An empirical investigation of the work environment on board industrial- and cruise ships and the associations with safety

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Master thesis in social- and community psychology

Spring 2011

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Preface

This master thesis, as many things, did not always go as planned. Starting out with a timetable and a plan is a good thing. Just make sure to account for unforeseen problems. Tiny surprises can topple plans and small errors can become time consuming mind benders. Many such surprises arose during this thesis, and made some days grow dark. But in the end all these problems were solved and much has been learnt as a result, and I am happy to present the finished thesis.

This thesis consists of an introductory article and two empirical research articles. The introductory article presents the general theoretical background for this study, and also an overall presentation and discussion of the two following research articles. The introductory article therefore contains some re-iteration as it sums up the two research articles.

At the completion of this master thesis, there are several people who need to be thanked:

- All respondents who participated in the study
- The two shipping companies that participated in this study
- Det Norske Veritas for being a part of this study, sharing their expertise and the financial support for data-collection travel
- Anne May and Magnhild for their support
- Kyrre for his help in creating the questionnaire
- Tonje for distractions and proof reading the thesis
- Fartein and Wendy for help
- Marta for being a great collaborator
- Torbjørn Rundmo for being a dedicated supervisor

I am glad past-Øyvind managed to complete this thesis, and I hope future Øyvind will put the knowledge and skills past-Øyvind has acquired, to good use.

Øyvind Teige Heidenstrøm

April 2011

CONTENT

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Introduction article:

An empirical investigation of the work environment on board industrial- and cruise ships and the associations with safety

Abstract

The overall aim of this study was to examine the work environment and the associations with safety, and see the relations with occupational accidents and undesired events on board industrial and cruise ships. 215 seafarers participated in this quantitative survey study, with a response rate of 35%. When conducting the hierarchical block regression analysis separately on superiors/officers and subordinates/ratings, the work environment emerged as a predictor for safety status (compliance, attitudes and commitment). Several significant differences in the beta value between the two groups were also found. When testing the differences in the safety status on ships with high and low number of undesired events and accidents, separately on the two groups, significant differences emerged only for superiors and officers; Significant differences were found in compliance when testing high and low number of undesired events, and for high and low number of accidents safety status and compliance emerged significant. Without assuming causation, the work environment appears to be a possible alternate and indirect way of improving on the safety status on board ships. However, safety status and the relations with undesired events and accidents require further investigation before a more accurate conclusion can be made.

Introduction

The shipping industry faces many challenges, amongst them the increasing regulations, environmental demands, increased responsibility, fluctuations and higher demands in economy. Much time and resources has long been directed into the research and improvements of materials, regulations and efficiency of ships in order to meet these demands. This focus can overlook the human factors, and the people can be neglected. And with the shipping industry possibly being the most international business in the world, more challenges arise, like communication difficulties, non-uniform training and cultural differences like religion, attitudes, standards, social hierarchy and interaction. Shipping is one of the more dangerous occupations, and trawler fishing and merchant seafarers in the UK rate as the top two most hazardous occupations. Compared to the average British workers, British fishermen were 52.4 times- and British merchant seafarers were 26.2 times more likely to have a fatal accident at work, like drowning, injury, and asphyxiation from poisonous fumes (Roberts, 2002).

People design, operate, maintain, manage and defend hazardous technologies. That is why the human factor, not surprisingly, plays the major part in both causing and preventing organizational accidents. Surveys show that about 75-96% of marine casualties are fully or partially caused by human and organizational errors (Rothblum, 2000). Studies also show that human and organizational factors contribute, in one way or another, to: 75% of fires and explosions, 75% of allisions, 89-96% of collisions, 79% of towing vessel groundings, and 84-88% of tanker accidents (Rothblum, 2000). Accidents are not usually caused by a single failure of mistake but rather by the convergence of a whole chain of errors where each step could have lead to the prevention of the accident. And the initial step is often induced by technical failure, human and organizational factors, or a combination of both (Ren, Jenkinson, Wang, Xu, & Yang, 2008). This shows the importance of human- and organizational factors when trying to create a safer work environment, and has been the subject of much research in the last decade.

Accident within the offshore- and shipping industry can cause severe injury or death to personnel, large economical expenditures due to damaged or lost equipment and cargo, and severe environmental damage. This potential tragic injury and loss of human lives, and also the cost of such accidents to companies and the loss of a company's reputation make the

industry invest large sums on improving safety. It then becomes important that the initiatives taken within the companies have the desired effect.

Counter-effective safety initiatives

The offshore industry constantly give regular safety messages, safety training and indications of its safety commitment to the employees, but despite much research and improvement in safety performance, companies within the oil and gas sector still have problems motivating and sustaining a good safety performance amongst employees (Mearns & Reader, 2008). Mearns and Reader argue that this is because 'safety' in itself, is non-motivating. A good safety performance usually give no rewards or feedback, however a poor safety performance can results in accidents and damages to materials or personnel. These accidents can help keep employees motivated in the short term, but in the long run these accidents may be forgotten, and the motivation and focus on safety can fade (Mearns & Reader, 2008). A study conducted by Mearns, Whitaker and Flin (2003) showed that the constant safety initiatives by offshore companies made the employees weary, and actually lowered the impact on the people that the safety initiatives was directed at. A qualitative study by Antonsen (2009) on culture and safety on offshore supply vessels also showed that seafarers feel that the increasing rules and regulations are of great annoyance, and it deprives them of the need for reason. Furthermore they also felt that *"filling out a lot of forms is not really part of their job as sailors"*. Mearns and Reader (2008) suggest that improvements in safety performance may perhaps be better delivered indirectly, and not just through safety interventions.

Overview of the study

The overall purpose of this study is to examine if the work environment could be used as an indirect and alternate way of improving safety on board ships – by investigating the work environment and its associations to safety status, and to further examine the relations between safety status and actual undesired events and accidents on board ships. The first article examines the associations between the work environment and safety status on board industrial and cruise ships. The second article investigates the safety status on board industrial ships and its relations to recorded undesired events and accidents.

Theoretical background

Safety culture and safety climate

There is a mix of different constructs created to operationalize safety in order to understand and measure it. Safety culture and safety climate is mostly considered as a high priority for companies, and is often the subject of audits, improvement initiatives and is often considered as a performance measurement. However, the definition and usage of safety culture and safety climate constructs vary. In an article by Guldenmund (2000) he gives an abundance of definitions, proposed by different researchers, of safety culture and safety climate in which all vary in theoretical and practical use. He states that the researchers often define and operationalize safety culture or climate to best suit the purpose of their study, and that most researchers has not yet gone beyond the stage of face validity, and considers the construct to be in the first development stages. There are also different views on whether safety climate and safety culture can be considered separate or part of the same construct, and also, if separate constructs, whether safety culture precedes safety climate or vice versa. For example Schein (2004) sees climate preceding culture, where he argues that climate is culture in the making. Many articles have attempted to create new and better models, to systematize the great quantity of research on the constructs or to guide researchers to where the next step should be (ex: Choudhry, Fang, & Mohamed, 2007; Cooper, 2000; Diaz & Cabrera, 1997; Fernandez-Muniz, Montes-Peon, & Vazquez-Ordas, 2007; Glendon & Stanton, 2000; Guldenmund, 2000; Hale, 2000; Sørensen, 2002). And many researchers emphasize the need for a better construct (ex: Guldenmund, 2000; J. I. Håvold & Nesset, 2009; Reason, 1998). There is however some consensus in the literature on which base factors should be included in these measurements of safety, but there are usually variations when the concepts are being used.

Safety culture

Safety culture as a term saw its first light in 1987 in the OECD Nuclear Agency Report on the Chernobyl disaster in 1986, and has since been a loose description of corporate culture where safety is understood to be the number one priority (Cooper, 2000). In 1993The UK's Health and Safety commission proposed, according to Håvold (2003), the most comprehensive,

explicit and probably most used definition of safety culture;

> *"The safety culture of an organization is the product of individual and group values, attitudes, competencies, and patterns of behavior that determine the commitment to, and the style of proficiency of, an organization's health and safety programs. Organizations with a positive safety culture are characterized by communication founded on mutual trust, by shared perceptions of importance of safety, and by confidence in efficacy of preventive measures".*

This states that the safety culture is the beliefs, values, attitudes, and patterns of behavior that a group of people share with respect to safety. Safety climate has been used as a construct to measure safety culture, where safety climate is often defined as the 'visible' part of the safety culture.

Safety climate

The first study on safety climate as a construct was done at an automotive plant in 1951 by Keenan, Kerr and Sherman (Guldenmund, 2000), and has in 60 years not yet reached a maturity where one measurement approach or definition is commonly preferred by researchers. However, variables in the definitions of safety climate have consistently featured either employee's attitudes or perceptions of safety, and that is what Guldenmund (2000) calls safety climate in his article. He states that attitude theorists can see safety culture as what underlies these attitudes and beliefs. Zohar (2000) has proposed what has become the most commonly used definition of safety climate;

> *"Essentially climate perceptions relate to 'procedures as patterns', whereby consistent procedures represent patterns that reflect the importance and prioritization of safety over competing goals".*

Using these definitions, it would be possible to improve the safety culture or climate by modifying the employees' beliefs, values, attitudes, and patterns of behavior. Many studies has focused on the safety culture and climate in relation to safety performance, specifically if improving the safety culture or climate leads to less unsafe behavior and accidents.

Relationship between the safety climate, safety performance and accident rates

If safety culture and climate consists of employee's attitudes and beliefs, it could also affect employee behavior. One can then argue that a positive safety climate will induce safe behavior from the employee's where employees are less likely to exhibit unsafe behavior, not take unnecessary risks, and comply with rules and regulations (Clarke, 2006b; Lund & Aarø, 2004; Seo, 2005), which according to Reason (1990) is the forerunner or accident involvement.

A model of safety performance has been proposed by Griffin and Neal (2000), where safety performance is divided into three parts; organizational and safety climate as performance antecedents, safety knowledge and safety motivation as determinants of performance, and performance components. Compliance and participation was incorporated as safety performance components, where high compliance and participation is shown by complying with safety procedures and carrying out work in a safe manner, helping co-workers, promoting the safety program within the workplace, demonstrating initiative, and putting effort into improving safety in the workplace. Later analysis of the model found safety climate to predict safety knowledge and safety motivation, which in turn predicted safety compliance and safety participation. Showing that safety climate predicts safety performance, and is mediated by safety knowledge and safety motivation (Neal, Griffin, & Hart, 2000). This relationship has been supported in later studies where the perceived safety climate is found to predict employee's safety behavior (Clarke, 2006b; Garcia, Boix, & Canosa, 2004; Seo, 2005). The safety climate has also been found to be significantly correlated with self-reported accident rates (Vinodkumar & Bhasi, 2009).

As mentioned, Reason (1990) describes unsafe behavior as the forerunner of accident involvement. He classifies unsafe behavior as intended or unintended actions, where the latter is defined as slips or lapses. Intended unsafe actions are governed more by attitudes and compliance, and he classifies these acts as mistakes (rule-based mistake or knowledge based mistake) and violations (routine violation or acts of sabotage). Studies investigating behavior and accident rates have found evidence to support this connection. Mearns, Flin, Gordon and Fleming (2001) found unsafe behavior to be the best predictor for accidents and near-misses. This is further supported in a later study where risk of injury and accident rates has been found to be associated with higher levels of stress and poor safety behavior (Glasscock, Rasmussen, Carstensen, & Hansen, 2006).

Improving the safety climate

In order to improve the safety climate it is important to understand what contributes to unsafe attitudes and behavior. Many studies link safety to different parts of the work environment, with much research done on stress and fatigue and their effects on safety. With a growing consensus that the cultural context of work practice may influence safety just as much as technology and formal organization structure (Antonsen, 2009), recent studies has also begun focusing on safety related to the psychosocial aspects of the work environment. For example studies on social support, openness amongst co-workers, feedback from superiors, and reciprocal theory through safety citizenship behavior, perceived organizational support, and mental contracts (ex: Clarke, 2006a; Coyle-Shapiro & Conway, 2005; Didla, Mearns, & Flin, 2009; Eisenberger, Stinglhamber, Vandenberghe, Sucharski, & Rhoades, 2002; Rhoades & Eisenberger, 2002). Investigating the work environment could potentially lead to sources for further improvement in safety, and new kind of initiatives could spark a fresh way of motivating employees to create a safer work environment.

Work environment and safety

The work environment has been used as a predictor for different safety measures, and safety performance is most often used in the form of number of accidents, near-accidents, and undesired events. As stated above, attitudes towards safety is thought to affect safety related behavior, which in turn affect safety performance. Studies using this concept as measure could therefore give indications of work environments factors associated with the safety climate.

The work environment in relation to safety performance

In a review study, Shannon, Mayr and Haines (1997) investigated the relationship between organizational- and workplace factors and injury rates, and identified ten studies eligible for review. Four of those studies used work environment factors of interest to this paper (Cohen, Smith, & Cohen, 1975; Habeck, Leahy, Hunt, Chan, & Welch, 1991; Shannon, Walters, Lewchuk, Richardson, Moran, Haines, & Verma, 1996; Tuohy, & Simard, 1993; in Shannon, et al., 1997). Amongst other findings; good relations between management and workers, company committing resources to employee health, and the relative importance of safety

versus production were found to be related to lower injury rates. In addition, age and marital status where also found to be related to lower injury rates. Education/literacy however did not show any significant relations to injury rates.

Different types of stress have been some of the most researched work environment factors in relation to safety. Ergonomic stress has been investigated by Melamed (1989, in Lawton & Parker, 1998) who ran a study on Israeli workers and found ergonomic stress level (body motion and posture, physical effort, active hazards and environmental stressors) where predictors of accident involvement. They argue that this preoccupation may serve as a distracting factor making the worker less attentive to danger. One could pose a similar argument for stress derived from the physical workload or perceived work pressure, and in a study by Frone (1998) adolescents with heavier workloads were more likely to have reported a workplace accident. Another stress indicator is role overload, which has been defined as the degree to which role performance is seen as being affected by inadequate time, training, and resources – and has been found to be associated with unsafe behavior by Hofmann and Stetzer (1996). The effects of role overload, work pressure and work load upon safety can also be explained as the workers desire to use shortcuts in order to deal with the amount of work, thereby skipping or hastening safety procedures.

Stress offshore has been investigated by Rundmo (1995) who found Norwegian offshore workers with high job stress along with high levels of perceived risk and dissatisfaction with safety measures to significantly predict involvement in accidents and near-accidents. A later study by Mearns, Flin, Gordon, and Fleming (2001) with offshore personnel in the UK on human and organizational factors in offshore safety, found results that indicate perceived pressure for production is the main driver for predicting unsafe behavior.

Recent studies have also begun focusing on psychosocial aspects of the work environment, and the quality of communication and relationship amongst employees and with management has been found to be associated with safety. A recent qualitative study by Antonsen (2009), mentioned earlier, showed that a sense of solidarity and community like the feeling of 'being on the same boat', where the crew seem to foster a climate for care and open communication, give effects that are regarded as positive in terms of safety within an organization.

A study by Rundmo (1994) on offshore workers, found social support from management to be associated with lower injury rates. Høivik, Baste, Brandsdal, and Moen (2007) conducted a study in a Norwegian petroleum company and found perception of nearest manager and

confidence in management both had a significant correlation of -.26 and -.30 respectively with the total of recorded injuries, serious accidents, undesirable incidents, and sickness absence. This is further supported in a study by Hofman and Morgeson (1999) where the quality of the relationship between leaders and employees were found to be an important predictor of safety behavior, and indirectly to the number of accidents.

Mearns, Rundmo, Gordon and Fleming (2004) found, in a study on psychosocial and organizational factors in offshore safety, that accident involvement could be improved by attention to safety measures directed at personnel, improving communication and influence, attending to workers concern about hazards to the installation. And also have installation management cultivate a culture in which safety goals are given precedence over production, and people are encouraged to rely on others, as well as themselves in order to detect errors and resolve safety problems before they grow into something more serious.

One can argue that all of the above factors contribute to general employee attitudes towards the company and the work – and that job satisfaction therefore would also be associated with safety. However, different results have been found regarding job satisfaction. A study by Holcom, Lehman and Simpson (1993) found that employees which had experienced accidents at the workplace had been described as being unsatisfied with their jobs. This is further supported by a later study which found job satisfaction to be positive associated with the safety climate (Kath, Magley, & Marmet, 2010), were the safety climate was found to predict job satisfaction. But Lawton and Parker (1998) showed in a review study, that job dissatisfaction did not predict accident liability but it was related to the probability of excess time off and of developing a neurotic complication after an accident. Job satisfaction has also been incorporated into safety climate, and a distinction between measurements of safety climate and work environment is not always possible. Håvold (2003) has done a review of different safety climate scales, and some of these scales incorporate job satisfaction. He argues that employees who are satisfied with their job will care about the quality of their work, and be more committed to the organization. This study uses commitment, along with safety compliance and safety attitudes as a measure for safety status. These constructs can be considered as visible parts of the safety culture (safety climate), and there are studies linking work environment to safety climate.

The work environment in relation to safety climate

Job insecurity has been found to give attitudinal reactions in employees, and lead to decreased organizational commitment, intentions to quit, and reduced satisfaction (Ashford, Lee, & Bobko, 1989). A later study by Probst (2001) support this and showed that a high feeling of job insecurity lead to a decrease in safety motivation, compliance, and job dissatisfaction.

Most of the research into safety attitudes, compliance and commitment is focused on psychosocial aspects of the work environment. A study by Mearns and Flin (1995) on offshore oil and gas industry in the UK, show employee attitudes to safety is underpinned by a supportive environment, along with overt management commitment, personal need for safety, personal appreciation of risk, attributions of blame, and conflict and control. The same year Mearns and Flin (1995) presented, at an Economic & Social Research Council conference, a model of accident causation where attitudes to risk is affected by job satisfaction, safety satisfaction, management commitment to safety, and co-workers commitment to safety. A later study by Parker, Axtell and Turner (Parker, Axtell, & Turner, 2001) found a connection between the quality of communication and self-reported safe working. They argue that open communication about general work aspects might enhance safety by promoting organizational commitment.

One of the main focuses of high risk industries is to improve employee compliance with rules and procedures. Safety compliance is the employee's willingness to follow rules, procedures, and regulations established by the organization in order to create a safer work environment, prevent accidents and have been a high priority in high-risk industries (Neal, et al., 2000). When an employee does not comply with these rules, their actions can be defined as an error or a violation. Reason (1990) defines a violation as a deliberate deviation from those practices deemed necessary in order to maintain the safe operations of a potentially hazardous system. Violations of rules and procedures have been found to be a significant contributor of accidents. Lawton (1998) gives possible explanations for this link; some violations circumvent one layer of defense (rules and procedures) and can make the environment less forgiving to errors, and additionally can take employees into new unpracticed situations.

According to Battmann and Klumb (1993) one can see compliance as behavioral economics. They state that behavioral economics is where the study of violations should be seen in a social context, and that the presence of violations is dependent of an organizations' social force, the existing safety culture, shared beliefs, attitudes, norms and practice. They suggest

that the decision to violate rules or procedures depends on if the perceived cost for complying outweighs the perceived benefits of not complying. In their study they find evidence suggesting that groups of employees develop their own internal work procedures that can deviate from the external and official rules, and they conclude that increasing feedback and unifying behavior constraints by the management is one important way to prevent routine violations. Lawton (1998) argues that if employees follow all the rules, their efficiency worsen, and the management wants to know why. But if rules are broken and an accident happen, the employee risk not receiving compensations. Lawton therefore stresses the importance of the purpose of the rules. If the purpose of the rules are other than safety, like minimize compensation claims and avoid the cost of accidents, the attitudes of the employees are affected. In order to try and explain the connection between safety climate and accident involvement new concepts has been introduced. Safety citizenship behavior is one such concept, and researchers have found correlations of .47-.64 between safety compliance and safety citizenship behavior (SCB) (Didla, et al., 2009).

Safety citizenship behavior and perceived organizational support

Compared to safety compliance, SCB opens up for the use of an employee's discretion. By using one's judgment the employee is forced to evaluate the situation and make a decision towards an action, which is likely to lead to an increase in safety consciousness (Didla, et al., 2009). However, both SCB and safety compliance is important for a safer work environment and Clarke (2006a) has found that both of these lead to a reduction in accidents. SCB is a relatively new concept in safety management, demonstrated by employees taking actions like helping co-workers, promoting safety programs, demonstrating initiative, and suggesting changes for improving safety. Similar constructs to safety citizenship behavior has been found to have an effect on safety performance, and Didla (2009) see SCB as a potentially important aspect of reducing risk, and should be focused on.

