within the organisation, arising from strategic or other top level decisions. This includes resource allocation, crewing strategy and contracting (Dekker, Dekker 2006, Reason 2001, Reason, Hobbs 2003). An organisation is a complex system balancing different, and often also conflicting, goals towards safety and production in an aggressive and competitive environment (Rasmussen 1997), a situation that to a large extent is current within shipping. The BBS approach towards safety often implies that more automation and tighter procedures should be added in order to control the human actions. However, the result may be that more complexity is added to the system. This in combination with the organisation's struggle to survive in the competitive environment, leads to the system becoming even more prone to accidents (Perrow 1999) (Dekker & Dekker 2006, Reason 2001, Reason & Hobbs 2003). However, the concept of focusing on the human side of safety is not wrong. After all, the technology and production systems are operated, maintained and managed by humans, and as the final barrier towards accidents and incidents they are most of the time directly involved. The proponents of the BBS approach argue that behaviour control and modification may bring a shift in an organisation's safety culture, also at the upper level, but this is most likely if the focus is not exclusively addressing observed deficiencies at the organisation's lower levels (DeJoy 2005). DeJoy (2005) calls attention to three apparent weaknesses related to the BBS approach:

1. By focusing on human error it can lead to victim-blaming.
2. It minimises the effect of the organisational environment in which a person acts.
3. Focusing on immediate causes hinders unveiling the basic causes, which often reside in the organisational environment.

Due to this, we will also include the organisational environment in the safety culture concept, as proposed by Cooper (2000).

2.2 *The relation to organisational factors*

When human error is not seen only as a cause of accidents, but as a symptom and consequence of problems deeper inside the organisation, or what Reason (2001, 2003) refers to as latent organisational factors, emphasis is placed on weaknesses in strategic decisions made at the top level in the organisation. These strategic decisions may reflect an underlying assumption about the best way to adapt to external factors and to achieve internal integration, and if they are common for most shipping companies an organisational culture may also

be revealed (Schein 2004). Schein (2004) also stresses the importance of leadership. The top management influences the culture as only they have the possibility of creating groups and organisations through their strategic decisions. And when a group is formed, they set the criteria for leadership and how the organisation will support and follow up their leaders. The leaders, at all levels on shore and at the vessel, are also key figures in the development of a safety culture. It is their task to detect the functional and dysfunctional elements of the existing culture, and to channel this to the upper levels of the organisation. In return, the upper levels of the organisation should give their leaders the support necessary in order to develop the desired culture.

3 METHODOLOGICAL IMPLICATIONS

Cooper's (2000) framework put forward the importance of methodological triangulation in order to grasp all facets of the cultural concept. The internal psychological factors are most often assessed via safety climate questionnaires. Our approach is to start with such a survey in order to gain insight into the seafarer's perceptions and attitudes related to safety, along with self-reported work behaviour related to risk taking, rule violation and accident reporting. The survey also includes questions related to crewing strategy, which opens up the possibility of assessing the relationship between the organisational situation and actual behaviour. The survey results are used to determine which organisational factors are most likely affect the safety culture, and to define research areas for a further qualitative study.

3.1 *Development of questionnaire items*

The survey instrument was developed by Studio Apertura in collaboration with DNV and SINTEF. The development was based on an evaluation of seven already existing questionnaires in comparison with various theoretical views of the safety culture concept (Studio Apertura 2004). Minor adjustments were made after a pilot for use within the tanker and bulk carrier sector. This resulted in a questionnaire with constructs and accompanying number of items as presented in table 1. All items were measured on a 5 point likert scale ranging from *strongly disagree* to *strongly agree,* or *very seldom/never* to *very often/always.*

3.2 *Questionnaire sample*

A total of 1574 questionnaires were distributed to 83 randomly selected Norwegian controlled tankers and bulk carriers. All vessels were flying a flag on the Paris MOU white or grey list. 76 vessels returned a total of 1262 completed forms, which gives an individual response rate of 80% and a vessel response rate of 91.5%. The survey was carried out in 2006.

Table 1. Questionnaire constructs and number of items.

Construct	Number of items
Top management's safety priorities	3
Local management	7
Procedures & guidelines	7
Interaction	18
Work situation	8
Competence	5
Responsibility & sanctions	7
Working environment	9
Reporting practices	10

3.3 *Statistical analysis*

The Statistical Package for the Social Sciences (SPSS) v.15.0 was used to perform all of the analysis, which included descriptive statistics, exploratory factor analysis (EFA), confirmatory factor analysis (CFA) and bivariate correlation analysis.

