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Measuring Safety Climate in Shipping Companies

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ABSTRACT

The purpose of this paper is to investigate the safety climate in the Finnish maritime sector. Maritime industry can be considered as one of the most dangerous industries in the world. Thus, there is a need for constantly focus on safety in maritime industry. It is commonly accepted that by strengthening safety climate the overall level of safety is improved. The Nordic Safety Climate Questionnaire (NOSACQ-50) was applied in this in this study. The NOSACQ-50 safety climate survey was carried out in eight maritime organisations in Finland. Total number of respondents was 402. The response rate was 52%. The study indicated rather positive results about the current level of safety climate. The average scores for NOSACQ-50 dimensions varied between 3.0 and 3.4. Regarding the strength of the safety climate, no significant differences between organizations were identified in any dimension in this study. It was a little surprise that, contrary to the previous studies, this study indicated rather positive results about the current level of safety climate. However, the results should be taken only as indicative results about the current safety level of the entire Finnish shipping industry. The survey tool enables comparisons of the safety climate dimensions between occupational groups and between shipping companies. A conclusion could be drawn on that that the maritime organisations and the authorities would benefit if the safety climate surveys will be carried out at the regular intervals.

1. Introduction.

The purpose of this paper is to investigate the safety climate in the Finnish maritime sector.

The maritime industry is a good example of safety critical industries (Borgersen et al. 2016 where it is always a possibility of a major accident which can result injuries, harm for property and even fatalities (Hystad et al. 2014). There are examples of fatal accidents such as the Herald of Free Enterprise, the Scandinavian Star, the Prestige and the most recent the Costa Concordia which have led to numbers of loss of lives, destroyed vessels and severe environmental damages (Kirby & Law, 2010; Schröder-Hinrichs et al. 2012; Fenstad et al. 2016; Lappalainen, 2016).

According to Bhattacharya (2015), maritime industry can be considered as one of the most dangerous industries in the world. Thus, there is a need for constantly focus on safety in maritime industry. It is commonly accepted that by strengthening safety climate the overall level of safety is improved (Lu and Yang 2011: Bosak et al. 2013; Tholen et al. 2013; Gao et al 2014; Fenstad et al. 2016; Schwatka et al. 2016).

A breakdown in the organisation safety culture was seen as the main contributor to the above mentioned accidents. As a response, the authorities soon began to demand a proper safety culture which would be achieved by implementing safety management systems (Lappalainen, 2016). Thus, the International Maritime Organisation (IMO) enacted the ISM Code that provides an international standard for the safe management and operation of ships and for the prevention of pollution. The ISM Code requires that "every Company should develop, implement and maintain a Safety Management System (SMS)" (IMO, 1993). Safety climate has been seen as a manifestation of the safety culture and it is believed that by measuring safety climate an organisation is able to identify actions to improve its safety culture.

The research questions of this study are:

1. What is the current level of safety climate in the Finnish shipping industry?

2. What is the strength of the safety climate in the Finnish

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shipping industry?

3. Do the evaluations of different safety climate dimensions differ from each other?

2. Theoretical Framework.

The concepts of safety climate and culture have been adopted to safety studies from the organisational studies (Lappalainen, 2016). The organisational culture can be defined as a background factor influencing the company's operations, an organisational variable or a metaphor for conceptualizing the organisation (Smircich, 1983). Most definitions consider safety culture as a part of organisational culture, with a focus on safety (Glendon & Stanton, 2000; Cooper, 2000; Wiegmann et al. 2002; Richter & Koch, 2004; Reiman et al. 2008: Guldenmund, 2014). Respectively, safety climate is defined as employees shared perceptions about their work environment in relation to safety (see, for example, Zohar, 2010; Kines et al. 2011; Hystad et al. 2013; Schwatka et al. 2016). However, concepts of safety climate and culture have been under continuing debate and no consensus has not been reached (see, for example, Bosak et al. 2013)