In a study by Podsakoff, MacKenzie, Paine and Bachrach (2000) job satisfaction, organizational commitment, and supervisor fairness were found to be great motivators for citizenship behavior. A later study by Mearns and Reader (2008) showed perceived supervisor support for health, and support from the organization predicted more SCB behavior, like helping colleagues with safety related matters and reporting dangers at work. They also investigated the relationship between SCB and perceived organizational support (POS) and

found evidence that by focusing on activities that are designed to improve health, organizations can get benefits not just in health but also in safety performance.

POS is the employees' beliefs about an organization's support, commitment and care towards them (K. Mearns & Reader, 2008). In a study by Eisenberger, Fasolo and Davis-LeMastro (1990) a reciprocal commitment to the organization was found with POS being positively related to conscientiousness in carrying out conventional job responsibilities, the expressed affective and calculative involvements in the organization, and innovation on behalf of the organization in the absence of anticipated direct reward or personal recognition. Mearns and Hope (2005) found that employees showed increased commitment, lower levels of unsafe behavior and were more compliant towards rules and regulations when they had a high level POS, as a result of the organization's commitment towards their health and well being. A later study also showed that employees feel an obligation towards the organizations welfare when they feel a high level of POS, and hold the belief that good performance will be recognized and rewarded by the organization (Rhoades & Eisenberger, 2002).

Rhoades and Eisenberger (2002) further investigated what helps develop POS and found three categories that influence POS; fairness of treatment, supervisor support, and organizational rewards and job conditions. POS was strongly related to how reasonable and fair the distribution of resources are amongst employees, and the interpersonal treatment in resource allocation, how much supervisors value the contributions by employees and their care towards employee well being; the organizational reward and recognition of employee efforts, along with general working conditions provided by the organization.

Differences in an organizations sub-culture

When employees work together they can often form their own sub-culture within an organization, with a mutual understanding on how they do things. These sub-cultures can evolve in different departments, positions, and levels of management (Clarke, 1999; Harvey et al., 2002; Schein, 2004). In a study by Hofstede (1998), in a large Danish insurance company, he found three distinct sub-cultures: a professional sub-culture, an administrative sub-culture, and a costumer interface sub-culture. Mearns, Flin, Gordon, and Fleming (1998), in a study on offshore employees, found evidence suggesting attitudes towards safety, for the permanent staff, were influenced by whether they were superiors/officers or not. Håvold (2005) found

significant differences between the knowledge of safety protocols, and he argues that this may be because superiors have a responsibility for the safety of the employees they supervise. The earlier mentioned study by Bjerkan (2010), showed that groups need to be taken into account when investigating the effects of safety climate and perceptions of the work environment. As superiors and officers are tasked with the responsibility of both the safety of themselves and their employees, along with equipment and the ship, one could expect differences to emerge in predictors of safety compared to subordinates and ratings.

Aims of the thesis

Specific aims of the 1ST article

The specific aims of the 1st article is to examine the work environment predictors for safety status on board industrial and cruise ships, and to investigate the differences between superiors/officers and subordinates/ratings. The working model of the study is presented in figure 1. The specific questions addressed in this article are as follows:

1. Does the work environment predict safety status? In accordance with theory presented in the first article it is predicted that all factors in the work environment; job satisfaction, stress, working conditions, goals, relationship with co-workers, and relationship with superiors, will contribute significantly towards explained variance in safety status.

2. Do the work environment show the same predictors for both superiors/officers and subordinates/ratings? With the differences in work description between superiors/officers and subordinates/ratings, along with the theory and findings on organizational sub-culture presented, it is expect that the motivation for complying with rules and regulations, as well as the reason for attitudes towards those rules and regulations and the general commitment to overall safety will differ. It is therefore predicted that differences between superiors/officers and subordinates/ratings will be found in the degree of explained variance from individual work environment variables.
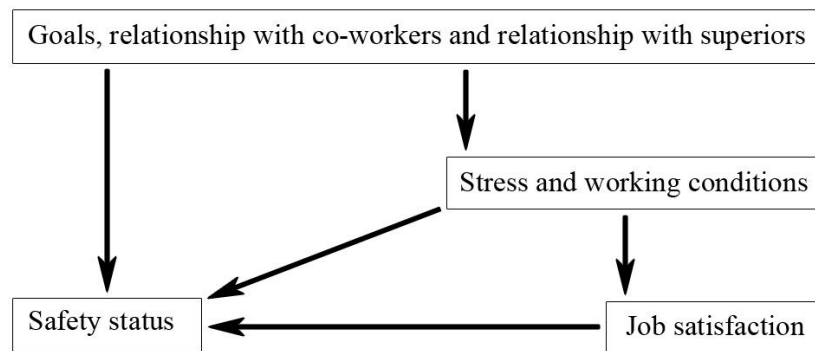
Figure 1. *Work model of the first article*

Specific aims of the 2ND article

The specific aims of the 2nd article is to examine the relationship between safety status, compliance, attitudes and commitment, and safety performance in the form of number of undesired events and accidents. And also to investigate the differences between superiors/officers and subordinates/ratings. These questions will be examined:

1. Will an increase in safety related compliance, attitudes and commitment result in less undesired events and accidents? According to the theory and presented studies in the 2nd article, it is expected that safety status will be associated with safety performance. It is predicted that: A) Ships with low number of undesired events and accidents will score higher on attitudes towards rules and regulations. B) Ships with low number of undesired events and accidents is expected to score higher on compliance with rules and regulations C) Ships with low number of undesired events and accidents is expected to score higher on commitment.

2. Do superiors/officers and subordinates/ratings perceive and report the safety status on board ships similarly? With potential differences in organizational sub-cultures, along with the differences in job description for superiors/officers and subordinates/ratings where the latter do the majority of the labor, it is predicted that there will be differences between the two groups in the subjective perception of the safety status on board.

Method

Samples and procedures

The two shipping companies were recruited with the help of Det Norske Veritas. Due to the remote locations of the ships and also the limited internet accessibility, the questionnaire was designed in Microsoft Excel in order to survey data from multiple respondents before being sent back. The questionnaire was sent by e-mail to the captains of 24 ships, selected by the shipping companies' management to participate in the survey. All ships were either in lay-up or in transit. When everyone wanting to participate in the study had been given the opportunity to do so, the questionnaire was returned. Everyone on the ship was invited to participate in the survey, and given information that the study were voluntary, all information would be kept anonymous, confidential and no individual answers would be relayed to the shipping company. The participants were also informed that a summary report would be given to the shipping company at the conclusion of the study. There were no excluding demographic variables.

Interviews

Prior to the construction of the questionnaire, a total of 15 interviews were conducted in order to gain additional insight into the world of shipping and also to assess the aspects of the work environment considered to be important for seafarers. Three interviews were with personnel at Det Norske Veritas, four with key management personnel at the two shipping companies, and eight interviews were conducted with seafarers on board ships. The interview were semi-structured with topics from different aspects of both physical and psychosocial work environment like; physical working conditions, social interactions with co-workers and superiors, spare time, their relations with the company, and also their opinion on what is important for creating a good work environment. The interviews were analyzed using a contextual content analysis, and the informants statements and believes about the work environment were used to create the items in the work environment questionnaire. These interviews were conducted in collaboration with Marta Lang (2011).

Sample

A total of 215 seafarers from two Norwegian shipping companies, both superiors/officers ($n = 97$) and subordinates/ratings ($n = 87$), in addition to some unspecified ($n = 31$) participated in this study. The response rate was 35%. Almost all respondents were male (94.4%) and most had completed College or University (68.8%). The age of the sample were fairly distributed with age group 25-29 (20.5%), 30-34 (14.0%) and 50 years or older (20.0%) being most populated. The main nationality represented in the sample are Filipino (63.3%) followed by Norwegian (21.4%) and Indian (11.6%). Most respondents were married (68.8%) and about one third were single (28.8%). The sample has more officers and managers (45.1%) than ratings or subordinates (40.5%) and there were some who did not respond (14.4%). Most worked on carrier ships (Roll-on-Roll-off 49.8%, Pure-Car-Truck-Carrier 28.4%) and a few on passenger ships or cruise ships (11.2%). The sample shows most respondents working on deck (41.9%) and engine (33.0%), followed by catering (8.8%) and on the bridge (8.4%)

In article 2 of this study, only the sample from one of the shipping companies was used due to incompatible data on undesired events and accidents, along with the removal of ships with 5 or less respondents. This reduced sample consisted of 170 respondents distributed on 13 ships are relevant for this study. All respondents reported to be male (95.3%), with 8 missing (4.7%). The majority of respondents reported to be in the age between 25 and 34 (34.7%), followed by 45 years or older (29.4%), between 35 and 44 (20.6%), and 24 years or younger (15.3%). The main nationality represented in the sample are Filipino (63.3%) followed by Norwegian (21.4%) and Indian (11.6%). The distribution between superiors /officers and subordinates/ratings were equal (41.8%) with some missing (16.5%). A little over half of the respondents worked on carrier ships (Roll-on-Roll-off 53.5%, Pure-Car-Truck-Carrier 32.9%, bulk 4.1%) and a few on passenger ships or cruise ships (2.4%). The sample shows most respondents working on deck (41.9%) and engine (33.0%), followed by catering (8.8%), bridge (8.4%), assistants, cadets and other (6.1%) with four missing (1.9%).

Questionnaire

The work environment questionnaire was constructed using the results from the contextual content analysis from the interviews. Parts of "Det Norske Veritas Insight questionnaire" were also added in order to investigate the safety status on board the ships. In the questionnaire these items were categorized in seven topics a) My company's safety and goals, b) My working conditions, c) My relations, d) My superiors and the shipping company, e) Job stress, f) My job satisfaction, followed by demographical information in g) About myself. For the complete questionnaire see appendix C. The survey was issued in English and created in Microsoft Excel in order to collect multiple responses in a single Excel file. The survey took about 20-30 minutes to complete. Performing a Principal component analysis with a Promax rotation, resulted in seven dimensions with a total of 25 factors. For factor loadings and internal consistency consult appendix A. All scales were measured using a five-point likert scale, with different types of rating related to the items of topic. The seven dimensions with their individual components were;

Safety status: Compliance – Willingness to comply with existing rules and regulations established to create a safer work environment; Attitudes - Attitudes towards checklists, job permits and risk assessment; Commitment - Willingness to improve on safety and if leaders encourage to report unsafe conditions. Scale: Strongly disagree, disagree, neither agree nor disagree, agree, strongly agree.

Job satisfaction: Rewards and Benefits - Satisfaction with salary, chances of promotion, further education and other benefits. Satisfaction with co-workers - Communication and treatment with and by co-workers, and their level of competence. Task - Task satisfaction, use of own competence, respect others have for the work, and possibility of variation. Meaningfulness - The value of the work, having to do the work of others, the perception and meaning in doing tasks given and difficulties in performing tasks due to rules and regulations. Feeling of safety - Job security and trust in co-workers handling of a crisis. Worry - Deadlines, amount of paperwork and quality of sleep. Scale: Strongly disagree, disagree, neither agree nor disagree, agree, strongly agree – and: very unsatisfied, unsatisfied, neither satisfied nor unsatisfied, satisfied, very satisfied.

Stress: Responsibility and decisions - The burden of responsibility and the pressure of making decisions. Work Strain - Amount and pace of work, interruptions and operating hours.

Physical nuisance - The effect of temperature, vibrations and noise from the ship. High risk tasks - Concern about injuring co-workers and causing financial loss for the company. Isolation - The feeling of isolation, contact with family friends and information about the world outside the ship. Variation - The variation in the work. Scale: very often or always, often, sometimes, seldom, very seldom or never.

Working conditions: Monetary loyalty - Monetary reason for having this job. Loyalty and Goodwill - Loyalty towards the shipping company and willingness to "go the extra mile". Intent to leave - Motivation to stay in the company. Scale: Strongly disagree, disagree, neither agree nor disagree, agree, strongly agree.

Company goals: Feeling cared for - The feeling that the company sees the workers as people and cares for their well-being, worker's perception of the company's goals eg: profits vs. safety and worker's requests for equipment. Scale: Strongly disagree, disagree, neither agree nor disagree, agree, strongly agree.

Relationship with co-workers: Openness towards co-workers - If workers regard co-workers as friends, welcomes new people, takes the time to listen if someone needs to talk, and if praise others when they've done a good job. Social grouping - If workers only socialize, and like to socialize with people from their own department. Openness towards cross-gendered work environment - If workers are comfortable or expecting problems when working with the opposite gender. Emotional involvement in co-workers problems – Caring and taking notice on mood and feeling of co-workers shown by conversing about private affairs, friends and family. Scale: Strongly disagree, disagree, neither agree nor disagree, agree, strongly agree.

Relationship with superiors: Commitment - If they seem to take their job and responsibilities seriously, are perceived as good role models, makes ratings feel appreciated and cared for, and takes comments and suggestions seriously. Trust - Trust given and received from superiors, availability when needed, and the level of comfort asking for clarification or instructions. Scale: Strongly disagree, disagree, neither agree nor disagree, agree, strongly agree.

Statistical analysis

Statistical analyses were performed using SPSS 17.0 (Statistical Package for the Social Sciences), with the level of significance set to $p < .05$. The questionnaire was tested for internal reliability, and cronbach's alpha and average inter-item correlation was calculated.

In order to test the predictive power of the work environment with safety status as the criterion variable, a hierarchical block regression was performed on the entire sample using Safety status as criterion variable. Job satisfaction was added in the first block, as it is thought to be the general over all attitudes produced by the work environment, and is affected by the other work environment variables in the analysis. Stress and working conditions were added in the second block, followed by goals, relationship with co-workers and relationship with superiors. Demographical variables age, nationality, relationship status and general education were added in the fourth block. To test the differences in work environment predictors between superiors/officers and subordinates/ratings, the same analysis were conducted separately on the two groups. In addition, t-tests were conducted in order to examine if there were significant differences between the predictors for superior/officers and subordinates/ratings in the regression analysis. The formula used can be found in Howell (2002), and is shown below:

$$t = \frac{b_1 - b_2}{\sqrt{s_{b_1}^2 + s_{b_2}^2}}$$

In order to explore the difference in predictors of the three safety factors (Compliance, Attitudes, Commitment) for superiors/officers and subordinates/ratings, a stepwise regression analysis were conducted. The graphical presentation (stacked bar chart) is calculated using the following formula:

$$R^2 * 100\% = \sum_{i=1}^{n} \beta * r * 100$$

When checking for multi-collinearity, none of the correlations between predictor variables were above .6 as recommended by Skog (2005). According to Field (2009) a VIF larger than 10 and a tolerance lower than .3 is an indicator of multi-collinearity, and Brace, Kemp, and

Snelgar (2003) use a tolerance above .1 as a criteria for being acceptable. All models were found to be acceptable.

To examine the associations between safety status and undesired events and accident, a correlation analysis were conducted. Ships were also grouped by high and low number of undesired events and accidents and t-tests were performed in order to examine any differences in safety status between the two groups.

Results

Results from the 1ST article

The first aim of this article was to examine the work environment as a predictor for safety status. Hierarchical block regression analysis showed the model explained a large amount of variance (62%) in safety status. Satisfaction with co-workers, feeling of safety, goodwill towards the company, openness towards co-workers, and commitment from superiors were significant predictors of safety status.

The second aim of the study were to investigate any differences between superiors/officers and subordinates/ratings. When performing the analysis on superiors/officers and subordinates/ratings an even higher amount of explained variation emerged explaining 78% and 73% respectively. Different pattern in predictors were also revealed, with few predictors turning out to be significant for both groups, except for feeling of safety. For superiors and officers, satisfaction with co-workers, feeling of safety, attitudes towards working with the opposite gender, and commitment from superiors were significant predictors. For subordinates and ratings, Worry, feeling of safety, monetary loyalty, goodwill towards the company, and openness towards co-workers were significant predictors of safety status. Testing the differences between the predictors for the two groups revealed showed five variables significantly different: Working with the opposite gender, and trust in superiors had significantly more predictive power for superiors and officers, whilst worry, work strain, and monetary loyalty had significantly more predictive power for subordinates and ratings.

The results supported the two predictions in the article. The work environment was found to be strongly associated with safety status for seafarers in both superiors/officers and

subordinates/ratings. Results also show differences in the two groups, indicating that sub-cultures need to be taken into account when investigating or attempting to create initiatives directed at improvements of safety status through the work environment.

Results from the 2ND article

The first aim of the second article was to investigate the relations between undesired events and accidents, and safety status. The results from comparing ships with high and low number of undesired events showed superiors and officers constantly rating ships with high number of undesired events as higher on all safety factors, except for commitment which were rated as the same on both ships. Only compliance, however, turned out to be significantly higher. Subordinates and ratings rate attitudes and commitment higher on ships with low number of undesired events, and rate compliance higher on ships with low number of undesired events, but none of them were significant. Comparing ships with high and low number of accidents, the results seem to somewhat mirror those of undesired events and accidents. Superiors and officers rate all safety factors as higher on ships with high number of accidents, with over all safety status and compliance being significant. Subordinates and ratings rate all safety factors higher on ships with low number of accidents except for attitudes, but again; none of the differences were significant. The results contradict the predictions that ships with low number of undesired events and accident would be rates significantly higher on compliance, attitudes and commitment.

Partial support were found for the second aim of the study; to investigate differences between superiors/officers and subordinates/ratings. Interesting differences between superiors/officers and subordinates/ratings were found in their perception of compliance, attitudes and commitment. Results could indicate subordinates and ratings having a more accurate depiction of safety status on board the ships, and it could be that future safety culture assessments should primarily focus on this group in order to get the most accurate measurement. Further examination is however required before any conclusion can be made.

Discussion

The overall purpose of this study was to investigate alternate ways of improving safety on board ships. The first step (article 1) was to investigate the work environment as predictor for safety status. The second step (article 2) was to examine the associations between safety status and undesired events and accidents. Differences in sub-culture between superiors/officers and subordinates/ratings were also investigated. A comprehensive discussion on the results is found in the articles.

Overall, the seafarers in this study seem to be content with the perceived work environment on board the ships in this study. The majority of scores rated the work environment variables from neutral to high; although there are variations and some seafarers also rated some variables at the lowest possible score. Likewise, the safety status on board the ships was mostly rated neutral to high.

In article 1, significant predictors for the entire, were in support of much of the presented theory. High satisfaction with co-workers and openness with co-workers were significant predictors of better safety status. This is in accordance with earlier findings (Antonsen, 2009; Shannon, et al., 1997). This could also relate to SCB, where better satisfaction with the workplace would lead to a more caring towards the company and its interests (Håvold & Nesset, 2009; Mearns & Reader, 2008). High goodwill towards the company along with superiors and officers' commitment towards the company and safety where also significant predictors of better safety status, which is also in accordance with earlier findings (Hofmann & Morgeson, 1999; Høivik, et al., 2007; Rundmo, 1994; Shannon, et al., 1997), and SCB along with POS (Mearns & Reader, 2008; Rhoades & Eisenberger, 2002). Feeling of safety was also a significant predictor of safety status, as found in earlier research (perceived risk; Rundmo, 1995) and (job insecurity; Ashford, et al., 1989; Probst & Brubaker, 2001).

In article 2, the results contradicted most of the presented theory. Only the theories on differences in sub-culture were partially supported. The results from ships with high and low number of undesired events showed superiors and officers constantly rating ships with high number of undesired events as higher on all safety factors, except for commitment which were rated as the same on both ships. Only compliance, however, turned out to be significantly higher. Subordinates and ratings rate attitudes and commitment higher on ships with low

number of undesired events, and rate compliance lower on ships with low number of undesired events, but none of them were significant.

For ships with high and low number of accidents, the results seem to somewhat mirror those of undesired events and accidents. Superiors and officers rate all safety factors as higher on ships with high number of accidents, with over all safety status and compliance being significant. Subordinates and ratings rate all safety factors higher on ships with low number of accidents except for attitudes, but again; none of the differences were significant.

For shipping companies struggling to keep seafarers motivated to maintaining a safe work environment, these findings could prove useful. If trying to improve upon the safety on board ships through work environment, the results shows that, having superiors and officers that care and support their employees, emphasizes the company's commitment and prioritization of their employees, and ensuring an open and caring environment amongst co-workers, could be an indirect way of improving on safety for all seafarers. But the results also show the need for separate initiatives; with a focus on building trust between the management and the superiors/officers, and ensuring that the subordinates/ratings feel that management and their leaders care about them and give them satisfactory salaries. According to the findings

As presented in the introduction, Mearns and Reader (2008) suggested in their article that improvements in safety performance may perhaps be better delivered indirectly, and not just through safety interventions. This study has taken one step in the direction of finding work environment as an alternate and indirect way of improving on safety on board ships. There are however some limitation in the current study that need to be taken into account.