With regard to the EFA, the principal component analysis with Varimax rotation was carried out. The factors were extracted based on the three following analytical criteria: (1) Pairwise deletion, (2) Eigen value more than 1, and (3) factor loading more than 0.50. Of the extracted factors, all factors with 2 or fewer items were removed, based on the notion that a factor should be comprised of at least three items to be robust (Pett, Lackey & Sullivan 2003). A confirmatory factor analysis (CFA), using a one-factor solution for each construct, has also been performed. The advantage of the CFA is that it allows for more precision in evaluating the measurement model (Hinkin 1995), and the results were compared with the EFA for providing validity evidence based on the hypothesis that a valid instrument should produce similar results.

Each factor was then evaluated using the Kaiser-Meyerto-Olkin (KMO) parameter, and only factors with KMO value at 0.60 or above were included in the further analysis (Hair 1998).

This was followed by a scale-reliability test. For that purpose, the Cronbach's Alpha coefficient of internal consistency was calculated, and evaluated along with inter-item statistics. Cronbach's Alpha is a measure of scale reliability concerned with the proportion of a scale's total variance that is attributable to a common source, presumed to be the true score of the latent construct being measured. In our case that will be the safety culture. Usually a value above 0.7 is considered acceptable, although some advocate an alpha level of 0.8 or better (Netemeyer, Sharma & Bearden 2003). As the alpha value is a function of, inter alia, the average inter-item correlation; the inter-item

correlation and item-total statistics have also been evaluated. Rules of thumb suggest that the item-total correlation should exceed .50, and the inter-item correlation should exceed .30 (Hair 1998), but it should *not* exceed .80. An inter-item correlation exceeding .80 suggests that items are duplicates of one another (Pett, Lackey & Sullivan 2003). Then the remaining items went through a last CFA, a five-factor solution, in order to provide each factor's explained variance.

Finally, correlation analysis has been carried out in order to evaluate the construct validity, which is viewed as the extent to which an operational measure truly reflects the underlying safety culture concept, and if they operate in a consistent manner.

Based on this analytical process, five factors (1) interaction, (2) reporting practices, (3) competence, (4) local management, and (5) work situation were found to be reliable and valid. The aforementioned factors are presented further in detail in the next section.

4 RESULTS

4.1 *Results from descriptive analysis*

Regarding demographics, 21 different nationalities are represented. The Filipino contingent forms the largest group constituting 63% of the sample, followed by the Norwegian group with almost 11%, and the Polish which represents 9%. The last major group was the Russians with 6%. The other remaining 17 nationalities were represented in a range from 3% to 1%.

There is also great variation with regard to employment conditions. All in all, 12% of the sample consists of permanent employees, of whom 80% are Norwegian and 16% from the European Union. 91% of the Norwegians are permanent employee. The remaining 9% are apprentices, substitutes or newly employed on probation. Only 3% of the non Norwegian sailors are permanent employees. With regard to the Filipino seafarers, the largest nationality, 99.6% are contract employees, most on 9 month contracts (62%), followed by 6 month contracts (27%). The extended use of contract employment is reflected in their experience. All in all, 85% had three years or more experience within shipping in general. However, 69% of the sample had worked on the current vessel for only 1 year or less.

The employment terms were in general different for the captains. The captains normally do not have sailing periods that exceed 6 months. The most typical sailing period for the captains is 3 months or less.

4.2 *Results from factor analyses*

From the 9 theoretical safety culture constructs, a five factor solution was derived, (1) interaction, (2) reporting practices, (3) competence, (4) local management, and (5) work situation. With regard to the "local management", "competence" and "work situation" factor both EFA and CFA result in final solutions consisting of the same items, but with minor differences in factor loading. The CFA included three more items in the "interaction" factor than the EFA, and the final factor, "reporting practices" resulted from only the CFA.

Four of the constructs did not pass the reliability tests. The first, "top management's safety priorities", was excluded due to low representative reliability across subpopulations. This construct also consisted of too few items. The remaining three constructs, "procedures and guidelines", "responsibility and sanctions" and "working environment" were excluded due to low validity, mostly resulting from poor theoretical relationship within the items of each construct.

For the further analysis the results from the CFA are used. The 5 factors in question are presented in Table 2 along with number of items and explained variance.

Each factors Cronbach's alpha value and inter item statistics is presented in table 3.

The alpha values range from .808 to .878, and the internal item statistics are all within the recommended levels. The five factors are therefore considered to be a reliable and valid reflection of the underlying safety culture concept.

Further, table 4 presents the correlation coefficients between the factors, or safety culture dimensions. All correlations are significant at the 0.01 level (2-tailed)

Table 2. Final factors, number of items and explained variance.