At first, no consensus about the definitions of concepts of safety climate or safety culture can be found (Guldenmund, 2010; Lappalainen, 2016; Schwatka et al. 2016). On the contrary, safety culture has numerous different definitions in literature (Reason, 1997; Wiegmann et al. 2002; Haukelid, 2008; Oltedal, 2011). Richter and Koch (2004) define safety culture as commonly learned meanings, experiences and interpretations of work and safety, which guide people's perceptions about risks, accidents and accident prevention. Reiman et al. (2008), on the other hand, define safety culture as organisational culture in which safety related values and basic assumptions highlight safety and commitment. According to Antonsen (2012), the concept of safety culture could be defined how the cultural processes and traits within organisations influence safety. Accordingly, safety climate is defined in several ways. One definition for safety climate is that is workgroup members' shared perceptions of management and workgroup safety related policies, procedures and practices (Kines et al. 2011; see also Zohar, 2010; Hystad et al. 2013; Schwatka et al. 2016). Safety climate has been seen as a manifestation of the safety culture (Guldenmund, 2010; Oltedal, 2011; Schwatka et al. 2016). Antonsen (2012) have noted that the terms safety climate and safety culture are difficult to separate when it comes to content, and they have, in many instances, been used interchangeably.

Another debate concerns the relationship of safety climate and safety culture. According to Guldenmund (2010), the concept of organisational climate has come to mean more and more the overt manifestation of culture within an organisation. It is believed that climate follows naturally from culture (Guldenmund, 2010; Oltedal, 2011). Accordingly, safety climate means attitudes to safety and safety culture represents the strong convictions or dogmas underlying those attitudes to safety (Guldenmund, 2010). Following this approach, Bhattacharya (2015), who studied safety climate in shipping, defines safety climate as a construct used to take a 'snap shot' of the safety culture on board ships (see also Bergh et al. 2013; Borgersen et al. 2013). In sum, safety climate has been seen as a manifestation of the safety culture (Oltedal, 2011; Schwatka et al. 2016). Antonsen (2012) advises to be cautious when drawing conclusions about safety culture from a study of safety climate. According to him, safety culture and safety climate are not always consistent (Antonsen, 2012).However, it is quite common to mix the concepts of safety climate and safety culture and the concepts have been used interchangeably (Antonsen, 2012; see also Guldenmund, 2010).

Thirdly, there is unceasing debate about the dimensions of safety climate. No consensus has been reached regarding the specific dimensions making the safety climate. (Guldenmund, 2010: Lu and Yang 2011; Antonsen, 2012). According to Guldenmund (2010), the researchers have applied different dimensions for operationalising safety climate (see also. Kines et al. 2011) and the number of those dimension have differed significantly from two to sixteen (Guldenmund, 2010).That is the fact also in shipping industry. Different questionnaire surveys with different thematic dimensions or attributes have been applied to investigations of safety climate in the shipping industry (Lu and Yang, 2011; Hystad et al. 2014; Bhattacharya, 2015; Fenstad at al. 2016). According to Guldenmund (2010), the problem is that there is not much correspondence between safety climate studies which makes difficult to compare the results of the studies and does not assist to learn from others (industries) (See also. Kines et al. 2011).

Safety climate is commonly associated with positive outcomes in relation to safety (Borgersen, 2013) that is why safety climate measurements have been common in safety critical industries. According to Gao et al. (2014) safety climate can be seen as a predictor of safety behaviour and safety performance (see also: Lu & Tsai, 2010; Bosak et al. 2014; Tholen et at. 2014) or an indicator of the overall strength of an organization's safety culture (Schwatka et al. 2016). In safety critical industries, safety climate has been considered essential for safe operations (see, for example, Giskegjerde, 2011). In shipping context, in has been found that that greater safety climate will lead to better safety behaviour and further reduce accident occurrences (Lu and Yang, 2011). Fenstad et al. (2016) have found that there is a positive correlation between safety climate and shipboard safety (See also Kines et al. 2011). Correspondingly, based on the recent meta-analysis of safety climate studies, Ajslev et al. (2017) concluded that problems in the area of safety climate are progressively associated with increased odds for experiencing accidents.