Methodological limitations

As some ships and shipping companies tend to have ratings recruited from countries with low-salary workforce like the Philippines, and officers from western countries (Norway and India in this sample).The differences between superiors/officers and subordinates/ratings may have been affected by nationality culture. This could emphasize differences between the two groups. National culture has also been found to have an effect on response styles, where one nationality group can tend to answer in a specific bias (Silverthorne, 2005).

National differences in working conditions like salary, contract length, and standards can result in differences in expectations and satisfaction with present circumstance. The different

types of cargo carried by ships (e.g. containers, cars, chemicals) also pose different kinds of dangers, and consequently require different levels of safety measures. Generalizing the results across different ship types and other nationalities will therefore be difficult. The size of the sample in this study was also not optimal, even though all sampling adequacy-tests were satisfactory in both the factor- and regression analyses.

As always, with self-report surveys, there may be response bias where respondents answer what they think is socially desirable. There is also the possibility that the self-reported answers do not reflect the actual level of the concept measured.

The delay between data on undesired events and accidents and the questionnaire data could result in the two data sets not being related as closely as they could. There could have been initiatives taken on board the ships to improve upon safety, and as this study were unable to obtain such data, this could be a confounding variable in the present study. A longitudinal study with multiple measurements would be able to examine the associations between undesired events, accidents and safety status, more in depth compared to a cross-sectional study.

Causality also needs to be addressed. In this study, causality cannot be derived from analyses, as the methods examine relations between variables and not the direction of causes. Establishing causality through experimental design is very difficult to achieve in organizational research. But indications of causality may perhaps be better derived from longitudinal studies.

Practical applicability

The practical applicability of this study is at this point in time somewhat limited. No causal relationship has been established, as the study aimed to investigate the predictors of safety status. Furthermore, the relationship between undesired events and accidents, and safety status was inconclusive. The study has however presented a model of the work environment that is strongly associated with safety status, and can be used to further investigate the relationship between the two. This model is also developed for shipping companies, and may therefore be useful for investigating the work environment on board ships. Lastly, the study has shown the importance of not considering the entire ship as one culture, but taking sub-cultures into account.

Future research implications

Three suggestions are made for future research. Firstly, if investigating predictors of safety or the work environment, one should take into account the different sub-cultures that may arise within an organization. Secondly, further validation of the questionnaire and safety status with larger samples and also in other industries than shipping in order to assess the validity and generalization of the results. And lastly, as this is an attempt to investigate alternate and indirect ways of improving upon safety, path analysis with the work environment and safety status could be performed in an attempt to create a causal model of the relationship.

Conclusion

The overall aim of the study, to investigate the work environment as an alternate way of improving on safety on board ships, remains inconclusive. The work environment has been shown to be strongly associated with safety status, but safety status however could not be related to undesired events and accidents. Despite the methodological limitation, this study is believed to have made some contributions to the investigation of new ways to improve upon safety. This study has identified variables in the work environment that predicts safety status, and also works environment variables that predicts compliance, attitudes and commitment individually. Significant differences in the predictors between sub-cultures on board ships have also been shown, along with the importance of testing the significance levels of such differences in order to not overestimate differences that are not there.

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1ST Article of Master Thesis:

Work environment and the associations with safety status on board

industrial and cruise ships

Abstract

The aim of the study was to examine the association between the work environment and safety status on board ships. A total of 24 ships participated in this quantitative survey study with a total of 215 seafarers (97 superiors/officers, 87 subordinates/ratings) leaving a response rate of 35.5%. Hierarchical block regression on the entire sample showed satisfaction with co-workers, feeling of physical safety and job security, goodwill towards the company, openness amongst co-workers, and superiors committed to their job and the safety, contributing significantly to explained variance in employees' safety compliance, attitudes, and commitment. Leaving work environment factors explaining a total of 62% of the variance. Differences was found between superiors/officers and subordinates/ratings, where a total of 78% and 73% of the variance was explained respectively. Attitudes towards working with the opposite gender and trust in superiors were more important for superiors/officer, whilst worry about work off shift, work strain, and monetary reasons for having the job were more important for subordinates/ratings. As expected, the work environment seems to be strongly associated with the compliance, attitudes and commitment to safety on board ships. The study was conducted in collaboration with Det Norske Veritas (DNV).

KEYWORDS; Shipping, Work environment, Safety, Job satisfaction, Stress, Goals, Social factors, Working conditions, Attitudes, Commitment, Compliance.

Introduction

The potential tragic injury and loss of human lives, the cost of accidents, and the loss of company's reputation make the offshore and shipping industry invest large sums on improving safety. Despite much improvement in safety performance, many companies still have problems motivating and sustaining a good safety performance amongst employees (Mearns & Reader, 2008). Mearns and Reader (2008) argue that this is because 'safety' in itself, is non-motivating. A poor safety performance can result in accidents and damages to materials and personnel, whilst a good safety performance usually gives no feedback. Accidents can help keep employees motivated in the short term, but as time passed, these accidents fade and the focus on safety can fade with it. Mearns, Whitaker and Flin (2003) has shown that the constant safety initiatives by offshore companies made the employees weary, and actually lowered the impact on the people that the safety initiatives was directed at. Mearns and Reader (2008) thus suggest that improvements in safety performance may perhaps be better delivered indirectly, and not just through safety interventions. Investigating the work environment could potentially lead to sources for further improvement in safety, and new kind of initiatives could spark a fresh way of motivating employees to create a safer work environment.

Investigating safety

There is a mix of different constructs created to operationalize safety in order to understand and measure it. Guldenmund (2000) states that the researchers often define and operationalize safety culture or climate to best suit the purpose of their study. There is however some consensus in the literature on which base factors should be included in these measurements of safety, but there are usually variations when the concepts are being used. Safety climate is often viewed as the visual part of safety culture, and has consistently featured either employee's attitudes or perceptions of safety (Guldenmund, 2000). If safety culture and climate consists of employee's attitudes and beliefs, it could also affect employee behavior. One can then argue that a positive safety climate will induce safe behavior from the employees where they are less likely to exhibit unsafe behavior, which according to Reason (1990) is the forerunner or accident involvement. It has also been found that they will not take unnecessary risks, and comply with rules and regulations (Clarke, 2006b; Lund & Aarø, 2004;

Seo, 2005). In this study, safety status is used to investigate seafarers' perceptions on safety on board the ships. Safety status is defined as the self-reported perceived status of safety, consisting of the employees' perceptions of the attitudes to rules and regulations, along with perceived compliance with said rules and regulations and commitment towards overall safety.

Work environment and safety

There has been a growing consensus that the cultural context of the work practice may influence safety just as much as technology or formal organizations (Antonsen, 2009), and studies has begun focusing on safety related to the psychosocial aspects of the work environment (ex: Clarke, 2006a; Coyle-Shapiro & Conway, 2005; Didla, Mearns, & Flin, 2009; Eisenberger, Stinglhamber, Vandenberghe, Sucharski, & Rhoades, 2002; Rhoades & Eisenberger, 2002).

The work environment and associations with safety

In a review study Shannon, Mayr and Haines (1997) investigated the relationship between organizational and workplace factors and injury rates. Amongst other findings; good relations between management and workers, company committing resources to employee health, and the relative importance of safety versus production were found to be related to lower injury rates (Cohen, Smith, & Cohen, 1975; Habeck, Leahy, Hunt, Chan, & Welch, 1991; Shannon, Walters, Lewchuk, Richardson, Moran, Haines, & Verma, 1996; Tuohy, & Simard, 1993; in Shannon, et al., 1997). In addition, they found that age and marital status were related to lower injury rates, but education or literacy did not show any significant relations to injury rates.

Stress

Different types of stress have been some of the most researched work environment factors in relation to safety. Ergonomic stress has been investigated by Melamed (1989, in Lawton & Parker, 1998) who ran a study on Israeli workers and found ergonomic stress level (body motion and posture, physical effort, active hazards and environmental stressors) were

predictors of accident involvement. A study by Frone (1998) found that adolescents with heavier workloads were more likely to have reported a workplace accident. Stress has been investigated on offshore plattforms by Rundmo (1995), who found Norwegian offshore workers with high job stress, along with high levels of perceived risk and dissatisfaction with safety measures, significantly predicted involvement in accidents and near-accidents. Stress has also been investigated in relation to unsafe behavior, where unsafe behavior was associated with role overload (Hofmann & Stetzer, 1996), and perceived pressure for production (Mearns, Flin, Gordon, & Fleming, 2001).

Job satisfaction

Job satisfaction is a popular topic of research in organizational culture, and has also been investigated in association with safety although not all studies find a relation between the two. A study by Holcom, Lehman and Simpson (1993) found that employees which had experienced accidents at the workplace had been described as being unsatisfied with their jobs, but Lawton and Parker (1998) showed in a review study, that job dissatisfaction did not predict accident liability. A later study which found the safety climate to be predict job satisfaction (Kath, Magley, & Marmet, 2010). Håvold (2003) has done a review of different safety climate scales, and some of these scales incorporates job satisfaction. He argues that employees who are satisfied with their job will care about the quality of their work, and be more committed to the organization.

Psychosocial variables

Job insecurity has been found to give attitudinal reactions in employees, and lead to decreased organizational commitment, intentions to quit, and reduced satisfaction (Ashford, Lee, & Bobko, 1989). Probst (2001) found support for this and showed that a high feeling of job insecurity lead to a decrease in safety motivation, compliance, and job satisfaction.

Much research has also been done on social interaction and communication. A study by Rundmo (1994) on offshore workers, found social support from management to be associated with lower injury rates. This is further supported in a study by Hofman and Morgeson (1999) were the quality of the relationship between leaders and employees were found to be an important predictor of safety behavior, and indirectly to the number of accidents. Mearns and

Flin (1995), in a study on offshore oil and gas industry in the UK, showed that employee attitudes to safety is underpinned by a supportive environment, along with overt management commitment, personal need for safety, personal appreciation of risk, attributions of blame, and conflict and control. The same year Mearns and Flin (1995) presented, at an Economic & Social Research Council conference, a model of accident causation where attitudes to risk is affected by job satisfaction, safety satisfaction, management commitment to safety, and co-workers commitment to safety. A later study by Parker, Axtell and Turner (Parker, Axtell, & Turner, 2001) found a connection between the quality of communication and self-reported safe working. They argue that open communication about general work aspects might enhance safety by promoting organizational commitment. Mearns, Rundmo, Gordon and Fleming (2004) found that accident involvement could be improved by attention to safety measures directed at personnel. By improving communication and influence, attending to workers concern about hazards to the installation, and also have installation management cultivate a culture in which safety goals are given precedence over production, and people are encouraged to rely on others, as well as themselves in order to detect errors and resolve safety problems before they grow into something more serious. And finally, Høivik, Baste, Brandsdal, and Moen (2007) conducted a study in a Norwegian petroleum company and found perception of nearest manager and confidence in management both had a significant correlation of -.26 and -.30 respectively with the total of recorded injuries, serious accidents, undesirable incidents, and sickness absence.

<div align="center">Compliance</div>

One of the main focuses of high risk industries is to improve employee compliance with rules and procedures (Neal, Griffin, & Hart, 2000). When an employee does not comply with these rules, their actions can be defined as an error or a violation. Reason (1990) defines a violation as a deliberate deviation from those practices deemed necessary in order to maintain the safe operations of a potentially hazardous system. Violations of rules and procedures have been found to be a significant contributor of accidents (Lawton, 1998). In order to try and explain the connection between safety climate and accident involvement new concepts has also been introduced. Safety citizenship behavior is one such concept, and researchers have found correlations of .47-.64 between safety compliance and safety citizenship behavior (SCB) (Didla, et al., 2009).

Safety citizenship behavior and perceived organizational support

Compared to safety compliance, SCB opens up for the use of an employee's discretion. By using one's judgment the employee is forced to evaluate the situation and make a decision towards an action, which is likely to lead to an increase in safety consciousness (Didla, et al., 2009). However, both SCB and safety compliance is considered important for a safer work environment, and Clarke (2006a) has found that both of these lead to a reduction in accidents. Didla (2009) sees SCB as a potentially important aspect of reducing risk, and states that this should be focused on.

SCB behavior has been found to be predicted by job satisfaction, organizational commitment, and supervisor fairness (Podsakoff, MacKenzie, Paine, & Bachrach, 2000), along with perceived supervisor support for health, and support from the organization (Mearns & Reader, 2008). Mearns and Reader (2008) also investigated the relationship between SCB and Perceived Organizational Support (POS) and found evidence that by focusing on activities that are designed to improve health, organizations can get benefits not just in health but also in safety performance.

Perceived Organizational Support

POS is the employees' beliefs about an organization's support, commitment and care towards them (Mearns & Reader, 2008). High levels of POS has been found to make employees show increased commitment, lower levels of unsafe behavior and were more compliant towards rules and regulations (Mearns & Hope, 2005), as a result of the organization's commitment towards their health and well being. A later study also showed that employees feel an obligation towards the organizations welfare when they feel a high level of POS (Rhoades & Eisenberger, 2002). Rhoades and Eisenberger (2002) further investigated what helps develop POS and found three categories that influence POS; fairness of treatment, supervisor support, and organizational rewards and job conditions. POS was strongly related to how reasonable and fair the distribution of resources are amongst employees, and the interpersonal treatment in resource allocation, how much supervisors value the contributions by employees and their care towards employee well being; the organizational reward and recognition of employee efforts, along with general working conditions provided by the organization.

Differences in an organizations sub-culture

When employees work together they can often form their own sub-culture within an organization, with a mutual understanding of how they do things. These sub-cultures can evolve in different departments, positions, and levels of management (Clarke, 1999; Harvey et al., 2002; Schein, 2004). In a study by Hofstede (1998), in a large Danish insurance company, he found three distinct sub-cultures: a professional sub-culture, an administrative sub-culture, and a costumer interface sub-culture. Mearns, Flin, Gordon, and Fleming (1998), in a study on offshore employees, found evidence suggesting attitudes towards safety, for the permanent staff, were influenced by whether they were superiors/officers or not. Håvold (2005) found significant differences between the knowledge of safety protocols, and he argues that this may be because superiors have a responsibility for the safety of the employees they supervise. The earlier mentioned study by Bjerkan (2010) showed that groups need to be taken into account when investigating the effects of safety climate and perceptions of the work environment. As superiors and officers are tasked with the responsibility of both the safety of themselves and their employees, along with equipment and the ship, one could expect differences to emerge in predictors of safety compared to subordinates and ratings.

Aims of the study

This study examines the predictors for safety climate, measured by safety compliance, attitudes and commitment. Presented findings show that many factors in the work environment are associated with the safety climate. Job satisfaction (feeling of safety, satisfaction with tasks and co-workers, rewards and benefits), Stress (workload, perceived work pressure, uncomfortable postures), Working conditions (loyalty and goodwill, intent to leave, monetary incentive), Company goals and prioritization of safety and productivity over the employees (feeling cared for), Relationship amongst co-workers (openness, support, social grouping, emotional involvement), Relationship with superiors (social support and feedback, trust, quality of communication) have all been shown to be associated with safety. Either with safety performance, or attitudes and behavior in the safety climate. Based on these findings the following expectation is made:

H$_1$: Factors in the work environment will contribute significantly towards explained variance in safety status.

With the differences in work description between superiors/officers and subordinates/ratings, one would expect that the motivation for complying with rules and regulations, as well as the reason for attitudes towards those rules and regulations and the general commitment to overall safety will differ. It is therefore expected that:

H₂: Differences between superiors/officers and subordinates/ratings will be found in the beta value of work environment variables predicting safety status.

Method

Sample

The sample was collected from two Norwegian shipping companies, one industrial shipping company, and one cruise ship company – with the help of Det Norske Veritas (DNV). The questionnaire was designed in Microsoft Excel in order to survey data from multiple respondents before being sent back. The questionnaire was sent by e-mail to the captains of 24 ships selected, by the shipping companies' management, to participate in the survey. All ships were either in lay-up or in transit. When everyone wanting to participate in the study had been given the opportunity to do so, the questionnaire was returned. Everyone on the ship was invited to participate in the survey, and given information that the study were voluntary, all information would be kept anonymous, confidential and no individual answers would be relayed to the shipping company. The participants were also informed that a summary report would be given to the shipping company at the conclusion of the study.

A total of 215 seafarers completed the questionnaire resulting in a calculated response rate of 35%. Detailed demographics are shown in table 1. Almost all respondents were male (94.4%) and most had completed College or University (68.8%). The age of the sample were fairly distributed with age group 25-29 (20.5%), 30-34 (14.0%) and 50 years or older (20.0%) being most populated. The main nationality represented in the sample are Filipino (63.3%) followed by Norwegian (21.4%) and Indian (11.6%). Most respondents were married (68.8%) and about one third were single (28.8%). The sample has more officers and managers (45.1%) than ratings or subordinates (40.5%) and there were some who did not respond (14.4%). Most worked on carrier ships (Roll-on-Roll-off 49.8%, Pure-Car-Truck-Carrier 28.4%) and a few

on passenger ships or cruise ships (11.2%). The sample shows most respondents working on deck (41.9%) and engine (33.0%), followed by catering (8.8%) and on the bridge (8.4%).

Table 1: Detailed demographics

Variable	No. Respondents (percent)	Variable	No. Respondents (percent)
Gender		*General education*	
Male	203 (94,4%)	Basic	16 (7,4%)
Female	3 (1,4%)	High School	14 (6,5%)
Missing	9 (4,2%)	Vocation School	34 (15,8%)
Age		College / Univeristy	148 (68,8%)
20 or younger	12 (5,6%)	Missing	3 (1,4%)
20-24	21 (9,8%)	*Tyoe of ship*	
25-29	44 (20,5%)	PCTC	61 (28,4%)
30-34	30 (14,0%)	Ro-Ro	107 (49,8%)
35-39	25 (11,6%)	Passenger / Cruise	24 (11,2%)
40-44	17 (7,9%)	Other	18 (8,5%)
45-49	23 (10,7%)	Missing	5 (2,3%)
50 or older	43 (20,0%)	*Superior or subordinate*	
Missing	0 (0,0%)	Officer / Manager	97 (45,1%)
Nationality		Rating / Subordinate	87 (40,5%)
Norwegian	46 (21,4%)	Missing	31 (14,4%)
Filipino	136 (63,3%)	*Position*	
Indian	25 (11,6%)	Deck	90 (41,9%)
Other	7 (3,3%)	Engine	71 (33,0%)
Missing	1 (0,5%)	Ship assistant	1 (0,5%)
Relationship status		Apprentice/Cadet	8 (3,7%)
Single	62 (28,8%)	Bridge	18 (8,4%)
Married / Living partner	148 (68,8%)	Catering	19 (8,8%)
Divorced	5 (2,3%)	Other	4 (1,9%)
Missing	0 (0,0%)	Missing	4 (1,9%)
Total	215 (100%)	*Total*	215 (100%)

Material

The questionnaire used in this study was developed for DNV in order to examine the work environment on board ships. In order to create the questionnaire a total of 20 interviews were conducted. Three interviews with management in two shipping companies and five interviews with key personnel at DNV were conducted for background information on the challenges within the shipping industry. 12 seafarers were interviewed on board ships to get their views on the work environment and life on board a ship to assess challenges, and what is most important for achieving a good work environment. These interviews were analyzed using

contextual content analysis, and questionnaire items were formulated from statements made by informants during the interviews. In addition, a selection of items from the DNV's Insight questionnaire was added in order to assess safety behavior, attitudes and commitment. See appendix A for questionnaire items. The finished questionnaire was reduced to 94 items (89 scale items and 15 demographic items).

The questionnaire was created in Microsoft Excel in order to be distributed by e-mail, and can hold survey data from multiple respondents. Seven dimensions (Safety status, Job satisfaction, Stress, Working conditions, Goals, Relationship with co-workers, and Relationship with superiors) were analyzed through exploratory factor analysis, with principal component analysis and direct oblimim rotation, and a total of 22 factors were identified. The Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity were both acceptable for all analysis.

Questionnaire properties

Safety status is used in this study as an alternative to safety culture and safety climate, as these constructs vary in definition and usage. Safety status is here defined as the self-reported perceived status of safety, in regards to compliance with rules and regulations, attitudes towards said rules and regulations, and commitment to overall safety. The questionnaire properties is presented below.