Factor	Number of items	Explained variance
Interaction	8	35.63%
Reporting practices	5	9.77%
Competence	4	7.12%
Local management	3	5.96%
Work situation	3	5.08%

Table 3. Final factors, Cronbach's alpha and inter-item statistics.

Factor	Alpha	Inter-item range	Item-total range
Interaction	.878	.360–.606	.520–.724
Reporting practices	.808	.335–.761	.491–.668
Competence	.839	.497–682	.628–.712
Local Management	.866	.692–.716	.724–774
Work situation	.817	.512–.749	.554–.739

Table 4. Factor correlation matrix. Pearson's *r*.

	F1	F2	F3	F4	F5
F1: Interaction	1				
F2: Reporting practices	.352	1			
F3: Competence	.639	.323	1		
F4: Local management	.474	.362	.367	1	
F5: Work situation	.494	.322	.441	.444	1

The five safety culture dimensions correlate in a positive direction, which is consistent with the theoretical concept, and they are therefore considered to be a valid reflection of the underlying safety culture construct.

5 DISCUSSION

All three constructs have a good alpha level, and as the alpha levels are concerned with the variance that is common among the items, these constructs also reflect the areas where it is possible to speak about safety culture. With reference to Cooper's framework towards safety culture, we will further discuss how the organisation's factors such as crewing strategy, witch includes employment terms, rotations system and policy towards the on board shipping management, may affect the on board safety culture and climate represented by the identified dimensions. The organisation's structural factors are all to be found within Cooper's element of *situation*, while the identified safety culture dimensions are to be found within the elements of *person* and *behaviour*.

Interaction is the dimension accounting for the largest proportion of the total explained variance, with 35.63%, meaning that with regard to safety culture most of the variance in the original data is explained by this dimension. When taking into account how distinctive a ship is as a work place, this is no surprise. A ship may be characterised as a total institution since both work and leisure time happen at the same place and with few possibilities to interact with the surrounding world (Goffman 1968). In such a setting the crew members are socialised into a common culture and rules of interaction. Schein (2004) refers to this as internal integration. The interaction climate is characterised by lack of stability within the crew due to different terms of employment. First of all, permanent employment seems to be reserved for the Norwegian sailors. Sailors of other nationalities are almost all contract employees. In addition, the length of contract varies and all crew members have different dates for signing on and signing off. Schein (2004) points out that lack of stability may be a threat to the possibility of developing a culture: "*(. . .) there must be a history of shared experience, which in turn implies some stability of membership in the group.*" Even if the crew as a group is in constant change, they all have common history as seafarers. So even if lack of stability within the group indicates that a common culture should not develop on the ship, a common culture of how to act and interact may have developed amongst the seafarers, and when a new crewmember is signed on a new vessel, he knows what is expected from him. However, the question is if such a culture is a safe culture? Reason (2001, 2003) emphasize that to reach a safe culture, the organisation should strive for an informed culture where those who manage and operate the system, both on board and on shore, have current knowledge about the factors that determine the safety of the system as a whole, which again depends on that the crew on board are prepared to report their errors and near misses, and the *reporting practice* is one of the dimensions deriving from the analyses, explaining 9.77% of the variance. This dimension also includes feedback on reported events. In order to attain good reporting practices, the organisation should strive to create an atmosphere of openness, trust and loyalty. Integrating into the group is also a survival mechanism, and every crewmember will most likely make an effort to integrate. If not, he would most likely have a hard time during his contract period with no possibility to leave the vessel and the other crewmembers. However, to compromise oneself and be open about one's own mistakes is not always an easy task, especially not in an unknown working environment. Something that may reinforce the crewmembers' fear of reporting their own mistakes is the ongoing practice that each crew member is evaluated by their senior officer/captain, and based on this report get recommended or not recommended for re-hire. Interviews have revealed that this evaluation practice differs. Some practise an open evaluation where all parts are involved, with focus on how to improve the evaluated crew's shortcomings, and where the shore organisation seeks to ensure that the evaluation is conducted in as objective a way as possible. At other vessels, the evaluation is closed for insight by the evaluated and may also be highly subjective. Some of the respondents have expressed that by reporting, their next contract may be at stake, or they may meet with other negative consequences. So, lack of stability and constantly changing working groups may sacrifice a trusting and open environment, and thus also the sailors' commitment to safety.