In his recent study, Bhattacharya (2015) noted that there has been limited research on safety climate in shipping, especially with regard to its measurement. However, several studies have investigated safety climate in seafaring during the recent years. Lu and Tsai (2010) investigated the importance of safety climate in explaining safety behaviour in container shipping operations, Lu and Yang (2011) evaluated safety climate and safety behaviour in the passenger ferries operating between Taiwanese islands, Borgersen et al. (2013) studied how the authentic leadership influence on safety climate (the target group was Filipino

seafarers), Hystad et al. (2014) explored the determinants of positive safety climate among offshore oil-workers and seafarers working on oil platform supply ships, Bhattacharya (2015) applied safety climate approach for measuring the prevailing safety culture among Indian maritime officers and Fenstad at al. (2016) studied crew members perceptions of shipboard safety on high-speed crafts (HSC) carrying out passenger transport in Norwegian waters.

According to Bhattacharya (2015) there seems to be no specific tool for measurement of safety climate in the shipping industry. And, no consensus has been reached regarding the specific dimensions making the safety climate. (Guldenmund, 2010: Lu and Yang 2011; Antonsen, 2012). Different questionnaire surveys with different thematic dimensions or attributes have been applied to investigations of safety climate in the shipping industry (Lu and Yang, 2011; Hystad et al. 2014; Bhattacharya, 2015; Fenstad at al. 2016). According to Kines et al. (2011) the differences between approaches applied to safety climate investigations make difficult to compare the results of the studies and does not assist to learn from other industries.

Safety climate has been usually measured by applying a questionnaire survey (Guldenmund, 2010). Thus, in this study we have applied The NOSACQ-50 (Nordic Safety Climate Questionnaire). The NOSACQ-50 methodology was introduced by Törner et al. (2008) and Kines et al. (2011) in order to provide a consistent factor structure and a solid theoretical grounding for safety climate questionnaires in different contexts. Kines et al. 2011 claim that the NOSACQ provides a tool for comparison of safety climate across industrial branches and across nations. The NOSACQ-50 methodology has gained considerable acceptance, as evidenced by its translation into multiple languages and its widespread application to measure and identify safety climate in safety critical industries (Strauch, 2015; see also Vu & De Cieri, 2015)

3. Methods.

In this study, we used the Nordic Safety Climate Questionnaire (NOSACQ-50) to assess the current status of the safety climate on the Finnish shipping business. The NOSACQ-50 questionnaire is based on organizational and safety climate theory, psychological theory, previous empirical research, empirical results acquired through international studies, and a continuous development process, to provide a common framework for assessment of safety climate in different industries (Kines et al. 2011). In the NOSACQ-50 survey safety climate is defined as workgroup members' shared perceptions of management and workgroup safety related policies, procedures and practices. It is suitable for research purposes as well as for practical use in evaluating safety climate status, as a diagnostic tool, and in evaluating the effect of safety climate interventions (Kines et al. 2011).

The NOSACQ-50 consists of 50 items comprising seven sum variables (dimensions), three of them measuring management principles and four of them measuring working principles:

1) Management safety priority, commitment and competence (e.g. Management encourages employees here to work in accordance with safety rules - even when the work schedule is tight)

2) Management safety empowerment; (e.g. Management encourages employees here to participate in decisions which affect their safety)

3) Management safety justice; (e.g. Management looks for causes, not guilty persons, when an accident occurs)

4) Workers' safety commitment; (e.g. We who work here try hard together to achieve a high level of safety)

5) Workers' safety priority and risk non-acceptance; (e.g. We who work here never accept risk-taking even if the work schedule is tight)

6) Safety communication, learning, and trust in co-workers' safety competence; (e.g. We who work here always discuss safety issues when such issues come up)

7) Workers' trust in the efficacy of safety systems. (e.g. We who work here consider that safety rounds/evaluations help find serious hazards)

It is noteworthy that unlike many other safety climate measuring tools, in NOSACQ-50 respondents do not assess how they themselves act but they are assessing what are the normal practices or principals among their work group. Since safety climate is shared and communal phenomenon, it is useful also measure not just the individual but common practices. This also moderates the typical issue regarding climate measures when people tend to overestimate their own performance. As regards to management's role, NOSACQ focus more on assessing management practices and principles than individuals.