Internal consistency of the scales is shown in table 2, where the majority was found to have an acceptable alpha ($\alpha > .70$) (Nunnally & Bernstein, 1994), and some were found to be adequate (Tabachnick & Fidell, 1996); Commitment ($\alpha=.57$), Worry ($\alpha=57$), Feeling of safety ($\alpha=.50$), Monetary loyalty ($\alpha=.66$), Goodwill ($\alpha=.56$), Intent to leave ($\alpha=.55$), and Emotional involvement ($\alpha=.68$). These factors all consists of 2-3 items, which can have a negative impact on the alpha level. However, all the scales have an acceptable average inter-item correlation ($r > .30$) (Field, 2009), and is therefore included in the analysis. In addition Schmitt (1996) states that an alpha ranging as low as .40 can still be meaningful. For items and factor loadings see appendix A.

Table 2: Internal consistency and average item-total correlation

	α	Average inter-item correlation	Items
Safety status	.785	.44	12
Compliance	.743	.49	6
Attitudes	.759	.60	3
Commitment	.568	.39	3
Job satisfaction			
Rewards and benefits	.827	.63	5
Co-workers	.871	.73	4
Task	.840	.68	4
Meaningfulness	.702	.52	3
Worry	.573	.39	3
Feeling of safety	.501	.34	2
Stress			
Resp. & decisions	.810	.63	4
Work strain	.815	.64	4
Physical nuisance	.841	.71	3
High risk tasks	.919	.85	2
Isolation	.797	.66	2
Variation	-	-	1
Working conditions			
Monetary loyalty	.658	.49	2
Goodwill	.564	.86	2
Intent to leave	.551	.39	2
Goals			
Feeling cared for	.768	.51	6
Relationship with co-workers			
Openness	.714	.51	4
Social grouping	.770	.63	2
Working with opposite gender	.709	.55	2
Emotional involvement	.683	.52	2
Relationship with superiors			
Commitment	.817	.61	5
Trust	.748	.55	4
N	207-215		
Likert-scale range	1-5		

The inter-dimensional correlations are shown in table 3, and the subscales used in the analysis can be found in appendix B. The discriminant validity was found to be satisfactory (low – med correlation). All subscales and dimensions had a correlation below .60.

Table 3: Pearson's correlations between the main factors and safety factors

	1	A	B	C	2	3	4	5	6
1. Safety status	-								
A. Safety - Compliance	.88**	-							
B. Safety - Attitudes	.75**	.44**	-						
C. Safety - Commitment	.55**	.34**	.18**	-					
2. Job satisfaction	.50**	.54**	.30**	.14	-				
3. Stress	.21**	.24**	.18*	-.05	.42**	-			
4. Working conditions	.18**	.25**	.08	-.01	.14*	-.08	-		
5. Relationship with co-workers	.45**	.37**	.27**	.40**	.33**	.13	-.02	-	
6. Relationship with superiors	59**	.57**	.34**	.37**	.54**	.20**	.08	.34**	-

n = 185-215

* p < .05; ** p < .01

Statistical Analysis

Statistical analyses were conducted using mainly SPSS 17.0 (Statistical Package for the Social Sciences, now PASW). In order to test H_1, a hierarchical block regression was performed on the entire sample using Safety status as criterion variable. Job satisfaction was added in the first block, as it is thought to be the general over all attitudes produced by the work environment, and is affected by the other work environment variables in the analysis. Stress and working conditions were added in the second block, followed by goals, relationship with co-workers and relationship with superiors. Demographical variables age, nationality, relationship status and general education were added in the fourth block.

To test H_2, the same setup as above was used with a selection variable of being a superior or a subordinate. In addition, t-tests were conducted in order to examine if there were significant differences between superior/officers and subordinates/ratings in the regression analysis. The formula used can be found in Howell (2002), and is shown below:

$$t = \frac{b_1 - b_2}{\sqrt{s_{b_1}^2 + s_{b_2}^2}}$$

When checking for multi-collinearity, none of the correlations between predictor variables were above .6 as recommended by Skog (2005). According to Field (2009) a VIF larger than 10 and a tolerance lower than .3 is an indicator of multi-collinearity, and Brace, Kemp, and Snelgar (2003) use a tolerance above .1 as a criteria for being acceptable. Table 4 shows the

VIF's and tolerances for the three models, and all models were found to be acceptable. The model for subordinates/ratings however, has four variables with a tolerance lower than .3 and two variables lower than .2, of 26 variables in total, indicating a degree of multi-collinearity within acceptable levels.

Table 4: VIF and tolerance values for the three regression models

	VIF		Tolerance	
	Max	Average	Min	Average
Sample	2.537	1.780	.394	.593
Superiors/Officers	3.686	2.236	.271	.481
Subordinates/Ratings	5.751	3.061	.174	.366

In order to explore the difference in predictors of the three safety dimensions (Compliance, Attitudes, Commitment) for superiors/officers and subordinates/ratings, a stepwise regression analysis were conducted. The graphical presentation is calculated using the following formula:

$$R^2 * 100\% = \sum_{i=1}^{n} \beta * r * 100$$

Results

The following two tables (table 5 and 6) show basic descriptive statistics for the sample and the two groups separately. Table 5 shows the mean score and standard deviation for the sample, superiors/officers, and subordinates/ratings, and table 6 shows the percentage distribution of low, neutral, and high scores on the same factors and dimensions. The tables shows the majority of respondents rating high on perceived safety, job satisfaction, satisfaction with working conditions, feeling cared for by the shipping company, and satisfaction with the relationship with co-workers and superiors, along with a low score on feeling of stress. There are also some differences between the two groups worth highlighting. More superiors and officers rate higher on the perceived commitment to safety, feeling of physical- and job safety, feeling of work strain, amount of high risk tasks, and emotional involvement in co-workers compared to subordinates and ratings, who in turn rate higher on

attitudes towards safety and satisfaction with rewards and benefits.

Table 5: Mean and standard deviations for safety and work environment factors for the entire sample, superiors/officers and subordinates/ratings.

	Sample		Superiors/officers		Subordinates/ratings	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Safety status	3.83	0.44	3.81	0.44	3.89	0.42
Compliance	3.94	0.47	3.90	0.46	4.03	0.45
Attitudes	3.60	0.81	3.51	0.82	3.73	0.82
Commitment	3.85	0.57	3.92	0.49	3.78	0.61
Job satisfaction	3.65	0.37	3.63	0.35	3.68	0.38
Rewards and benefits	3.50	0.66	3.41	0.67	3.64	0.64
Co-workers	4.00	0.47	4.02	0.40	4.01	0.41
Task	3.94	0.52	3.93	0.46	3.93	0.59
Meaningfullness	3.45	0.64	3.41	0.64	3.46	0.67
Worry	3.71	0.52	3.66	0.55	3.77	0.45
Feeling of safety	2.97	0.76	3.08	0.70	2.80	0.81
Stress	3.50	0.54	3.46	0.55	3.58	0.53
Responsebility and desicions	3.46	0.71	3.43	0.70	3.53	0.68
Work strain	3.26	0.67	3.14	0.73	3.39	0.62
Physical nuisance	3.50	0.85	3.57	0.83	3.52	0.85
High risk tasks	3.81	1.19	3.53	1.25	4.17	1.01
Isolation	3.90	1.03	4.05	1.05	3.75	0.98
Variation	3.33	0.78	3.40	0.75	3.30	0.83
Working conditions	3.42	0.46	3.37	0.45	3.48	0.47
Monetary loyalty	3.21	0.91	3.11	0.98	3.32	0.80
Goodwill	3.85	0.63	3.77	0.67	3.92	0.59
Intent to leave	3.19	0.78	3.24	0.81	3.18	0.76
Goals - Feeling cared for	3.47	0.67	3.53	0.68	3.43	0.62
Relationship with co-workers	3.87	0.40	3.94	0.37	3.79	0.40
Openness	4.02	0.45	4.06	0.41	3.99	0.42
Social grouping	4.08	0.64	4.16	0.62	4.02	0.67
Openness cross-gendered workplace	3.76	0.70	3.77	0.75	3.70	0.67
Emotional involvement	3.46	0.72	3.61	0.68	3.24	0.69
Relationship with superiors	3.80	0.45	3.79	0.42	3.88	0.46
Commitment	3.74	0.54	3.70	0.52	3.83	0.52
Trust	3.89	0.49	3.90	0.41	3.93	0.54
	N = 198-215		n = 91-97		n = 79-87	

Table 6: Percent of low, neutral and high scores on safety- and work environment factors for superiors/officers and subordinates/ratings.

	Superiors and officers				Subordinates and ratings			
	Low	Neutral	High	Missing	Low	Neutral	High	Missing
Overall perceived safety	-	16.5	77.3	6.2	-	10.3	81.6	8.0
Perceived safety compliance	-	14.4	82.5	3.1	-	8.0	88.5	3.4
Attitudes towards safety	10.3	38.1	51.5	-	6.9	27.6	64.4	1.1
Perceived commitment to safety	-	16.5	79.4	4.1	-	31.0	64.4	4.6
Overall job satisfaction	1.0	29.9	66.0	3.1	1.1	21.8	73.6	3.4
Satisfaction with rewards and benefits	9.3	38.1	49.5	3.1	6.9	24.1	67.8	1.1
Satisfaction with co-workers	1.0	2.1	96.9	-	1.1	3.4	93.1	2.3
Satisfaction with tasks	1.0	10.3	88.7	-	3.4	5.7	90.8	-
Perceived meaningfullness of tasks	9.3	42.3	48.5	-	9.2	36.8	54.0	-
Worry about work off shift	68.0	23.7	6.2	2.1	77.0	21.8	-	1.1
Feeling of physical- and job safety	32.0	32.0	36.1	-	48.3	27.6	24.1	-
Overall feeling of stress	48.5	42.3	3.1	6.2	44.8	43.7	2.3	9.2
Stressfull responsebilities and desicions	48.5	39.2	9.3	3.1	54.0	36.8	8.0	1.1
Feeling of work strain	34.0	43.3	22.7	-	40.2	52.9	5.7	1.1
Amount of physical nuisance	56.7	29.9	13.4	-	46.0	42.5	11.5	-
Amount of high risk tasks	55.7	14.4	26.8	3.1	78.2	6.9	11.5	3.4
Feeling of isolation	76.3	9.3	14.4	-	63.2	20.7	16.1	-
Variation in tasks	9.3	47.4	42.3	1.0	10.3	46.0	37.9	5.7
Overall satisfaction with working conditions	3.1	50.5	44.3	2.1	1.1	41.4	51.7	5.7
Money is reason for having this job	40.2	12.4	45.4	2.1	27.6	13.8	56.3	2.3
Goodwill towards company	5.2	12.4	81.4	1.0	3.4	11.5	85.1	-
Intent to leave	46.4	25.8	25.8	2.1	36.8	36.8	23.0	3.4
Goals - Feeling cared for by company	10.3	28.9	57.7	3.1	5.7	40.2	50.6	3.4
Satisfaction with relationship with co-workers	-	8.2	88.7	3.1	-	14.9	83.9	1.1
Openness towards co-workers	-	4.1	93.8	2.1	-	5.7	94.3	-
Social grouping amongst co-workers	3.1	4.1	92.8	-	4.6	10.3	83.9	1.1
Openness towards cross-genderd workplace	8.2	13.4	77.3	1.0	8.0	18.4	73.6	-
Emotional involvement in co-workers	11.3	16.5	72.2	-	19.5	34.5	46.0	-
Satisfaction with relationship with superiors	-	20.6	78.4	1.0	-	16.1	78.2	5.7
Perceived commitment from superiors	1.0	29.9	68.0	1.0	1.1	21.8	74.7	2.3
Trust in superiors	1.0	7.2	90.7	1.0	1.1	11.5	83.9	3.4
	n = 97				n = 87			

In order to explore the predictors of Safety status, three hierarchical linear block regression analyses were performed. Table 7 shows the results from the analysis based on the entire sample, whilst table 8 shows the results of separate analyses for superiors/officers and subordinates/ratings. The regression analysis for the entire sample (table 7) show Job satisfaction explaining 32% ($F_{change\ (6,\ 155)}$ = 12.14, p < .001) of the variance and adding Stress and Working conditions explaining 45% ($F_{change\ (9,\ 146)}$ = 3.83, p < .01) of the variance. When

including Goals, Relationship with co-workers and Relationship with superiors 58% ($F_{change\ (7, 137)} = 6.20$, $p < .001$) of the variance is explained, and when adding demographic variables (age, nationality, relationship status and general education) 62% ($F_{change\ (4, 133)} = 3.70$, $p < .01$) of the variance in the model is explained. All blocks significantly contributed to added explained variance. The variables Co-workers ($\beta = .24$, $p < .01$), Feeling of safety ($\beta = -.17$, $p < .01$), Goodwill ($\beta = .23$, $p < .01$), Openness ($\beta = .29$, $p < .001$), Commitment ($\beta = .23$, $p < .01$), and General education ($\beta = .14$, $p < .05$) were found to have significant predictive power when all blocks were added. Thus supporting the first hypothesis (H_1).

Table 7: Hierarchical block regression analysis with Safety status: superiors/officers and subordinates/ratings

	Predictors	Block 1 β	Block β	Block 3 β	Block 4 β
Job satisfaction	Rewards & benefits	.11	-.02	-.14	-.15
	Co-workers	.45***	.38**	.21*	.24**
	Task	-.11	-.15	-.09	-.09
	Meaningfulness	.18**	.23**	.11	.10
	Worry	-.04	.01	-.01	-.04
	Feeling of safety	-.19**	-.14*	-.18**	-.17**
Stress	Resp. & decisions		-.01	.00	.05
	Work strain		-.03	.01	-.02
	Physical nuisance		.02	.03	.03
	High risk tasks		.02	.03	.04
	Isolation		-.02	-.01	.00
	Variation		.03	.03	.05
Working conditions	Monetary loyalty		.06	.03	.00
	Goodwill		.39**	.20**	.23**
	Intent to leave		-.08	-.04	-.03
Goals	Feeling cared for			.11	.11
Relationship with co-workers	Openness			.31***	.29***
	Social grouping			.01	.01
	Working with opposite gender			-.06	-.05
	Emotional involvement			-.09	-.10
Relationship with superiors	Commitment			.25**	.23**
	Trust			.06	.04
Demographic	Age				-.02
	Nationality				.12
	Relationship status				-.06
	Education				.14*
	R^2	.32	.45	.58	.62
	Adj. R^2	.29	.39	.51	.55
	F_{change}	12.14***	3.83*	6.20***	3.70**
	N	172			

*p < .05; **p < .01; ***p < .001

The regression analysis for superiors/officers and subordinate/ratings is shown in table 8. For officers and ratings job satisfaction explains 41% ($F_{change\ (6,\ 71)} = 8.28$, $p < .001$) of the variance in safety status, and adding Stress and Working conditions explains 60% ($F_{change\ (9,\ 62)} = 3.21$, $p < .01$) of the variance. When including Goals, Relationship with co-workers and Relationship with superiors 74% ($F_{change\ (7,\ 53)} = 4.04$, $p < .01$) of the variance is explained, and when adding demographic variables (age, nationality, relationship status and general education) 78% ($F_{change\ (4,\ 49)} = 2.39$, $p > .05$) of the variance in the model is explained. All blocks, except the demographic block, contributed significantly to added explained variance. Co-workers ($\beta = .28$, $p < .05$), Feeling of safety ($\beta = -.24$, $p < .01$), Working with opposite gender ($\beta = -.24$, $p < .01$), Trust in superiors ($\beta = .31$, $p < .01$) , Nationality ($\beta = .17$, $p < .05$), and Education ($\beta = .21$, $p < .05$) where found to have significant predictive power on Safety status.

For subordinates/ratings the table show Job satisfaction explaining 29% ($F_{change\ (6,\ 56)} = 3.82$, $p < .01$) of the variance. When adding Stress and Working conditions the model explains 54% ($F_{change\ (9,\ 47)} = 2.93$, $p > .01$) of the variance, and including Goals, Relationship with co-workers and Relationship with superiors leads to 70% ($F_{change\ (7,\ 38)} = 3.16$, $p < .01$) of the variance explained. When finally adding demographic variables (age, nationality, relationship status and general education) the entire model explain 73% ($F_{change\ (4,\ 34)} = 0.97$, $p > .05$) of the variance. Similar to the analysis for superiors and officers only block 1 (Job satisfaction) and block 2 (Goals, Relationship with co-workers, and Relationship with superiors) where found to significantly contribute to explained variance. Variables found to be significant association with the criterion variable were Worry ($\beta = -.43$, $p < .05$), Feeling of safety ($\beta = -.30$, $p < .05$), Monetary loyalty ($\beta = .-41$, $p < .01$), Goodwill ($\beta = .30$, $p < .05$), and Openness towards co-workers ($\beta = .39$, $p < .01$).

Many differences between the two groups emerged from the analysis, as shown in table 8, and Feeling of safety where the only factor significant and with high predictive power for both groups. Satisfaction with co-workers, Working with the opposite gender, Trust in superiors, Nationality, and Education where only significant for superiors and officers and all factors except for Satisfaction with co-workers had more predictive power then for subordinates and ratings. Worry, Monetary loyalty, Goodwill, and Openness towards co-workers where significant and with more predictive power for subordinates/ratings. However, when testing these differences with t-tests (table 9), significant differences were only found in four of the nine factors. Work strain also emerged as a significant difference between the two groups, but

was not significant for any of the two groups in the regression analysis, despite having a high predictive power for subordinates and ratings. Working with the opposite gender ($t_{(158)}$ = -2.48, p < .05), and Trust in superiors ($t_{(158)}$ = 2.57, p < .05) had significantly more predictive power for superiors and officers, whilst Worry ($t_{(158)}$ = 2.36, p < .05), Work strain ($t_{(158)}$ = -2.09, p < .05), and Monetary loyalty ($t_{(158)}$ = 3.10, p < .001) had significantly more predictive power for subordinates and ratings when all blocks were added. With the prediction of finding differences between the two groups (H_2), this hypothesis was supported.

Table 8: Hierarchical block regression analysis with Safety status, showing β for superiors/officers and subordinates/ratings

	Predictors	Block 1		Block 2		Block 3		Block 4	
		sup/off β	sub/rat β	sup/off β	sub/rat β	sup/off β	sub/rat β	sup/off β	sub/rat β
Job satisfaction	Rewards & benefits	-.06	.22	-.14	-.04	-.18	-.07	-.20	-.05
	Co-workers	.40***	.66***	.29**	.61***	.20*	.27	.25*	.32
	Task	-.02	-.23	-.03	-.27	-.05	-.08	-.05	-.03
	Meaningfulness	.38***	.00	.41***	-.02	.25*	-.06	.20	-.06
	Worry	-.06	-.25	.04	-.29	.04	-.35*	.03	-.43*
	Feeling of safety	-.26**	-.18	-.19*	-.31*	-.24**	-.28*	-.24**	-30*
Stress	Resp. & decisions			-.01	-.05	.00	-.11	.02	-.05
	Work strain			-.15	.27	-.07	.36*	-.09	.30
	Physical nuisance			-.07	.09	-.06	.05	-.05	.07
	High risk tasks			-.01	-.05	.08	-.10	.10	-.15
	Isolation			.11	-.15	.10	-.11	.07	-.03
	Variation			.07	.15	.04	.10	.07	.11
Working conditions	Monetary loyalty			.16	-.30*	.16	-.31*	.13	-.41**
	Goodwill			.39***	.49***	.09	.33**	.14	.30*
	Intent to leave			-.19	.05	-.09	.02	-.03	.05
Goals	Feeling cared for					.11	.16	.15	.09
Relationship with co-workers	Openness					.19	.41**	.16	.39**
	Social grouping					.08	-.02	.05	-.03
	Working with opposite gender					-.22*	.10	-.24**	.11
	Emotional involvement					.03	-.04	.03	-.06
Relationship with superiors	Commitment					.07	.23	.03	.20
	Trust					.29**	-.14	.31**	-.10
Demographic	Age							-.01	-.05
	Nationality							.17*	.04
	Relationship status							.04	.01
	Education							.21*	.20
	R²	.41	.29	.60	.54	.74	.70	.78	.73
	Adj. R²	.36	.21	.50	.40	.63	.54	.66	.54
	F$_{change}$	8.28***	3.82**	3.21**	2.93**	4.04***	3.16**	2.39	0.97

N$_{sup/off}$ = 78   N$_{sub/rat}$ = 63

*p < .05; **p < .01; ***p < .001

Table 9: T-tests of regression coefficients between superiors/officers and subordinates/ratings

	Safety $t_{(158)}$
Rewards & benefits	-0.77
Co-workers	-0.29
Task	-0.07
Meaningfulness	1.61
Worry	2.36*
Feeling of safety	0.43
Resp. & decisions	0.41
Work strain	-2.09*
Physical nuisance	-0.88
High risk tasks	1.56
Isolation	0.65
Variation	-0.25
Monetary loyalty	3.10***
Goodwill	-0.99
Intent to leave	-0.51
Feeling cared for	0.33
Openness	-1.36
Social grouping	0.43
Working with opposite gender	-2.48*
Emotional involvement	0.55
Commitment	-0.76
Trust	2.57*
Age	0.51
Nationality	0.75
Relationship status	0.11
Education	0.07

*p < .05; **p < .01; ***p < .001

In order to explore the difference in predictors of the three safety dimensions (Compliance, Attitudes, Commitment) for superiors/officers and subordinates/ratings, a stepwise regression analysis were conducted. Figure 1 shows the results from the analysis. The blocks are stacked by factors, shown by the gray blocks, in order from the bottom; Job satisfaction, Stress, Working conditions, Goals, Relationship with co-workers, and Relationship with superiors. Demography variables are not marked by gray blocks and reside at the top.