A crew committed to safety is essential, but not enough. Lack of competence may cause a situation where the crew do not identify potential dangerous situations, or create them. *Competence*, which accounts

for 7.12% of the total variance, is in this setting comprised of activities performed on board the vessel, and is all under the control of the captain, training, drills and familiarisation when signing on. Also, the competence dimension does correlate strongly with the interaction dimension with a correlation coefficient at .639. This indicates that a situation when the sailors are feeling confident with the nature of their task also results in a better interaction climate where conflicts are more likely to be absent. As with the interaction climate, competence will also be affected by the crew stability. A crew member that is constantly signing on new vessels and that has to interact with new crew members and leaders, uses more effort adapting to the new situation, working out how things are done at that specific vessel, the informal structure onboard and so on. When more stability is provided, more effort may be placed on upgrading their competence, and the competence will be kept within the vessel and organisation. Both the training activities and crewing strategy may be controlled by the ship management, and thus these safety culture dimensions are also, to a certain degree, controllable.

The dimension of *work situation* consists of proactive activities as Safe Job Analysis (SJA), safety evaluations and the possibility they have to prioritize safety in their daily work. So how may the organisation affect this? For one, they may supply sufficient crew. Today many vessels are sailing with a smaller crew at the same time as new standards and resolutions like the ISM-code increase the amount of paperwork to be done. Both own observations and interviews reveal that inter alia check lists and SJA are done in a mechanical manner. This may originate from various reasons such as an overload of work, no understanding of the importance of those activities, lack of feedback or improper planning by the local management.

The *local management* dimension, accounts for 5.96% of the explained variance, and the direct effect of local management is relatively small. However, local management is considered to have an indirect effect on the safety climate through the managers, or senior officers, affect on the interaction climate, competence and training activities, reporting practices and the work situation. Again we wish to focus on the importance of stability within the work group. Most captains have a sailing period of 3 months or less, while most of the non Norwegian ratings have a sailing period of 9 months. Most senior officers also have a shorter sailing period then an ordinary rating. Then a rating possibly has to deal with several different leaders during his stay. And each captain and department manager's leadership style may vary, and are sometimes even destructive, as shown by following comment from a Pilipino engineer. "*The only problem on board is the treatment of senior officers to the lowest rank. (. . .) There are some senior officers who are always very insulting towards jr. officers and rating."* Schein (2004) regards the leader as an important key figure in the cultural development. At sea the captain holds a key role. The captain is the one in command at every vessel, and according to Schein (2004) the captain's orientation will affect the working climate, which precedes the existence of a culture. So, in a situation where lack of crew stability impedes the development of a safety culture, the role of the captain is even more vital. Also, it is important to take into account that the leadership style that is practised on board not only affect the sphere of work, but also time off. However the Captains themselves may not be aware of their own importance, or how they affect safety. Most Captains, or other department leaders for that matter, do not have managerial training or education. When adopting a cultural view towards safety, as in this research, in as opposed to a behaviour based view, more emphasis is placed on organisational factors. Decisions regarding crewing strategy, employment terms and managerial development programmes are all strategic decisions made on shore. With reference to Schein's culture definition, we will argue that the safety culture originates within the organisation on shore. Based on Scheins' definitions of culture there ought to exist a pattern of shared basic assumptions that may solve the problems the shipping industry is facing. Our case however has revealed an offshore practise characterised by extended use of contract employment, lack of stable working conditions on board the vessels, and little or no use of managerial training and development. This practice does not promote a good safety culture and is considered to has a negative effect on the overall safety level.

6 CONCLUSIONS

The aim of this paper was to analyse the characteristics of the safety culture on Norwegian tankers and bulk carriers, and identify what organisational factors may affect the safety culture on board vessels. Statistical analysis identified five safety related dimensions on board the vessels: interaction climate, reporting practices, competence, local management and work situation. Within shipping the interaction climate is characterised by unstable working conditions. Under such conditions it is difficult to achieve and maintain a stable crew, and proper management becomes even more important. Also the Captain has a vital role, as he has the possibility to directly affect all the other safety related aspects through his own leadership style. The Captains, officers and ratings normally have different employment terms and shift terms. This may jeopardise the development of a sound safety culture as the crew has a poor possibility of developing common behaviour practices and a mutual understanding

of how to do things right. As neither the Captains nor the officers normally have any managerial training, their leadership styles often affect the safety in a negative direction. The on board situation is to a large extend considered to be created by the on-shore crewing strategy and management policy.

In order to develop a sound safety culture on-board, the shipping companies should go in new directions and pursue a crewing strategy which offers more favourable employment terms and fixed shifts for all nationalities, and strive for a more stable workforce. Another measure would be to accept the Captain's and department managers' roles as leaders, and offer managerial development. A final measure will be to develop a policy and system that ensure proper onboard management.

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