Kines et al. (2011) found NOSACQ-50 to be a reliable instrument for measuring safety climate and valid for predicting safety motivation, perceived safety level, and self-related safety behaviour. It is also valid for detecting significant differences in safety climate between organizational units. Ajslev et al. (2017) used five items from NOSACQ-50 to measure safety climate among 15,144 Danish workers and found out that higher number of safety climate problems are progressively associated with increased odds for experiencing accidents.

The authors of the NOSACQ-50 questionnaire tool have provided guidance for interpreting the results of each dimension. A score of more than 3.30 indicates a good level allowing for maintaining and continuing developments; A score of 3.00 to 3.30 points to a fairly good level with slight need of improvement; A score of 2.70 to 2.99 shows a fairly low level with need of improvement; A score below 2.70 indicates a low level with great need of improvement. (NFA, 2017)

Safety climate can be characterised by its level and strength (Keren et al. 2009; Borgersen et al. 2013). Level of safety climate refers to the average score of perceptions in an organisation. Strength of safety climate refers to the perceptual consensus in an organisation with regard to the level of safety climate. (Keren et al. 2009; Borgersen et al. 2013).

4. Findings.

4.1. Participants.

The NOSACQ-50 safety climate survey was carried out in eight maritime organisations in Finland. Total number of re-

spondents was 402 (male 64%). The response rate was 52%. The number of respondents per organization varied from 1 to 340 respondents. The response rates varied from 33 to 100 percent. The average age of respondents was 48 years (MD 50, SD 9,4). Most of the respondents (66%) were from catering, household, entertainment and services. 23% of the respondents represented the operative functions (Table 1). Only 39 of the respondents (9,7%) considered themselves to belong to engine crew or deck crew.

Table 1: Respondents by personnel group.

Personnel group	n	%
Operative functions of the vessel	92	22,9
Catering/household/entertainment/services	257	63,9
Captain of the vessel	16	4
Expert	27	6,7
Other	10	2,5
Total	**402**	**100**

Source: Authors.

The majority of the respondents had over 10 years' experience for working in maritime occupation. Less than seven percent of the respondents had less than five year's maritime experience.

Table 2: Respondents by work experience in maritime occupation.

Work experience in maritime	n	%
5 years or less	30	7
5-10 years	53	13
10-20 years	103	26
20-30 years	152	38
over 30 years	64	16
Total	**402**	**100**

Source: Authors.

The average age of the respondents was 48 years. Every second respondent (52%) were over 50 years old. (Table 3.).

Table 3: Respondents by age.

Age group	n	%
35 years old or less	52	13
36-49 years old	141	35
50 years old or more	209	52
Total	**402**	**100**

Source: Authors.

4.2. Results.

The data was statistically analysed by using SPSS program. The NOSACQ-50 subscales had good or acceptable reliability scores (Table 4).

Table 4: Internal consistencies (Cronbach?s alpha based on standardized items) for the NOSACQ-50.

Dimension	No. of items	n	alpha
Dim 1	9	402	0,860
Dim 2	7	402	0,828
Dim 3	6	401	0,805
Dim 4	6	402	0,795
Dim 5	7	402	0,782
Dim 6	8	401	0,838
Dim 7	7	401	0,831

Source: Authors.

The average scores for NOSACQ-50 dimensions varied between 3,01 and 3,36. In average, the respondents gave highest scores for dimension 7 Workers' trust in efficacy of safety systems (3,4), and the lowest scores for dimension 2 Management safety empowerment (3,0). (Figure 1).

Some differences could be found between different respondents groups in dimension 5 and dimension 7.