Figure 1 show 68.4% of Operational atmosphere for superiors/officers being explained by the work environment and demographical variables, whilst for subordinates/ratings explained variance is 50.5%. Attitudes is explained with 42.4% for superiors/officers and 58.2% for subordinated/ratings, and in Commitment the work environment for superiors/officers and subordinates/ratings explain 33.0% and 32.7% respectively.

In Operational atmosphere for superiors/officers Co-workers (10.0%, $t_{(78)} = 2.57$, p < .05), Feeling of safety (8.2%, $t_{(78)} = -3.83$, p < .001), Responsibility and decisions (3.5%, $t_{(78)} = 2.06$, p < .05), Openness (18.6%, $t_{(78)} = 4.17$, p < .001), Working with opposite gender (4.8%, $t_{(78)} = -2.88$, p < .05), Trust in superiors (10.1%, $t_{(78)} = 2.71$, p < .01), Nationality (2.7%, $t_{(78)} = 2.19$, p < .05), and Education (4.1%, $t_{(78)} = 2.56$, p < .05) contribute significantly. For subordinates/ratings, Work strain (4.7%, $t_{(64)} = 2.29$, p < .05), Openness (26.6%, $t_{(64)} = 4.35$, p < .001), and Commitment (19.2%, $t_{(64)} = 3.26$, p < .001) contribute significantly to explained variance. This results in a total significant explained variance of 62.0% for superiors/officers and 50.5% for subordinates/ratings.

Rules and regulations for superiors/officers had a total explained variance of 42.4%, and a significantly explained variance of 37.1% comprised of Meaningfulness (14.8%, $t_{(78)} = -3.27$, p < .01), Feeling of safety (6.8%, $t_{(78)} = -2.43$, p < .05), Goodwill (10.0%, $t_{(78)} = 3.16$, p < .01), Nationality (2.5%, $t_{(78)} = 2.42$, p < .05), and Education (6.3%, $t_{(78)} = 2.44$, p < .05). For subordinates/ratings the total variance explained was 58.2% with all variables, Worry (1.1%, $t_{(64)} = -3.37$, p < .01), Feeling of safety (9.4%, $t_{(64)} = -4.10$, p < .001), Variation (2.0%, $t_{(64)} = 2.60$, p < .01), Monetary loyalty (7.6%, $t_{(64)} = -3.90$, p < .01), Goodwill (11.0%, $t_{(64)} = 3.16$, p < .01), Feeling cared for (16.2%, $t_{(64)} = 3.69$, p < .01), Openness (5.6%, $t_{(64)} = 2.06$, p < .01), and Education (7.5%, $t_{(64)} = 2.50$, p < .01), contributing significantly to explained variance.

In Commitment all variables contribute significantly to explained variance for both groups. For superiors and officers, Work strain (9.4%, $t_{(78)} = -2.81$, p < .01), Working with opposite gender (3.8%, $t_{(78)} = -2.07$, p < .05), Trust (19.8%, $t_{(78)} = 4.36$, p < .001) giving a total significant explained variance of 33.0%. Whilst for subordinates and ratings, Worry (4.3%, $t_{(64)} = -3.47$, p < .001), Openness (13.1%, $t_{(64)} = 2.69$, p < .01), Working with opposite gender (6.2%, $t_{(64)} = 2.48$, p < .05), and Commitment (9.1%, $t_{(64)} = 2.44$, p < .05) contribute significantly to explained variance, giving a total significant explained variance of 32.7%.

Figure 1: Work environment variables' unique explained variance on each Safety status factor for superiors/officers and subordinates/ratings.
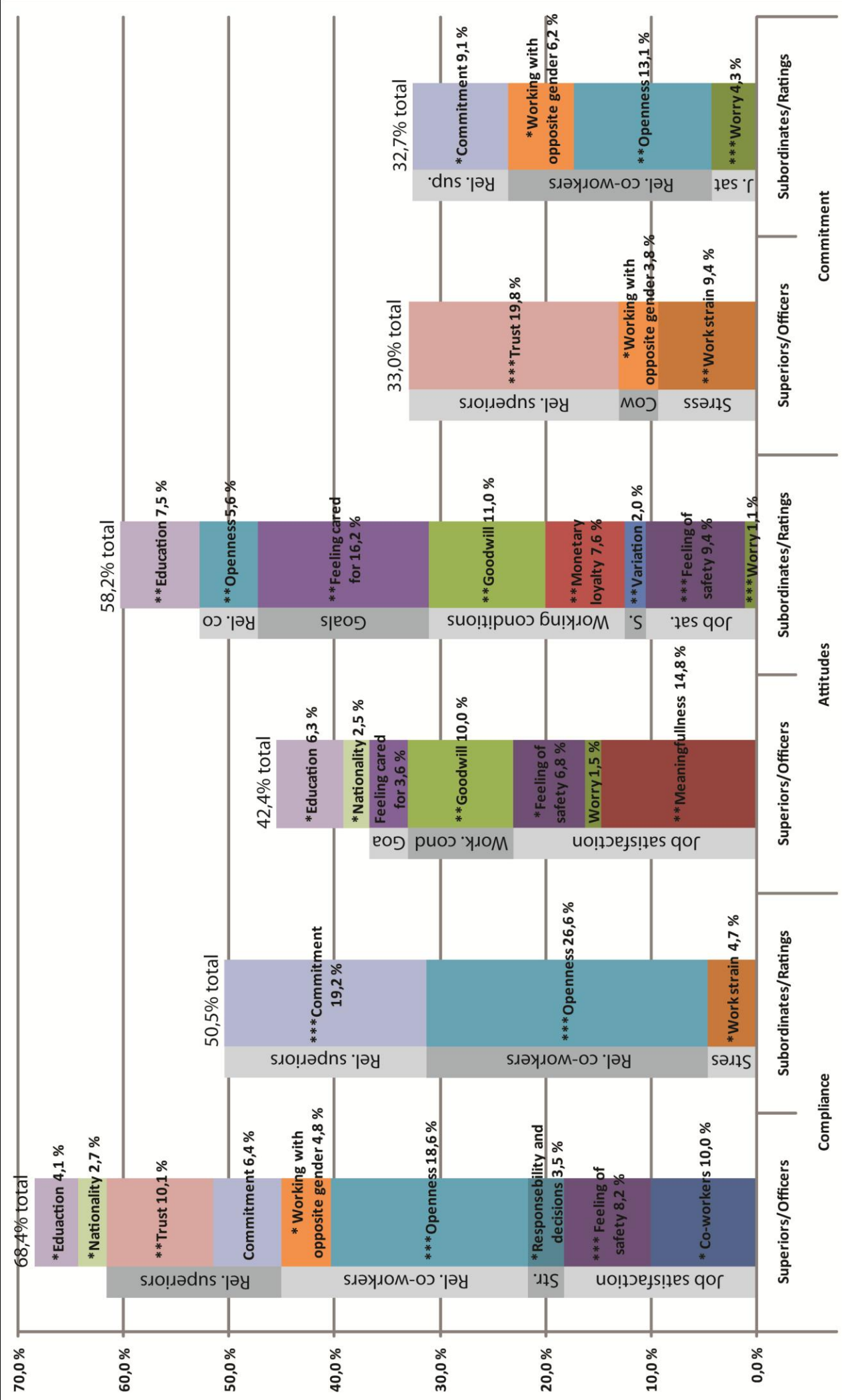
* p < .05; ** p < .01; ***p < .001

Discussion

The perceived work environment

Overall, the seafarers in this study seem to be content with the perceived work environment on board the ships in this study. The majority of scores rated the work environment variables from neutral to high; although there are variations and some seafarers also rated some variables at the lowest possible score. Superiors and officers reported to have a high trust in their superiors, and subordinates and ratings were very satisfied with their tasks. Both superiors/officers and subordinates/ratings were especially satisfied with their co-workers and and the openness between them. Both shipping companies in this study state that the social well-being of their employees is important to them, and create opportunities were the seafarers get time to socialize and get to know each other. The high scores on satisfaction with co-workers could be a result from these prioritizations.

On the other side, about 1/3 of superiors/officers and half of the subordinates/ratings reported to have low feeling of physical safety and job safety. About a quarter of superiors and officers felt a high work strain and high amount of high risk tasks, and about half of both groups also reported to have a high intent to leave. This intent to leave may be partially explained by the scores on monetary loyalty, where almost half of superiors and officers and just over half of subordinates and ratings report high on the salary being the main reason to keep their job. If a better offer would arrive from another shipping company this reason would vanish.

Work environment as a predictor of safety status regression

Explaining 62% of the variance in safety status for the entire sample, and 78% and 73% of the variance explained for superiors/officers and subordinates/ratings respectively, this model explain much of the variance in Safety status. Differences between the significance and size of predictors for superiors/officers and subordinates/ratings did emerge, and even more differences appeared when investigating the three safety factors Compliance, Attitudes, and Commitment in the Safety status dimension. As expected, the work environment was found to be a significant predictor of Safety status, for both superiors/officers, subordinates/ratings,

and for the entire sample. However, there is need for further exploration and studies in order to create a model explaining the associations between the work environment and safety status.

Work environment variables predicting Safety status

For the entire sample, high satisfaction with co-workers and openness with co-workers were significant predictors of better safety status. This is in accordance with earlier findings (Antonsen, 2009; Shannon, et al., 1997). If you develop a caring relationship with your co-workers one could assume that you would want to keep them safe. This could also relate to SCB, where better satisfaction with the workplace would lead to a more caring towards the company and its interests (Håvold & Nesset, 2009; K. Mearns & Reader, 2008). High goodwill towards the company and superiors and officers' commitment towards the company and safety where also significant predictors of better safety status, which is also in accordance with earlier findings (Hofmann & Morgeson, 1999; Høivik, et al., 2007; Rundmo, 1994; Shannon, et al., 1997), and SCB along with POS (Mearns & Reader, 2008; Rhoades & Eisenberger, 2002). Feeling of safety was also a significant predictor of safety status, as found in earlier research (perceived risk; Rundmo, 1995) and (job insecurity; Ashford, et al., 1989; Probst & Brubaker, 2001). Perceived risk could be explained by the general desire of self-preservation in human beings, where risk is perceived steps are taken to reduce those risks and increase the chances of nothing dangerous happening. Whereas job insecurity can be related to SCB, with job insecurity leading to lower organizational commitment and satisfaction, resulting in less desire to please the company and to protect its interests.

Regarding the demographical variables General education was a significant predictor of safety status, but in earlier research, this association was not significant. This is opposite to age, which has been found to be a significant predictor of safety in earlier research, but was not significant in this analysis (Shannon, et al., 1997).

Interestingly, stress factors were not found to be significant predictors of safety status. According to earlier findings one would expect such factors as the burden of responsibility and decisions and work strain to be a predictor for safety status. When comparing the two groups superiors/officers and subordinates/ratings, work strain becomes a significant difference and explain significantly more variation for subordinates and ratings. A possible explanation as to why age and stress where not found to be significant in this analysis could

be the sample size. As the sample size of this study is fairly small, one could expect some changes in the analysis if using a larger sample.

Group differences between superiors/officers and subordinates/ratings

Many of the significant predictors of safety status changed when the hierarchical block regression where conducted separately on superiors/officers and subordinates/ratings. The amount of explained variance also increased for both groups compared. The block with demographical variables were however not significant. This support the assumption that sub-cultures has emerged on board the ships, where the work environment is differently associated with safety status between the two groups.

For both groups Feeling of safety were a significant predictor. This could be explained with the need for safety and with survival being a basic human desire regardless of culture. Satisfaction with co-workers could also be argued to be a general determinant of satisfaction with the job, and applying earlier SCB research – should be a predictor for safety status. This variable however, was only significant for superiors and officers, despite being a larger predictor for subordinates and ratings. This could be explained by the small sample size but could also be a less important variable for subordinates and ratings.

In addition; attitudes towards working with the opposite gender, trust in superiors, nationality, and education significantly predicted safety status for superiors and officers, whilst worry, monetary loyalty, goodwill towards the company, and openness amongst co-workers were significant predictors for subordinates and ratings. As the grouping variable for the two groups is command, one could expect the differences in predictors to be explained by the different characteristics of being a superior/officer or subordinate/rating.

For superiors and officers, trust in superiors could be explained by the fact that they themselves also are superiors, and are expected to pass on orders to their own workers. This could result in a more conscious evaluation of the sensibility of the order, and competence of the superior issuing the order, compared to subordinates and ratings which are expected to follow orders regardless. Another explanation could be the distance and possibility of surveillance between the superiors giving the order and the person expected to follow said order. On board the ship, ratings have their immediate superior close by, but superiors often have their superiors based on shore. This could lead to trust being a larger predictor as it could

be comparatively easier to disregard an order. Nationality and education for superiors and officers could have a larger predictor as superiors and officers generally have higher education than subordinates and ratings, and also tend to be from a specific nationality. In this sample, the majority of superiors and officers are Indian, whilst the majority of subordinates and ratings are Filipino. Attitudes towards working with the opposite gender significantly contributed to explained variance in safety status for superiors and officers. This is an unexpected result, as there seem to be no apparent association between the two. Although, one possible explanation for this could be that as attitudes from leaders tend to rub off on those they supervise, superiors and officers are expected to stand as a good example for other employees. The strive to live up to the expectations of a good role model could be reflected in their attitudes towards working with the opposite gender, by trying to maintain a good social climate, not being prejudges and keeping an open mind for changes.

For subordinates and ratings, worrying about the job of shift, monetary reasons for having the job, goodwill towards the company, and openness amongst co-workers are significant predictors of safety status. These variables could just as well be important for both groups as supported by earlier findings. One explanation for this could be that superiors and officers in fact do have these variables as predictors for safety status, but the additional 'burden of command' make other variables more prominent, and therefore downplays the role of these variables. This theory is partially supported by the significance test on the regression coefficients between the two groups. Where only worry, work strain, monetary loyalty, attitudes towards working with the opposite gender, and trust where found to be significantly different between the two groups. This however leaves the differences in worry and monetary loyalty left to be explained. One possible explanation for monetary loyalty is the time and effort put into achieving the present position within the shipping company. As superiors and officers have worked to get a position of command, they would most likely strive to keep this position or advance further up in rank. Subordinates and ratings on the other hand would probably have an easier time getting the same position as they have, should they choose to leave for another shipping company or experience not having their contract renewed. As monetary loyalty is a negative predictor of safety status, this could explain the effort subordinates and ratings feel they have to put into safety in order to perform 'adequately'. Worrying about work, off duty, however seem to have no apparent reason for being significantly different. If this could be explained by worrying being a distraction regarding

safety there seem to be no reason for this variable to be different for the two groups, and warrants further studying.

Predicting compliance, attitudes and commitment

The graph showing the work environment and demographical predictors for the three safety factors separately (figure 1) show compliance with rules and regulations to be dominated by job satisfaction and satisfaction with relationship with co-workers and superiors. This could be explained by SCB and POS theory, along with the culture generated from the social interactions reported in relationship with co-workers and superiors. Job satisfaction could lead to more positive attitudes towards the job, hence the company, resulting in a desire to 'give something back to the company in form of more safety for personnel and materials. The culture could dictate the norm which employees is expected to follow in order to not risk standing out or social exclusion.

Attitudes towards rules and regulations are mostly explained by job satisfaction, working conditions and company goals. This again fits well with the theory on SCB and POS where a mutual beneficial relationship is formed between the company and its employees. The shipping company prioritizes the well-being of the seafarers and the seafarers repay this by keeping acting safe and generally trying to help the company any way they can.

Commitment towards safety is the factor which is less explained by the work environment, with satisfaction with the relationship with superiors and officers explaining most of the variance. This could be the results of the same cultural standard of what is expected of the seafarers on board a particular ship. Commitment towards safety however, could be defined as a personal preference towards how to approach safety issues, and not defined as part of the job description. Commitment towards safety could therefore be explained by other factors than work environment and demographical properties.

Methodical challenges

With the respondents in this study consisting mainly of Filipino and Norwegian sailors from almost exclusively Roll-on-Roll-off- and Pure-Car-and-Truck Carriers, the results are not representative for the population of sailors. National differences in working conditions like

salary, contract length, and standards can result in differences in expectations and satisfaction with present circumstance. The different types of cargo carried by ships (e.g. containers, cars, chemicals) also pose different kinds of dangers, and consequently require different levels of safety measures. Generalizing the results across different ship types and other nationalities will therefore be difficult.

The differences between superiors/officers and subordinates/ratings may also have been affected by nationality culture. Some ships and shipping companies tend to have ratings recruited from countries with low-salary workforce like the Philippines, and officers from western countries (Norway and India in this sample). This could emphasize differences between the two groups, and national culture has also been found to have an effect on response styles (Silverthorne, 2005).

The size of the sample in this study was not optimal. The work environment factors were however able to explain much of the variations in the regression analyses and all sampling adequacy-tests were satisfactory in both the factor- and regression analyses.

Conclusion

Although there are some limitations, the results found in this study are believed to be useful when considering non-direct ways to improve upon the safety climate. The work environment was found to be strongly associated with safety status for seafarers in both superiors/officers and subordinates/ratings. Although, this is statistical prediction and does not imply causality, SCB and POS theory along with earlier findings give reason to suspect a causal association. This could make the work environment a key focus area when trying to further improve upon the safety attitudes, the level of safety commitment, and compliance with rules and procedures. Having superiors and officers that care and support their employees, emphasizing the company's commitment and prioritization of their employees, and ensuring an open and caring environment amongst co-workers could be an indirect way of improving on safety for all seafarers. The results also indicate the need for separate initiatives, with a focus on building trust between the management and the superiors/officers, and ensuring that the subordinates/ratings feel that management and their leaders care about them and give them satisfactory salaries. For shipping companies struggling to keep seafarers motivated to maintaining a safe work environment, these findings could prove useful.

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2ND Article of Master Thesis:

Compliance, attitudes, and commitment on board industrial ships and

the relation to undesired events and accidents

Abstract

The aim of the study was to examine the association between undesired events and accidents, and safety status. A total of 24 ships participated in this quantitative survey study with a total of 170 seafarers (71 superiors/officers, 71 subordinates/ratings), leaving a response rate of 35.5%. Testing the differences in the safety status on ships with high and low number of undesired events and accidents separately on the two groups, significant differences emerged only for superiors and officers; Significant differences were found in compliance when comparing high and low number of undesired events, and safety status and compliance when comparing high and low number of accidents. Significant differences were also found between superiors/officers and subordinates/ratings, in compliance and attitudes. Results indicate subordinates and ratings having a more accurate depiction of the safety status on board ships, however further studies is required before an conclusions can be made regarding both differences between superiors/officers and subordinates/ratings, and the associations between undesired events and accidents, and safety status. The study was conducted in collaboration with Det Norske Veritas (DNV).

KEYWORDS; Shipping, Safety, Attitudes, Commitment, Compliance, Undesired events, Accidents.