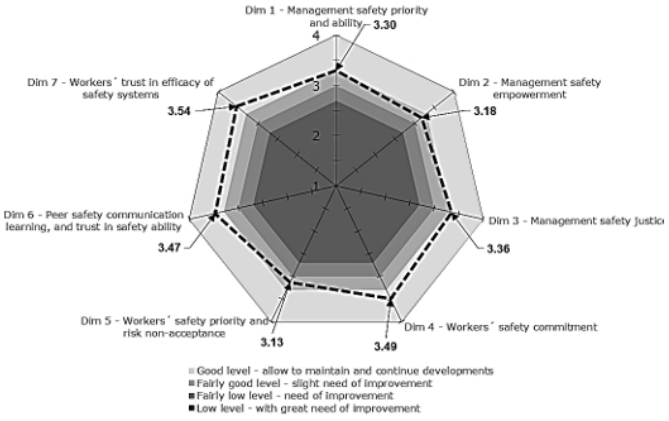
The dimension 5 Workers safety priority and risk non-acceptance measures how respondents consider workers at their workplace prioritize safety. Respondents at age 36-49 rated this dimension with lower score (3,01) than respondents at age 50 or more (3,15) (p=0.039). Also respondents with 5 years or less of maritime experience rated this dimension with lower score (2,87) than those with more than 30 years of maritime experience (3,19) (p=0,033).

The dimension 7 Workers' trust in efficacy of safety systems describes how useful respondents consider the safety systems

Figure 1: NOSAQ-50 Results.

Source: Authors.

Figure 2: NOSACQ-50 results at the end of the project.



Source: Authors.

and practices in their organisation. Respondents from operative functions (average score 3,2) gave lowers scores for dim 7 than respondents from catering etc. (average score 3,4) (p=0.000). Respondents at age 36-49 gave lower scores (3,29) than respondents at age 50 or more (3,42) (p=0.015). Respondents with 5 years (3,17) or less or 5-10 years (3,23) work experience in maritime gave lower scores than respondents with 20-30 years of maritime experience (3,42) (p=0.028; p=0.040).

No differences between organizations were identified in any dimension in this study, but it is notable that the number of respondents varied a lot between different organisations, which may affect the statistical analyses.

The NOSACQ-50 survey was repeated in the Fall 2016. Total number of respondents was 290 (male 64%). The response rate was 30%. The response rates varied from 11 to 63percent. Most of the respondents (66%) were from catering, household, entertainment and services. 108 respondents represented the operative functions. It should be noted that the target group of the second survey differed from them first round survey. The survey was targeted more to the operative personnel.

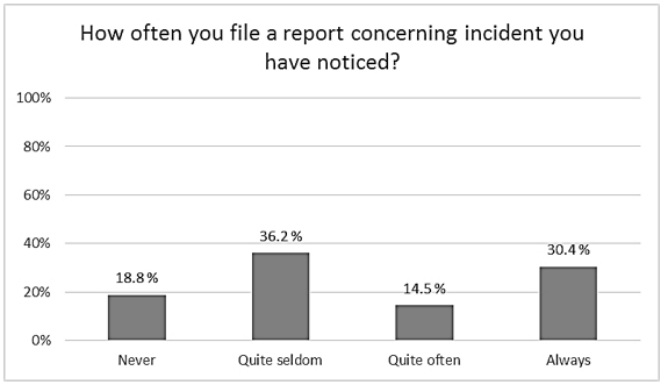
The average scores for the NOSACQ-50 dimensions were higher at the second round. The average scores of the second survey for NOSACQ-50 dimensions varied between 3,13 and 3,54. In average, the respondents gave highest scores for dimension 7 Workers' trust in efficacy of safety systems (3,54), and the lowest scores for dimension 5 Workers' safety priority (3,13). (Figure 2). As regards to reporting incidents and learning from them, most of the respondents (82-93%) agreed that safety attitudes are spread through training, and they feel free to report their own mistakes and they also do so. About four out of five respondents considered corrective actions are taken based on reports. Every fifth respondent felt that a one can get a bad reputation if reporting incidents. Almost one out of four respondents considered there are tendency to look for culprits, and up to 38% thought that some incidents occur without the organisation learning from them. (Figure 3.)

When comparing the differences between average scores of the personnel groups, we found out that the respondents from the operative functions considered more often that there is a tendency to look for culprits even in situations in which there are no culprits (p=0.001), and that the person reporting incidents easily gets a bad reputation (p=0.000), compared to the respondents working in catering etc.