Introduction

Safety culture has been a highly researched topic for the last two decades, and most companies with high-risk labor is constantly monitoring, measuring and trying to improve upon the safety culture or safety climate. The belief that safety culture can be used as an alternate safety performance can be an appealing thought, and many researchers are trying to establish a connection between safety culture or safety climate and occupational injuries and accidents. The resulting associations found in studies vary. One of the possible explanations for such differences in results could be the state of safety culture and safety climate as a concept. Since the first emergence of safety culture (OECD Nuclear Agency Report in 1987) and safety climate (Research project on a locomotive plant in 1951 by Keenan, Kerr and Sherman, in Guldenmund, 2000) the theory has evolved, but the model is by some researchers still considered to be in its infancy (Guldenmund 2000). The definitions and operationalization of the concept has not yet reached an agreed upon standard, and hence neither a commonly accepted causal model of its dimensions (Fernandez-Muniz, Montes-Peon, & Vazquez-Ordas, 2007; Guldenmund, 2000). The relationship between safety culture and safety climate do also have different views. If it is part of the same construct, measures different part of a broader construct, one preceding the other or one measuring parts of the other (Guldenmund, 2000). There are however some consensus on which elements should be included in safety culture and safety climate when they are to be operationalized.

Safety climate is by many considered to be the 'visual' part of safety culture, and has constantly featured employees' attitudes or perceptions of safety – defined by Zohar (2000) as: "Essentially climate perceptions relate to 'procedures as patterns' whereby consistent procedures represent patterns that reflect the importance and prioritization of safety over competing goals". If safety climate consists of employee's attitudes and beliefs, it could also affect employee behavior. One can then argue that a positive safety climate will induce safe behavior from the employee's where employees are less likely to exhibit unsafe behavior, not take unnecessary risks, and comply with rules and regulations (Clarke, 2006b; Lund & Aarø, 2004; Seo, 2005), which according to Reason (1990) is the forerunner or accident involvement.

Relationship between the safety climate and occupational injuries and accidents

The overall safety climate has been found to be related to employee behavior and occupational injuries. Neal Griffin and Hart (2000) found safety climate to predict safety performance, and to be mediated by safety knowledge and safety motivation, and a study by Garcia, Boix and Canosa (2004) on industrial workers found lower levels of safety climate to be related to workers' unsafe behavior. This relationship has been supported in later studies were the perceived safety climate was found to predict employees' safety behavior (Clarke, 2006b; Garcia, et al., 2004; Seo, 2005).

As research on safety climate progresses, there are different parts of safety climate and safety culture that has been found to be associated with injuries and accidents in the work place. As attitudes, compliance and commitment can be considered a visible part of safety culture, these constructs are used as safety status in the present study. Safety status is defined as the self-reported perceived status of safety, consisting of the employees' perceptions of the attitudes to rules and regulations, along with perceived compliance with said rules and regulations and commitment towards overall safety.

Attitudes and compliance

Lawton and Parker (1998) reviewed studies of attitudinal and motivational predictors in relation to the commission of violation at work and found that employee attitudes to risk and safety correlated with accidents. A study on Chinese construction workers by Siu, Phillips and Leung (2004), showed that attitudes to safety predicted occupational injuries, but not accident rates. Vinodkumar and Bhasi (2009), in a study on chemical workers in India, found attitudes towards safety to be significantly higher in companies with a low accident rate. As mentioned, Reason (1990) describe unsafe behavior as the forerunner of accident involvement, and studies investigating behavior and accident rates have found evidence to support this connection.

Unsafe behavior has been found to be the best predictor for accident involvement (Hofmann & Stetzer, 1996; Lawton, 1998), accidents and near-misses (Mearns, Flin, Gordon, & Fleming, 2001), and predict injury and accident rates (Glasscock, Rasmussen, Carstensen, & Hansen, 2006). Likewise in the mentioned study by Vinodkumar and Bhasi (2009) also showed compliance with rules and regulations along with management commitment to safety

to be significantly higher in companies with a low accident rate. According to this, a ship consisting of sailors with a positive attitude to safety could be expected to behave in a safer manner and avoid unnecessary risks. It is therefore hypothesized that:

H_1: Ships with low number of undesired events and accidents will score higher on attitudes towards rules and regulations.

H_2: Ships with low number of undesired events and accidents is expected to score higher on compliance with rules and regulations

Commitment

Creating rules and regulation in order to facilitate a safer work environment and expecting employees to follow them is one of many ways companies try to improve on safety. Another way would be to motivate the employees to actively make evaluations and decisions on safety as they perform their tasks. An employees that is committed towards safety, takes initiatives, notifies superiors on deficiencies or fault in safety and consciously make decisions on how to perform their work in a safe manner, in addition to caring about what is best for the company could be argued to be contributing to making the workplace safer. Such committed employees would, to a company and their co-workers, be valuable resources. Research within organizational- and safety commitment has shown them to be associated with occupational injuries and accidents. For example, a longitudinal study on offshore platforms in the North Sea by Mearns, Whitaker and Flin (2003), found management commitment towards safety to be significantly associated with official accident statistics. But in order to investigate commitment, new constructs such as Safety Citizenship Behavior (SCB) and Perceived Organizational Support (POS) has been created.

SCB is a relatively new concept and is demonstrated by employees taking actions like helping co-workers, promoting safety programs, demonstrating initiative, and suggesting changes for improving safety. Safety citizenship behavior has been found to correlate ($r = .47$ to $r = .64$) with compliance (Didla, Mearns, & Flin, 2009). Clarke (2006a) found high levels of SCB and compliance to lead to a reduction in accidents. Similar constructs to SCB has been found to have an effect on safety performance, and Didla (2009) see SCB as a potentially important aspect of reducing risk. Mearns and Reader (2008) investigated SCB and POS, and found high levels of both to be beneficiary towards safety performance.

POS is the employees' perception of the organization's support, commitment, and care towards them. POS has been found to be positively related to conscientiousness in carrying out conventional job responsibilities (Eisenberger, Fasolo, & Davis-LaMastro, 1990). A study by Mearns and Hope (2005) showed that employees with a high level of POS showed increased commitment, lower levels of unsafe behavior and were more compliant towards rules and regulations.Based on these findings, it is expected that:

H_3: Ships with low number of undesired events and accidents is expected to score higher on commitment.

<center>Differences in sub-culture</center>

When employees work together they can often form their own sub-culture within an organization, with a mutual understanding of how they do things. These sub-cultures can evolve in different departments, positions, and levels of management (Clarke, 1999; Harvey, et al., 2002). In a study by Hofstede (1998), in a large Danish insurance company, he found three distinct sub-cultures: a professional sub-culture, an administrative sub-culture, and a costumer interface sub-culture. A study by Mearns, Flin, Gordon, and Fleming (1998) on offshore employees found evidence suggesting attitudes towards safety, for the permanent staff, were influenced by whether they were superiors/officers or not. This is supported in a later study by Håvold (2005) who found significant differences between the knowledge of safety protocols, and he argues that this may be because superiors have a responsibility for the safety of the employees they supervise. A recent study by Bjerkan (2010), on employees in the Norwegian offshore and oil industry showed mixed results, and concluded that groups need to be taken into account when investigating the effects of safety climate and perceptions of the work environment on subjective health statuses as well as accident frequencies. Since one can expect superiors/officers and subordinates/ratings to develop group dependent perceptions and beliefs of safety, along with their differences in responsibility and work, it is expected to find differences between the two:

H_4: There will be differences between superiors/officers and subordinates/ratings in their subjective perception of the safety status on board.

Method

Sample

The sample was collected from two Norwegian shipping companies, one industrial shipping company, and one cruise ship company – with the help of Det Norske Veritas (DNV). Only one of the shipping companies was included in the analyses since the data on undesired events and accidents were not compatible between the two companies. The data and sample from the industrial shipping company is therefore used as the number of respondents and ships were the highest. The questionnaire was designed in Microsoft Excel in order to survey data from multiple respondents before being sent back. The questionnaire was sent by e-mail to the captains of 24 ships, selected by the shipping companies' management to participate in the survey. All ships were either in lay-up or in transit. When everyone wanting to participate in the study had been given the opportunity to do so, the questionnaire was returned. Everyone on the ship was invited to participate in the survey, and given information that the study were voluntary, all information would be kept anonymous, confidential and no individual answers would be relayed to the shipping company. The participants were also informed that a summary report would be given to the shipping company at the conclusion of the study.

A total of 215 seafarers completed the questionnaire resulting in a response rate of 35%, where 170 of these respondents and 13 ships are relevant for this study. Detailed demographics are shown in table 1. All respondents reported to be male (95.3%), with 8 missing (4.7%). The majority of respondents reported to be in the age between 25 and 34 (34.7%), followed by 45 years or older (29.4%), between 35 and 44 (20.6%), and 24 years or younger (15.3%). The main nationality represented in the sample are Filipino (63.3%) followed by Norwegian (21.4%) and Indian (11.6%). The distribution between superiors /officers and subordinates/ratings were equal (41.8%) with some missing (16.5%). A little over half of the respondents worked on carrier ships (Roll-on-Roll-off 53.5%, Pure-Car-Truck-Carrier 32.9%, bulk 4.1%) and a few on passenger ships or cruise ships (2.4%). The sample shows most respondents working on deck (41.9%) and engine (33.0%), followed by catering (8.8%), bridge (8.4%), assistants, cadets and other (6.1%) with four missing (1.9%).

Table 1: Detailed demographics

Variable	No. Respondents (percent)
Gender	
Male	162 (95.3%)
Missing	8 (4.7%)
Age	
24 or younger	26 (15.3%)
25 - 34	59 (34.7%)
35 - 44	35 (20.6%)
45 or older	50 (29.4%)
Superior or subordinate	
Officer / Manager	71 (41.8%)
Rating / Subordinate	71 (41.8%)
Missing	28 (16.5%)
Position	
Deck	90 (41.9%)
Engine	71 (33.0%)
Ship assistant	1 (0.5%)
Apprentice/Cadet	8 (37%)
Bridge	18 (8.4%)
Catering	19 (8.8%)
Other	4 (1.9%)
Missing	4 (1.9%)
Nationality	
Norwegian	19 (11.2%)
Filipino	127 (74.7%)
Indian	16 (9.4%)
Other	7 (4.2%)
Missing	1 (0.6%)
Tyoe of ship	
PCTC	56 (32.9%)
Ro-Ro	91 (53.5%)
Passenger / Cruise	4 (2.4%)
Bulk carrier	7 (4.1%)
Other	9 (5.3%)
Missing	3 (1.8%)
Total	170 (100%)

Material

Questionnaire

The questionnaire used in this study was developed for DNV in order to examine the work environment on board ships, and selected items from DNV's Insight questionnaire were added to assess the safety status. For information on the development of the questionnaire, see article 1. The items and questionnaire can be found in appendix B. Three safety factors were identified; compliance with rules and regulations, attitudes towards rules and regulations, and commitment to overall safety. These three factors were used to create Safety status. Safety status is used in this study as an alternative to safety culture and safety climate, as these constructs vary in definition and usage. Safety status is here defined as the self-reported perceived status of safety, in regards to compliance with rules and regulations, attitudes towards said rules and regulations, and commitment to overall safety.

Internal consistency of the scales is shown in table 2, and is based on the total sample used in article 1. All were found to have an acceptable alpha ($\alpha > .70$) (Nunnally & Bernstein, 1994), except for Commitment ($\alpha = .57$). However, as Commitment has an acceptable average inter-item correlation ($r > .30$), the factor is kept in the analysis (Field, 2009). Items in the safety factors can be found in appendix A.

Table 2: Internal consistency and average item-total correlation

	α	Average inter-item correlation	Items
Safety status	.79	.44	12
Compliance	.74	.49	6
Attitudes	.76	.60	3
Commitment	.57	.39	3
N	207-215		
Likert-scale range	1-5		

Undesired events and accidents data

The data collected regarding undesired events and accidents were retrieved from the annual reports for the two shipping companies. The data used were from the last quarter of 2009, two month prior to the questionnaire data collection. As the two data sets where incompatible

based on definitions and logging procedure, only the data from the industrial shipping company were kept in order to preserve validity and to keep the largest number of respondents and ships.

Accident in this study is defined as: *"An event which causes injury or illness to personnel and/or damage or loss of property, material, or damage to the environment, or to a third party"* (Norsk Standard 5814, ISO 14001:1996).

Whilst undesired events is defined as: *"An event which could have caused injury or illness to personnel and/or damage or loss of property, material, damages to the environment, or to a third party"* (Norsk Standard 5814, ISO 14001:1996).

Statistical Analysis

Statistical analyses were conducted using SPSS 17.0 (Statistical Package for the Social Sciences, now PASW) and Microsoft Excel. A Pearson's correlation was conducted on the safety factors and number of undesired events and accidents to examine the relationship between safety status and safety performance. In order to test H_1, H_2 and H_3 ships were separated into two groups based on high or low number of undesired events and accidents. T-tests were conducted to examine any differences in compliance, attitudes and commitment between the groups. T-tests were also conducted to examine any differences in the perceived safety status between superiors/officers and subordinates/ratings.

Results

Table 3 show superiors/officers and subordinates/ratings percentage of low, neutral and high scores on overall safety status and on the individual safety factors compliance, attitudes and commitment, divided on ships with high and low number of undesired events and high and low number of accidents. As the table shows, on ships with high number of undesired events and accidents, the majority of superiors/officers and subordinates/ratings rate all safety factors as high. Similar agreement is seen on ships with low number of undesired events and accidents, where the majority of superiors/officers and subordinates/ratings rate all safety factors as neutral. Interestingly, more superiors and officers rate the compliance as high than

subordinates and ratings on ships with high number of undesired events and accidents. The situation is reversed on ships with low number of undesired events and accidents, where more subordinates and ratings rate the compliance as high than superiors and officers.

Table 3: Percent of low, neutral and high scores on safety factors in ships with low and high number of undesired events and accidents sorted on superiors/officers and subordinates/ratings.

Number of undesired events and accidents	Low				High			
	Low	Neutral	High	Missing	Low	Neutral	High	Missing
Undesired events								
Superiors/Officers								
Overall perceived safety status	-	25.0	65.0	10.0	-	3.2	93.5	3.2
Perceived safety compliance	-	25.0	70.0	5.0	-	3.2	93.5	3.2
Attitudes towards safety	12.5	40.0	47.5	-	12.9	38.7	48.4	-
Perceived commitment to safety	-	20.0	72.5	7.5	-	16.1	83.9	-
Subordinates/Ratings								
Overall perceived safety status	-	11.1	77.8	11.1	-	6.8	84.1	9.1
Perceived safety compliance	-	11.1	85.2	3.7	-	2.3	93.2	4.5
Attitudes towards safety	-	25.9	70.4	3.7	13.6	22.7	63.6	-
Perceived commitment to safety	-	25.9	70.4	3.7	-	31.8	61.4	6.8
Accidents								
Superiors/Officers								
Overall perceived safety status	-	27.0	62.2	10.8	-	2.9	94.1	2.9
Perceived safety compliance	-	21.6	73.0	5.4	-	8.8	88.2	2.9
Attitudes towards safety	18.9	40.5	40.5	-	5.9	38.2	55.9	-
Perceived commitment to safety	-	24.3	67.6	8.1	-	11.8	88.2	-
Subordinates/Ratings								
Overall perceived safety status	-	3.6	92.9	3.6	-	11.6	74.4	14.0
Perceived safety compliance	-	-	96.4	3.6	-	9.3	86.0	4.7
Attitudes towards safety	7.1	32.1	60.7	-	9.3	18.6	69.8	2.3
Perceived commitment to safety	-	17.9	82.1	-	-	37.2	53.5	9.3

$n_{UDE, sup/off} = 30\text{-}40$; $n_{UDE, sub/rat} = 24\text{-}44$

$n_{accidents, sup/off} = 33\text{-}37$; $n_{accidents, sub/rat} = 27\text{-}42$

Table 4 show the Pearson's correlation between undesired events and accidents, and compliance, attitudes and commitment for superiors/officers and subordinates/ratings. Compliance is significantly correlated with undesired events for superiors and officers ($r = .305$, $p < .05$), along with accidents for superiors and officers ($r = .269$, $p < .05$). Attitudes ($r = .217$, $p > .05$) and commitment ($r = .216$, $p > .05$) also show a low, but not significant, correlation with accidents for superiors and officers. None of the correlations for subordinates and ratings are significant, but commitment and accidents show a low negative correlation ($r = -.230$, $p > .05$).

Table 4: Pearson's correlations between safety factors, undesired events and accidents sorted on superiors/officers and subordinated/ratings.

		Compliance	Attitudes	Commitment
Undesired events	Superiors/officers	.305[*]	.006	.006
	Subordinates/ratings	.082	-.045	-.093
Accidents	Superiors/officers	.269[*]	.217	.216
	Subordinates/ratings	-.060	.041	-.230

$n_{sup/off}$ = 66-68; $n_{sub/rat}$ = 65-68

* $p < .05$

T-tests were performed in order to examine the differences in perceived overall safety status along with the individual safety factors between superiors/officers and subordinates/ratings. Table 5 below, show mean factor score for the two groups along with t. The ratings of the safety factors for the two groups were quite similar. Only compliance (t = -2.31, p < .05) and attitudes (t= -2.15, p < .05) turned out to be significantly higher for subordinates and ratings than superiors and officers.

Table 5: T-tests on safety status, compliance, attitudes, and commitment between superiors/officers and subordinates/ratings.

		Mean	st.dev	t
Safety status	Sup/Off	3.79	.436	-1.900
	Sub/Rat	3.93	.414	
Compliance	Sup/Off	3.90	.477	-2.310*
	Sub/Rat	4.08	.412	
Attitudes	Sup/Off	3.45	.851	-2.150*
	Sub/Rat	3.76	.868	
Commitment	Sup/Off	3.92	.458	1.157
	Sub/Rat	3.82	.595	

$n_{sup/off}$ = 66-71; $n_{sub/rat}$ = 64-70

* $p < .05$

Testing the differences on ships with high and low number of undesired events showed few differences, shown in table 6. For superiors and officers, all safety factors were rated higher on ships with a high number of undesired events, except for commitment, which was rated the same on both types of ships with a little higher standard deviation for ships with high number of undesired events. Only compliance (t= -2.597, p < .05) was significantly higher for superiors and officers. When it comes to subordinates and ratings, even smaller differences

emerge. Overall safety status is rated equal on both types of ships with a slightly higher standard deviation on ships with low number of accidents. Compliance is rated somewhat higher on ships with high number of accidents, whilst attitudes and commitment is rated lower on ships with high number of accidents. None of the differences turned out to be significant.

Table 6: T-tests on safety status, compliance, attitudes, and commitment between ship groups with low and high rate of undesired events, sorted on sample, superiors/officers and subordinates/ratings

Undesired events				
	Ship group	Mean	st.dev	T
Superiors and officers				
Safety status	Low	3.72	.459	-1.495
	High	3.88	.397	
Compliance	Low	3.78	.504	-2.597*
	High	4.07	.391	
Attitudes	Low	3.44	.775	-0.049
	High	3.45	.953	
Commitment	Low	3.92	.481	-0.052
	High	3.92	.436	
n = 30-40				
Subordinates and ratings				
Safety status	Low	3.93	.449	-0.039
	High	3.93	.397	
Compliance	Low	4.04	.506	-0.666
	High	4.11	.345	
Attitudes	Low	3.81	.707	0.372
	High	3.73	.957	
Commitment	Low	3.88	.557	0.750
	High	3.77	.621	
n = 24-44				
* p < .05				

When examining the differences for superiors and officers between ships with a high and low number of accidents (table 7), all safety factors were rated higher on ships with high number of accidents. Only safety status (t= -2.821, p < .01) and compliance (t= -2.265, p < .05) however turned out to be significant. For subordinates and ratings, opposite tendencies appear. All safety factors except for attitudes were rated lower on ships with high number of accidents, although none of the differences were significant.

Table 7: T-tests on safety status, compliance, attitudes, and commitment between ship groups with low and high rate of accidents, sorted on sample, superiors/officers and subordinates/ratings

Accidents	Ship group	Mean	st.dev	T
Superiors and officers				
Safety status	Low	3.64	.451	-2.821**
	High	3.93	.374	
Compliance	Low	3.78	.486	-2.265*
	High	4.04	.437	
Attitudes	Low	3.27	.867	-1.847
	High	3.64	.801	
Commitment	Low	3.82	.487	-1.796
	High	4.02	.410	
n = 33-37				
Subordinates and ratings				
Safety status	Low	3.99	.420	1.060
	High	3.88	.409	
Compliance	Low	4.11	.398	0.488
	High	4.06	.425	
Attitudes	Low	3.71	.874	-0.335
	High	3.79	.874	
Commitment	Low	3.98	.566	1.904
	High	3.70	.596	
n = 27-42				

* $p < .05$; ** $p < .01$

Discussion

This article aims to investigate the associations between safety status and undesired events and accidents. Significant correlations were found between compliance and both undesired events and accidents, but only for superiors and officers. In addition, this correlation was positive, showing that higher levels of compliance correlate with higher levels of undesired events and accidents. This would seem counterintuitive as one could expect ships with high level of compliance to have less unsafe behavior and hence less undesired events and accidents. The opposite however could be just as likely considering the delay between the data on undesired events and accidents, and the questionnaire data. Ships having high numbers of undesired events and accidents could have motivated the sailors to pay extra attention to safety, or management could have intervened with safety initiatives in an attempt to improve upon the safety performance. As this study was unable to obtain data on such initiatives, this can only be hypothesized upon. Interestingly however, are the differences between superiors/officers and subordinates ratings, where subordinates and ratings show little correlation between undesired events and accidents, and compliance. A superior or officer may attempt to have subordinates and ratings comply with rules and regulations – but as subordinates and ratings are the ones who do most of the labor, their perceptions of compliance on board a ship may be more accurate than that of superiors and officers. Testing the differences in safety status between superiors/officers and subordinates/ratings show similar results. Significant differences were found in compliance and attitudes, resulting in partial support for H_4. These differences between superiors/officers and subordinates/ratings become more clear when differences in the safety factors were tested on ships with high and low number of undesired events and accidents.

The results from comparing ships with high and low number of undesired events showed superiors and officers constantly rating ships with high number of undesired events as higher on all safety factors, except for commitment which were rated as the same on both ships. Only compliance, however, turned out to be significantly higher. Subordinates and ratings rate attitudes and commitment higher on ships with low number of undesired events, and rate compliance lower on ships with low number of undesired events, but none of them were significant.

Comparing ships with high and low number of accidents, the results seem to somewhat mirror those of undesired events and accidents. Superiors and officers rate all safety factors as higher on ships with high number of accidents, with over all safety status and compliance being significant. Subordinates and ratings rate all safety factors higher on ships with low number of accidents except for attitudes, but again; none of the differences were significant.

This do not support hypothesis 1, 2 and 3. The significant differences found in superiors and officers contradict the predictions. Even though the results from subordinates and ratings indicate the expected results, none were significant. A possible explanation could be the convergent validity between the safety status used in the present study, and the safety culture constructs used in the presented theory supporting the predictions. The results however could indicate that subordinates and ratings could have a more accurate depiction of the actual safety status on board the ships. For superiors and officers, safety will always be a priority and will probably be reflected in their compliance, attitudes, and commitment, and possibly even stronger if they observe many undesired events and accidents on board the ship – and no matter how dedicated the superiors or officers are to safety, it is ultimately the one who does the work who will be deciding in which manner they will complete the task ahead.

Methodological challenges

Several limitations arise in this study. As some ships and shipping companies tend to have ratings recruited from countries with low-salary workforce like the Philippines, and officers from western countries (Norway and India in this sample).The differences between superiors/officers and subordinates/ratings may have been affected by nationality culture. This could emphasize differences between the two groups. National culture has also been found to have an effect on response styles (Silverthorne, 2005). Even though the distribution of superiors/officers and subordinates/ratings were fairly good, the sample size were also not optimal.

The delay between data on undesired events and accidents and the questionnaire data could result in the two data sets not being related as closely as they could. There could have been initiatives taken on board the ships to improve upon safety, and as this study were unable to obtain such data, this could be a confounding variable in the present study. A longitudinal

study with multiple measurements would be able examine the associations between undesired events, accidents and safety status, more in depth compared to a cross-sectional study.

Conclusion

Keeping the limitations in mind, the results show interesting differences between superiors/officers and subordinates/ratings in their perception of compliance, attitudes and commitment. Results indicate subordinates and ratings having a more accurate depiction of safety status on board the ships, and it could be that future safety culture assessments should primarily focus on this group in order to get the most accurate measurement. Further examination is however required before any conclusion can be made.

Being able to create an accepted causal model of safety culture and safety performance, including occupational injuries and accidents, would be a major advancement in safety research and could benefit companies with hazardous work environments. Such a model could be used to direct safety improvement initiatives, and help make the work environment safer. Even though little association between compliance, attitudes and commitment were found in this study, substantial findings from earlier studies support such an association. It is therefore likely that a more comprehensive design could yield more explicit results.

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Appendix

A: Factor loadings, internal consistency and average item-total correlation

Pattern Matrix[a]

Safety status	Component		
	1	2	3
SAFETY - Compliance - A30 - When I enter a new ship I always receive a proper hand-over	.73	-.30	.02
SAFETY - Compliance - A33 - Accidents and near-misses are always reported according to company orders	.73	.06	-.13
SAFETY - Compliance - A32 - Task assignments are always crosschecked and verified	.71	.13	-.15
SAFETY - Compliance - A34 - Senior ship's management ensures full cooperation between all on board departments	.60	.11	.10
SAFETY - Compliance - A29 - Emergency drills are conducted as prescribed	.59	-.09	.28
SAFETY - Compliance - A25 - Leaders make sure that relevant operational intentions and actions are understood	.51	.21	.15
SAFETY - Attitudes - A16 - [Reversed]Getting a permit to do a job is a waste of time	-.20	.84	.23
SAFETY - Attitudes - A17 - [Reversed]Checklists are sometimes unnecessary. because it is just common sense	.08	.80	-.01
SAFETY - Attitudes - A15 - [Reversed]Risk assessment is sometimes unnecessary. even though it is required	.06	.80	-.24
SAFETY - Commitment - A21 - My suggestions about safety will be acted upon if I express them to management on shore	-.03	-.22	.81
SAFETY - Commitment - A27 - My suggestions about safety will be acted upon if I express them to senior officers on board	.00	.08	.76
SAFETY - Commitment - A20 - I am encouraged by my seniors to report any unsafe conditions I may observe	.08	.28	.54

Pattern Matrix[a]

Job satisfaction	Component					
	1	2	3	4	5	6
JOBSAT - Reward&Benefits - I13 - The amount of pay I receive	.94	-.18	-.02	.02	-.10	.08
JOBSAT - Reward&Benefits - I19 - The benefits the company offers me	.83	.10	-.02	.06	-.07	-.06
JOBSAT - Reward&Benefits - I14 - The opportunities the shipping company provides for furthering my education	.78	.13	-.01	-.09	-.06	-.17
JOBSAT - Reward&Benefits - I22 - The rewards I receive	.76	-.12	.04	.05	.15	.07
JOBSAT - Reward&Benefits - I12 - My chances for a promotion	.47	.19	.05	-.15	.19	.08
JOBSAT - Co-workers - I15 - The communication I have with the employees in other departments	.00	.95	-.16	.01	-.00	-.02
JOBSAT - Co-workers - I16 - The communication I have with the people on board the ship	-.10	.94	.01	.01	-.01	-.01
JOBSAT - Co-workers - I18 - The way I am treated on board the ship	.04	.84	.04	-.06	.01	.10
JOBSAT - Co-workers - I17 - The competence of my co-workers	.05	.58	.24	.19	-.06	-.00
JOBSAT - Task - I5 - The respect my co-workers have for my work	-.01	-.06	.92	.07	-.08	.01
JOBSAT - Task - I6 - The possibilities for variation	-.04	-.09	.80	-.02	.10	.09
JOBSAT - Task - I4 - The use of my competence	-.04	.13	.78	-.01	.01	-.07
JOBSAT - Task - I10 - The opportunity to develop new competence in my work	.09	-.01	.78	.00	.02	-.08
JOBSAT - Meaningfullness - J2 - [Reversed]I often receive tasks I perceive as meaningless	-.00	-.11	.12	.87	-.13	.10
JOBSAT - Meaningfullness - J3 - [Reversed]I do a lot of work that should be done by others	.00	.13	-.07	.77	.05	.08
JOBSAT - Meaningfullness - J4 - [Reversed]Rules or procedures make my job difficult	-.04	.09	-.03	.59	.21	-.20
JOBSAT - Worry - I3 - Deadlines given to me	-.13	.01	.05	-.05	.88	.00
JOBSAT - Worry - I21 - The amount of paperwork I do	.09	-.17	-.10	.24	.70	-.04
JOBSAT - Worry - I23 - The quality of my sleep at night	.11	.15	.08	-.12	.54	.07
JOBSAT - FeelingOfSafety - J6 - If a crisis should occur, I'm confident my co-workers could handle it	.06	.08	-.09	.20	-.06	.83
JOBSAT - FeelingOfSafety - J5 - I don't worry about losing my job	-.07	-.01	.06	-.14	.07	.78

Pattern Matrix[a]

Stress	Component					
	1	2	3	4	5	6
STRESS - Responsebility&Decisions - F22 - Having to make decisions in situations where decisions are hard to make	.87	-.05	-.03	.00	.05	-.02
STRESS - Responsebility&Decisions - F21 - Having to make decisions too quickly	.85	.03	.04	-.09	-.11	-.09
STRESS - Responsebility&Decisions - F23 - Doing tasks that require complete concentration without having the necessary time	.81	.02	-.06	.03	-.01	-.02
STRESS - Responsebility&Decisions - F20 - An uncomfortable high amount of responsibility	.66	.02	.03	.07	.08	.21
STRESS - WorkStrain - F2 - Very high work pace	-.05	.94	.03	-.08	-.08	.00
STRESS - WorkStrain - F3 - Very high work load	-.03	.93	-.00	-.05	-.00	.07
STRESS - WorkStrain - F1 - Shift work with uncomfortable watches	-.03	.68	-.10	.21	.11	.08
STRESS - WorkStrain - F25 - Being interrupted in my work	.23	.58	.07	-.00	.02	-.16
STRESS - PhysicalNuisance - F13 - Disturbing vibrations from the ship	-.04	-.04	.94	.11	-.02	-.06
STRESS - PhysicalNuisance - F12 - Disturbing noise from the ship	-.06	.10	.90	-.04	.04	-.09
STRESS - PhysicalNuisance - F14 - Too extreme temperature (heat or cold) on board the ship	.10	-.07	.76	-.05	.00	.21
STRESS - HighRiskTasks - F30 - Doing a task were an error could result in co-workers being hurt	.04	-.05	.00	.96	.02	-.01
STRESS - HighRiskTasks - F31 - Doing a task were an error could result in financial loss for the company	-.05	.05	.03	.96	-.06	-.00
STRESS - Isolation - F10 - Difficulty staying in contact with family and friends at home	-.07	-.00	.03	-.09	.93	.08
STRESS - Isolation - F11 - Lack of information about the world outside the ship (e.g. News and world events)	.06	-.00	-.01	.05	.90	-.12
STRESS - Variation - F4 - Very little variation in the work	-.01	.03	.01	-.01	-.03	.96

Pattern Matrix[a]

Working conditions	Component		
	1	2	3
WORKCOND - MonetaryLoyalty - B6 - My high salary is the only reason I continue in this job	.91	-.09	.10
WORKCOND - MonetaryLoyalty - B13 - The need to support my family is the only reason I have this job	.81	.10	-.10
WORKCOND - Goodwill - B14 - It is OK for me to extend the on board sailing period or contract if the shipping company sees the need for it	.06	.85	-.07
WORKCOND - Goodwill - B11 - I have great loyalty to the shipping company	-.06	.82	.10
WORKCOND - IntentToLeave - B9 - [Reversed] If I had the opportunity to work in the offshore oil industry I would accept it	.13	.00	.88
WORKCOND - IntentToLeave - B8 - [Reversed] If I recieved another job offer on land I would quit immediately	-.13	.03	.78

Component Matrix^a

Goals	Comp. 1
GOALS - CaredFor - A7 - [Reversed] The shipping company only sees economy and numbers, and not the people	.74
GOALS - CaredFor - A6 - [Reversed] We have to fight for every request we make to the shipping company	.73
GOALS - CaredFor - A4 - [Reversed] The shipping company won't give us equipment that would make work easier	.70
GOALS - CaredFor - A5 - [Reversed] The shipping company puts profit ahead of safety	.66
GOALS - CaredFor - C28 - [Reversed] Ship management prioritize profits ahead of peoples well-being	.66
GOALS - CaredFor - A8 - [Reversed] There are too few people working on board my ship	.60

Pattern Matrix^a

Relationship with co-workers	Component			
	1	2	3	4
RELCOW - Oppenness - C16 - I always welcome new persons in my department	.85	-.03	.07	-.07
RELCOW - Oppenness - C19 - I regard my co-workers as friends	.75	.02	.08	-.11
RELCOW - Oppenness - C9 - If someone should feel the need to talk about their problems, I always take the time to listen	.75	-.06	.00	.07
RELCOW - Oppenness - C23 - I always tell people when they have done a good job	.61	.05	-.21	.14
RELCOW - SocialGrouping - C14 - [Reversed] I only socialize with people from my own department	-.06	.92	-.04	.07
RELCOW - SocialGrouping - C15 - [Reversed] I don't like to socialize with people from other departments	.04	.88	.08	-.10
RELCOW - OpennessCrossGender - C3 - [Reversed] Problems often arise because men and women work together	-.08	-.02	.92	-.02
RELCOW - OpennessCrossGender - C4 - [Reversed] I am not comfortable working with people of the opposite gender	.09	.05	.78	.10
RELCOW - EmotionalInvolvement - C6 - [Reversed] I never ask my co-workers about family related problems	-.05	-.14	.09	.92
RELCOW - EmotionalInvolvement - C5 - [Reversed] I never ask co-workers about their job related problems	.07	.17	-.03	.78

Pattern Matrix[a]

Relationship with superiors	Component	
	1	2
RELSUP - Commitment - D4 - My superiors always take action on suggestions from me and my co-workers	.83	-.07
RELSUP - Commitment - D7 - I feel that my direct superiors always take my comments and suggestions seriously	.78	-.09
RELSUP - Commitment - D2 - My direct superiors are good role models	.74	.14
RELSUP - Commitment - D12 - My direct superiors always give a clear answer, I never doubt where they stand	.74	.00
RELSUP - Commitment - D1 - I feel appreciated by my direct superiors	.69	.06
RELSUP - Trust - D20 - I am comfortable asking my direct superiors if I don't understand what I am supposed to do	-.30	.95
RELSUP - Trust - D30 - I am given trust from my direct superiors	.17	.73
RELSUP - Trust - D29 - My direct superiors are highly competent	.17	.67
RELSUP - Trust - D6 - My direct superiors are availiable when I need them	.18	.55

Internal consistency and average item-total correlation

	α	Average inter-item correlation	Items
Safety status	.785	.44	12
Compliance	.743	.49	6
Attitudes	.759	.60	3
Commitment	.568	.39	3
Job satisfaction			
Rewards and benefits	.827	.63	5
Co-workers	.871	.73	4
Task	.840	.68	4
Meaningfulness	.702	.52	3
Worry	.573	.39	3
Feeling of safety	.501	.34	2
Stress			
Resp. & decisions	.810	.63	4
Work strain	.815	.64	4
Physical nuisance	.841	.71	3
High risk tasks	.919	.85	2
Isolation	.797	.66	2
Variation	-	-	1
Working conditions			
Monetary loyalty	.658	.49	2
Goodwill	.564	.86	2
Intent to leave	.551	.39	2
Goals			
Feeling cared for	.768	.51	6
Relationship with co-workers			
Openness	.714	.51	4
Social grouping	.770	.63	2
Working with opposite gender	.709	.55	2
Emotional involvement	.683	.52	2
Relationship with superiors			
Commitment	.817	.61	5
Trust	.748	.55	4
N	207-215		
Likert-scale range	1-5		

B: Correlation between factors in the questionnaire

Appendix B: Pearson's correlations between criterion and predictor variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
1 Safety status	-																											
2 Operational atmosphere	.894**	-																										
3 Rules regulations	.481**	.273**	-																									
4 Commitment	.597**	.311**	.101	-																								
5 Task	.310**	.334**	.023	.074	-																							
6 Rewards Benefits	-.397**	-.394**	-.028	-.159*	-.296**	-																						
7 Co-workers	-.500**	-.429**	-.247**	-.224**	-.415**	.291**	-																					
8 Meaningfullness	-.305**	-.248**	-.019	-.292**	-.144*	.250*	.153*	-																				
9 Feeling of Safety	-.195*	-.195*	.118	-.297**	.037	.101	.035	.052	-																			
10 Balance Workload Time	.289**	.291**	.009	.131	.286**	-.350**	-.257**	-.221**	-.064	-																		
11 Responsebility Decisions	.129	.148*	.013	.028	.176*	-.124	-.191**	-.289**	.118	.362**	-																	
12 Physical nuisance	.152*	.119	.017	.119	.063	-.229**	-.143	-.231**	.096	.195**	.335**	-																
13 Liability	.164*	.188*	-.133	.214**	.177*	-.200**	-.144*	-.137	-.172*	.127	.169*	.190**	-															
14 Work strain Time pressure	.188*	.224**	-.151*	.160*	.183*	-.315**	-.082	-.246**	-.058	.327**	.394**	.259**	.273**	-														
15 Isolation	.113	.104	.011	.048	.112	-.084	-.192**	-.136	.137	.114	.272**	.328**	.142*	.189***	-													
16 Variation	.021	.009	.020	.005	.316**	-.001	-.152*	-.110	.090	.026	.130	.124	-.005	.152*	.088	-												
17 Monetary incentive	-.119	-.171*	.011	-.004	-.091	.171*	-.026	.031	.219**	.029	.166*	.195**	-.070	-.039	.059	.162*	-											
18 Loyalty Goodwill	.537**	.486**	.203**	.322**	.181*	-.342**	-.309**	-.093	-.159*	.199**	.009	.086	.252**	-.189**	-.147*	-.147*	-.133	-										
19 Intent to leave	-.023	.031	-.127	-.032	.056	.050	.009	.103	.055	-.066	-.032	-.098	.086	.000	.088	-.098	-.189**	-.133	-									
20 Companys Goals	.203**	.089	.162*	.217***	-.071	-.056	-.082	.150*	.055	.163*	.258**	.308**	.252**	.208**	.338**	.025	.323**	.097	-.102	-								
21 Being cared for	-.209**	-.177*	.025	-.225**	-.098	.381**	.097	.259**	.054	-.079	-.254**	-.241**	.142*	-.327***	-.099	-.108	-.104	-.178*	.120	-.351**	-							
22 Openness towards co-workers	.594**	.538**	.374**	.289**	.306**	-.245**	-.414**	-.120	-.033	.191**	.028	-.005	.067	.080	.019	.020	-.141*	.011	.068	.068	-.053	-						
23 Working with opposite gender	-.026	-.098	-.070	.062	-.009	.143*	-.115	-.059	.084	.010	.032	.115	-.004	-.024	.097	.211**	.202**	-.115	-.095	.270**	-.043	.076	-					
24 Emotional involvement	.088	.049	.140*	.020	.043	.085	-.089	-.132	.125	.068	.126	.125	-.243**	-.048	.045	.094	.242**	.125	-.166*	.244**	-.040	.160*	.161*	-				
25 Social grouping	-.259**	-.189**	-.272**	-.143*	-.118	.003	.314**	.145*	-.149*	-.117	-.119	-.114	-.063	-.075	-.197**	-.028	-.056	-.185**	.105	-.322**	.143*	-.401**	-.263**	-.242**	-			
26 Social support and feedback	.600**	.580**	.246**	.238**	.364**	-.559**	-.340**	-.281**	-.082	.339**	.164*	.172*	.077	.158*	.062	.054	-.154*	.403**	-.047	.090	-.240**	.428**	-.135	.080	-.138*	-		
27 Trust in superiors	.405**	.328**	.299**	.244**	.120	-.156*	-.343**	-.208**	.022	.074	.079	.096	.082	.048	.102	.004	.132	.261**	.017	.245**	-.195**	.263**	.084	.087	-.334**	.306**	-	
28 Communication	.250**	.151*	.030	.346**	.128	-.173*	-.231**	-.284**	.167*	.228**	.126	.304**	-.017	.145*	.188**	.154*	.273**	.051	-.182**	.385**	-.301**	.239**	.259**	.228**	-.346**	.279**	.236**	-

n = 185 - 210

*p < .05; **p < .01

C: The questionnaire

Insight Work Environment Questionnaire

Det Norske Veritas (DNV), in cooperation with Norwegian University of Science and Technology (NTNU), is developing a new measurement tool with the aim of assessing the physical- and psychosocial working environment in shipping companies, onboard ships covering areas such as job satisfaction, job stress, working conditions and cooperation with co-workers, supervisors and the shipping company. The study is conducted by two master students at NTNU, under the guidance of Professor Torbjørn Rundmo, and will also be used as part of their master's degree project.

The participation in the study is voluntary, and by completing the questionnaire you give consents for the data you provide to be used in this study. It will take about 20-30 minutes to complete the questionnaire. Please note that there are no "right "and "wrong" answers. We want your true opinion, and your initial response is often the right one. We would like to emphasize that the information you provide will be treated confidentially and no individual answers will be given to the shipping company. The information will be used to create a picture of the general state of the working environment on board the ships, within the shipping company, and to validate the questionnaire.

The final version of this questionnaire will be much shorter. There are some repetitions or similar questions throughout the questionnaire. This is by purpose and important in the development of the measurement instrument. Your participation is important for us.

Thank you in advance for your cooperation and support! If you have any questions, feel free to contact us: Øyvind Teige Heidenstrøm (Phone: +47 901 99 778, Email: oyvinhei@stud.ntnu.no) or Marta Lang (Phone: +47 411 65 314, Email: martala@stud.ntnu.no).

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Start questionnaire

MY COMPANY'S SAFETY AND GOALS

Considering your own working situation, to which degree would you agree or disagree with the following statements?	stronlgy disagree	disagree	neither agree nor disagree	agree	strongly agree
Everyone onboard the ship is working to get the job done	○	○	○	○	○
I am always given reasonable deadlines	○	○	○	○	○
The shipping company puts our well - being ahead of profit	○	○	○	○	○
The shipping company won't give us equipment that would make work easier	○	○	○	○	○
The shipping company puts profit ahead of safety	○	○	○	○	○
We have to fight for every request we make to the shipping company	○	○	○	○	○
The shipping company only sees economy and numbers, and not the people	○	○	○	○	○
There are too few people working onboard my ship	○	○	○	○	○
I feel unnecessarily surveiled by superiors or the shipping company while on the ship	○	○	○	○	○
I do much paperwork that doesn't make sense, just to satisfy external authoritites (flag, port, etc.)	○	○	○	○	○
It seems like the external authorities don't know what it is like onboard a ship	○	○	○	○	○
If I have to give lower priority to request from other departments they always show understanding	○	○	○	○	○
Checklists don't always help me do my job safer	○	○	○	○	○
There is too much focus on safety	○	○	○	○	○
Risk assessment is sometimes unnecessary, even though it is required	○	○	○	○	○
Getting a permit to do a job is a waste of time	○	○	○	○	○
Checklists are sometimes unnecessary, because it is just common sense	○	○	○	○	○
I have access to all the personal protective equipment I need	○	○	○	○	○
The personal protective equipment is easily available	○	○	○	○	○

	strongly disagree	disagree	neither agree nor disagree	agree	strongly agree
I am encouraged by my seniors to report any unsafe conditions I may observe	○	○	○	○	○
My suggestions about safety will be acted upon if I express them to management on shore	○	○	○	○	○
Seniors should delegate responsibilities to junior crews as parts of their training	○	○	○	○	○
Senior officers should encourage crewmember questions during normal operations and in emergencies on board	○	○	○	○	○
I am normally consulted on matters that affect the performance of my duties	○	○	○	○	○
Leaders make sure that relevant operational intentions and actions are understood	○	○	○	○	○
I am sure management will never compromise safety for profitability	○	○	○	○	○
My suggestions about safety will be acted upon if I express them to senior officers on board	○	○	○	○	○
My co-workers are adequately trained in emergency procedures	○	○	○	○	○
Emergency drills are conducted as prescribed	○	○	○	○	○
When I enter a new ship I always receive a proper hand-over	○	○	○	○	○
Our training has prepared the crew to work as a well-coordinated team in an emergency	○	○	○	○	○
Task assignments are always crosschecked and verified	○	○	○	○	○
Accidents and near-misses are always reported according to company orders	○	○	○	○	○
Senior ship's management ensures full cooperation between all onboard departments	○	○	○	○	○

MY WORKING CONDITIONS

Considering your own working situation, to which degree would you agree or disagree with the following statements?	stronlgy disagree	disagree	neither agree nor disagree	agree	strongly agree
I will always be allowed to return back home if something should happen with family	○	○	○	○	○
Everyone that feels the need for time off should get it, regardless of reason	○	○	○	○	○
The longer I stay onboard, the more comfortable I feel	○	○	○	○	○

	strongly disagree	disagree	neither agree nor disagree	agree	strongly agree
The length of my home period is ideal	○	○	○	○	○
I would prefer less salary if it would mean I could be more at home	○	○	○	○	○
My high salary is the only reason I continue in this job	○	○	○	○	○
I will quit my job if there is no chance for promotion to higher ranks	○	○	○	○	○
If I recieved another job offer on land I would quit immediately	○	○	○	○	○
If I had the opportunity to work in the offshore oil industry I would accept it	○	○	○	○	○
I have more important things to do than to have a shore leave when in port	○	○	○	○	○
I have great loyalty to the shipping company	○	○	○	○	○
The shipping company gets the loyalty it deserves from the employees	○	○	○	○	○
The need to support my family is the only reason I have this job	○	○	○	○	○
It is OK for me to extend the onboard sailing period or contract if the shipping company sees the need for it	○	○	○	○	○

MY RELATIONS

Considering your own working situation, to which degree would you agree or disagree with the following statements?	stronlgy disagree	disagree	neither agree nor disagree	agree	strongly agree
I never interfere with my co-workers areas of responsibility	○	○	○	○	○
I manage my duties without help from my co-workers	○	○	○	○	○
Problems often arise because men and women work together	○	○	○	○	○
I am not comfortable working with people of the opposite gender	○	○	○	○	○
I never ask co-workers about their job related problems	○	○	○	○	○
I never ask my co-workers about family related problems	○	○	○	○	○
I am not comfortable sharing my problems with my co-workers onboard	○	○	○	○	○

I always adapt my behavior to avoid confrontations onboard.	○	○	○	○	○
If someone should feel the need to talk about their problems, I always take the time to listen	○	○	○	○	○
The way we are used to do things on this ship should have priority before employee preferences	○	○	○	○	○
New employees have to adjust to our way of doing things	○	○	○	○	○
I like socializing with people from other religions	○	○	○	○	○
I find it difficult to go on sick leave leave because then someone else has to do my work	○	○	○	○	○
I only socialize with people from my own department	○	○	○	○	○
I don't like to socialize with people from other departments	○	○	○	○	○
I always welcome new persons in my department	○	○	○	○	○
When new people arrive in my department, problems always occur	○	○	○	○	○
I often need a break from my co-workers in my department	○	○	○	○	○
I regard my co-workers as friends	○	○	○	○	○
I feel that I have to be seriously ill in order to take a sick leave	○	○	○	○	○
I don't mind taking over the work for someone who is on sick leave	○	○	○	○	○
Critique towards someone in my department is critique towards all of us	○	○	○	○	○
I always tell people when they have done a good job	○	○	○	○	○
If I make a serious mistake I would be afraid to tell my superior	○	○	○	○	○
My co-workers do not tolerate that I make an error	○	○	○	○	○
I have serious problems understanding what my co-workers are saying due to language barriers.	○	○	○	○	○
Ship management prioritize profits ahead of safety	○	○	○	○	○
Ship management prioritize profits ahead of peoples well-being	○	○	○	○	○

MY SUPERIORS AND THE SHIPPING COMPANY

Considering your own working situation, to which degree would you agree or disagree with the following statements?	stronlgy disagree	disagree	neither agree nor disagree	agree	strongly agree
I feel appreciated by my direct superiors	○	○	○	○	○
My direct superiors are good role models	○	○	○	○	○
If I make a suggestion to my direct superiors, it is always taken seriously	○	○	○	○	○
My superiors always take action on suggestions from me and my co-workers	○	○	○	○	○
I am not comfortable going to my direct superiors with problems	○	○	○	○	○
My direct superiors are availiable when I need them	○	○	○	○	○
I feel that my direct superiors always take my comments and suggestions seriously	○	○	○	○	○
I am not satisfied with the feedback I get from my direct superiors	○	○	○	○	○
I am always told what I've done wrong	○	○	○	○	○
I am always told what I've done well	○	○	○	○	○
Sometimes it is necessary to stand up to my direct superiors in order to be respected	○	○	○	○	○
My direct superiors always give a clear answer, I never doubt where they stand	○	○	○	○	○
I feel the onboard authorities the ship are not respected	○	○	○	○	○
Onboard my ship, seniority is more important than rank	○	○	○	○	○
My nearest superior is strict rather than friendly	○	○	○	○	○
I have problems taking orders from people I don't know	○	○	○	○	○
I don't trust my direct superiors to take actions if needed	○	○	○	○	○
My direct superiors are not capable to see things from other's perspective	○	○	○	○	○
My nationality determines how I am treated by my direct superiors	○	○	○	○	○
	○	○	○	○	○

	very unsatisfied	unsatisfied	neither satisfied nor unsatisfied	satisfied	very satisfied
I am comfortable asking my direct superiors if I don't understand what I am supposed to do	○	○	○	○	○
My direct superiors never comment on the work I do	○	○	○	○	○
My direct superiors seldom give positive feedback	○	○	○	○	○
I always socialize with people from my own rank off duties	○	○	○	○	○
I am very satisfied with the way I receive orders	○	○	○	○	○
The more information I receive from the shipping company, the more I worry	○	○	○	○	○
I feel cared for by my direct superiors	○	○	○	○	○
I like my direct superiors	○	○	○	○	○
My direct superiors give contradictory messages	○	○	○	○	○
My direct superiors are highly competent	○	○	○	○	○
I am given trust from my direct superiors	○	○	○	○	○
I am satisfied with the training given to me by the shipping company	○	○	○	○	○
I do not like it when the shipping company interferes with the way I do things onboard the ship	○	○	○	○	○
I feel that the company sometimes implements unnecessary changes in my duties and tasks	○	○	○	○	○
It feels like the shipping company doesn't know what it's like onboard the ship	○	○	○	○	○
The shipping company doesn't listen to what I say	○	○	○	○	○
It feels like the shipping company is holding back information	○	○	○	○	○
Taken all the factors above into account, how satisfied are you in general with…	*very unsatisfied*	*unsatisfied*	*neither satisfied nor unsatisfied*	*satisfied*	*very satisfied*
Your direct superiors?	○	○	○	○	○
Your shipping company?	○	○	○	○	○

JOB STRESS

Considering your own working situation, how often do you experience the following conditions?	very often or always	often	sometimes	seldom	very seldom or never
Shift work with uncomfortable watches	○	○	○	○	○
Very high work pace	○	○	○	○	○
Very high work load	○	○	○	○	○
Very little variation in the work	○	○	○	○	○
No time for breaks	○	○	○	○	○
Not being able to perform your work in accordance to procedures	○	○	○	○	○
Co-workers without necessary competence	○	○	○	○	○
Co-workers that are not trustworthy	○	○	○	○	○
Being ordered to other ships or duties with short notice	○	○	○	○	○
Difficulty staying in contact with family and friends at home	○	○	○	○	○
Lack of information about the world outside the ship (e.g. News and world events)	○	○	○	○	○
Disturbing noise from the ship	○	○	○	○	○
Disturbing vibrations from the ship	○	○	○	○	○
Too extreme temperature (heat or cold) onboard the ship	○	○	○	○	○
Worry because of rough sea or weather	○	○	○	○	○
Having always to be kind and forthcoming even when I don't feel like it	○	○	○	○	○
Lack of training in new personnel	○	○	○	○	○
Too little time to load and unload cargo or passengers at port	○	○	○	○	○
Having to work overtime	○	○	○	○	○

An uncomfortable high amount of responsibility	○	○	○	○	○
Having to make decisions too quickly	○	○	○	○	○
Having to make decisions in situations where decisions are hard to make	○	○	○	○	○
Doing tasks that require complete concentration without having the necessary time	○	○	○	○	○
Doing routine tasks	○	○	○	○	○
Being interrupted in my work	○	○	○	○	○
Having to do tasks that my training did not prepare me for	○	○	○	○	○
Being exposed to threats	○	○	○	○	○
Being assaulted	○	○	○	○	○
Being able to communicate socially with my co-workers during work	○	○	○	○	○
Doing a task were an error could result in co-workers being hurt	○	○	○	○	○
Doing a task were an error could result in financial loss for the company	○	○	○	○	○

How much stress du you perceive?	very much	much	somewhat	little	very little or none
Taken all the factors above into account, how much stress do you in general perceive during your work?	○	○	○	○	○

OTHER RELEVANT JOB STRESS QUESTIONS

Below you will find some job stress questions which are included solely to validate the questionnaire. It is very important for the validation that you complete them.

Considering your own working situation, how often do you experience the following working conditions?	very often or always	often	sometimes	seldom	very seldom or never
My workload varies and results in my work piling up	○	○	○	○	○
I have to work overtime	○	○	○	○	○

I have to work at a high tempo	○	○	○	○	○
I have a lot to do	○	○	○	○	○
My work requires a high work capacity	○	○	○	○	○
I have to make quick decisions	○	○	○	○	○
My work is too complicated for me	○	○	○	○	○
My work demands total concentration	○	○	○	○	○
My work requires high precision	○	○	○	○	○
I get interrupted during my work	○	○	○	○	○
My work requires complicated decisions	○	○	○	○	○
My work is monotonous	○	○	○	○	○
I have to repeat the same task within only a few minutes	○	○	○	○	○
I do work that requires knowledge beyond my education	○	○	○	○	○
My skills and personal expertise is useful in my work	○	○	○	○	○
My work is challenging in a positive way	○	○	○	○	○
I find my work meaningful	○	○	○	○	○
My work requires me to learn new skills and knowledge	○	○	○	○	○
I can socialize with my co-workers during work	○	○	○	○	○
I am threatened or assaulted at work	○	○	○	○	○
If I make an error, I put others in danger	○	○	○	○	○
If I make an error, I risk financial loss	○	○	○	○	○

MY JOB SATISFACTION

Considering your own working situation, how satisfied are you with the following working conditions?	very unsatisfied	unsatisfied	neither satisfied nor unsatisfied	satisfied	very satisfied
My workload onboard	○	○	○	○	○
The task I am given	○	○	○	○	○
Deadlines given to me	○	○	○	○	○
The use of my competence	○	○	○	○	○
The respect my co-workers have for my work	○	○	○	○	○
The possibilities for variation	○	○	○	○	○
The freedom to perform tasks as I want to	○	○	○	○	○
The freedom to plan my work as I want to	○	○	○	○	○
The quality of the work I do	○	○	○	○	○
The opportunity to develop new competence in my work	○	○	○	○	○
The support I receive from my co-workers	○	○	○	○	○
My chances for a promotion	○	○	○	○	○
The amount of pay I receive	○	○	○	○	○
The opportunities the shipping company provides for furthering my education	○	○	○	○	○
The communication I have with the employees in other departments	○	○	○	○	○
The communication I have with the people onboard the ship	○	○	○	○	○
The competence of my co-workers	○	○	○	○	○
The way I am treated onboard the ship	○	○	○	○	○
The benefits the company offers me	○	○	○	○	○

Considering your own working situation, to which degree would you agree or disagree with the following statements?	stronlgy disagree	disagree	neither agree nor disagree	agree	strongly agree
My work is rewarding	○	○	○	○	○
I often receive tasks I perceive as meaningless	○	○	○	○	○
I do a lot of work that should be done by others	○	○	○	○	○
Rules or procedures make my job difficult	○	○	○	○	○
I don't worry about losing my job	○	○	○	○	○
If a crisis should occur, I am confident that my co-workers would handle it	○	○	○	○	○
My family is putting pressure on me to find work closer to home	○	○	○	○	○
I worry about making mistakes that won't be corrected by others	○	○	○	○	○
I worry about losing my job if I make a serious mistake	○	○	○	○	○
Whenever I feel the need, I can retreat to the quietness of my cabin	○	○	○	○	○
Onboard the ship I hide my worries	○	○	○	○	○

How satisfied are you in general?	very unsatisfied	unsatisfied	neither satisfied nor unsatisfied	satisfied	very satisfied
When you take all factors mention above and other factors in to consideration, in general how satisfied are you with your job?	○	○	○	○	○

OTHER RELEVANT JOB SATISFACTION QUESTIONS

Below you will find some job satisfaction questions which are included solely to validate the questionnaire. It is very important for the validation that you complete them.

Considering your own working situation, to which degree would you agree or disagree with the following statements?	stronlgy disagree	disagree	neither agree nor disagree	agree	strongly agree
I feel I am being paid a fair amount for the work I do	○	○	○	○	○

There is really too little chance for promotion in my job	○	○	○	○	○
My supervisor is quite competent in doing his/her job	○	○	○	○	○
I am not satisfied with the benefits I receive	○	○	○	○	○
When I do a good job, I receive the recognition for it that I should receive	○	○	○	○	○
Many of our rules and procedures make doing a good job difficult	○	○	○	○	○
I like the people I work with	○	○	○	○	○
I sometimes feel my job is meaningless	○	○	○	○	○
Communications seem good within this organization	○	○	○	○	○
Raises are too few and far between	○	○	○	○	○
Those who do well on the job stand a fair chance of being promoted	○	○	○	○	○
My supervisor are unfair to me	○	○	○	○	○
The benefits we receive are as good as the ones most other organizations offer	○	○	○	○	○
I do not feel that the work I do is appreciated	○	○	○	○	○
My efforts to do a good job are seldom blocked by red tape	○	○	○	○	○
I find I have to work harder at my job than I should because of the incompetence of people I work with	○	○	○	○	○
I like doing the things I do at work	○	○	○	○	○
The goals of this organization are not clear to me	○	○	○	○	○
I feel unappreciated by the organization when I think about what they pay me	○	○	○	○	○
People get ahead as fast here as they do in other places	○	○	○	○	○
My supervisor shows too little interest in the feelings of subordinates	○	○	○	○	○
The benefit package we have is equitable	○	○	○	○	○
There are few rewards for those who work here	○	○	○	○	○
I have too much to do at work	○	○	○	○	○
I enjoy the company of my co-workers	○	○	○	○	○
I often feel that I do not know what is going on with the company	○	○	○	○	○
I feel a sense of pride in doing my job	○	○	○	○	○

I don't feel my efforts are rewarded the way they should be	○	○	○	○	○
I am satisfied with my chances for promotion	○	○	○	○	○
There is too much bickering and fighting at work	○	○	○	○	○
My job is enjoyable	○	○	○	○	○
Work assignments are often not fully explained	○	○	○	○	○

ABOUT MYSELF

Please provide us with some information about yourself. All information is treated confidentially. When you are required to write information in a yellow cell, click on the yellow cell and use keyboard to enter the information

Your gender	○ Male ○ Female
Your age	○ 20 or younger ○ 20 - 24 ○ 25 - 29 ○ 30 - 34 ○ 35 - 39 ○ 40 - 44 ○ 45 - 49 ○ 50 or older
Your nationality	○ Norwegian ○ Pilipino ○ Indian ○ Polish ○ Russian ○ Chinese ○ Swedish ○ Other nationality If you chose other, please write your nationality below in the yellow cell
Relationship status	○ Single ○ Married / Living partner ○ Widow / Widower ○ Divorced

How long have you been in this company (number of years and months)	Please enter number of years and months in the yellow cells below ☐ Years ☐ Months
How long have you been in your current position (number of years and months)	Please enter number of years and months in the yellow cells below ☐ Years ☐ Months
How many shipping companies have you been with before this one	Please enter number of shipping companies in the yellow cells below ☐ Companies
Your type of ship	○ PGS ○ Ro-ro ○ Offshore fleet ○ Passenger / Cruise ○ Other type of ship If you chose other, please write your type of ship below in the yellow cell ☐
What is your position?	○ Officer / Manager ○ Rating / Subordinate
Please mark your current position	Industrial ship ○ Deck ○ Engine ○ Ship assistant ○ Apprentice ○ Bridge ○ Catering Passenger / Cruise ship ○ Deck ○ Engine ○ Ship assistant ○ Apprentice ○ Bridge ○ Boarding assistant/Cleaning ○ Catering/Restaurant/Shop/Conference center

	○ Other position
	If you chose other, please write your position in the yellow cell below
Please use the yellow box to the right to write what you think is the most important thing for you to have a good working environment on board your ship (up to 50 words)	
If you have any comments to the questionnaire, you can write them in the yellow box to the right (up to 50 words)	
Where are you or right now?	○ In port ○ In transit ○ In lay up ○ On land

END OF THE QUESTIONNAIRE

Ready - submit values

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THANK YOU FOR YOUR PARTICIPATION

This is the end of the questionnaire. We thank you for your participation. You can now close the questionnaire by clicking the button bellow.

Finished -
Close questionnaire