Respondents with less than five years of experience in maritime agreed less concerning making use of safety materials produced by the organisation, and that safety attitudes are spread through training, than respondents with 20-30 or over 30 years of experience. Respondents with less than five years of maritime also agreed less receiving feedback on the reports they file. The respondents with less than 5 years of experience in maritime were less active to monitor the work of the safety organisation at their workplaces than respondents with over 30 years of experience.

Respondents at age 35 or younger were less active trying to make use of safety materials produced by the organisation (2,81) or actively monitoring the work of the safety organisation (2,65) than respondents at age 50 or more (3,09; 2,98) (p=0.009; p=0.006).

Figure 3: How often respondents do not report incidents they have noticed.



Source: Authors.

5. Discussion.

The purpose of this paper was to investigate the current status of the safety climate on the Finnish shipping business. The research questions were: What is the current level of safety climate in the Finnish maritime organizations involved into the study, what is the strength of the safety climate in the Finnish shipping industry and do the evaluations of different safety climate dimensions differ from each other? The Nordic Safety Climate Questionnaire (NOSACQ-50) was used as the research method in this study.

It was a little surprise that, contrary to the previous studies, this study indicated rather positive results about the current level of safety climate. The average scores for NOSACQ-50 dimensions varied between 3,0 and 3,4 at the first round. Two dimensions were at good level and the other dimensions were at fairly good level. This study indicates higher scores for all the dimensions compared to grand means of the NOSACQ-50 database (See Table 5 below). The NOSACQ-50 database contains data from a total of 37,634 'worker' respondents from 279 different work sites or studies in 37 industrial sectors on 6 continents, using 26 different language versions (NFA, 2017).

Table 5: Comparison of the means of this study to the grand means of NOSACQ-50 Database.

NOSACQ-50 Dimensions	Grand mean	This Study
Dim 1 - Management safety priority and ability	3.00	3.20
Dim 2 - Management safety empowerment	2.92	3.00
Dim 3 - Management safety justice	2.98	3.10
Dim 4 - Worker safety commitment	3.16	3.30
Dim 5 - Workers safety priority and risk non-acceptance	2.95	3.10
Dim 6 - Peer safety communication, learning, and trust in safety ability	3.12	3.20
Dim 7 - Workers trust in the efficacy of safety systems	3.20	3.40

Source: Authors.

The strength of safety climate refers to the perceptual consensus in an organization with regard to the levels of safety climate (Keren et al. 2009; Borgersen et al. 2013). Regarding the strength of the safety climate, no significant differences between organizations were identified in any dimension in this study. However, there were some differences between respondents groups. The differences were found between different respondent groups in dimension 5 (Workers safety priority and risk non-acceptance) and dimension 7. (Workers' trust in efficacy of safety systems). The operative personnel was more critical than catering etc. personnel concerning trusting the efficacy of safety systems. This is understandable since their work includes more serious occupational risks than other personnel groups. However, the proportion of the engine and deck crew was quite low (9,7%), and with greater proportion of operative crew respondents there might have also been differences in other dimensions. The younger respondents as well as the respondents with the least work experience in maritime were more critical than the older or most experienced respondents concerning workers' safety priorities and concerning the efficacy of safety systems. The longer people have been working the more adjusted they become to the risks and safety deficiencies at their work. Also, the respondents with higher age and more maritime experience have longer perspective to the development of safety field in maritime and therefore they might see the current situation more positively than the younger and less experienced.

The comparison above is made for providing inspiration for further development. It should not be used for any grading of organisations or industries. The NOSACQ-50 database is not based on a representative sample. The data provided by the database can be biased because it may include only those companies interested in being measured. Those companies are usually very proactive in relation to safety issues. Similarly, the companies involved in our study are considered to belong to the group of the most proactive shipping companies in Finland. Thus, our results should be taken only as indicative results about the current safety level of the entire Finnish shipping industry.

Originally, NOSACQ-50 is planned to measure occupational safety climate, which can be understood as a workgroup members' shared perceptions of managers' as well as workgroup's safety related policies, procedures and practices. In this study, the occupational safety climate scores seemed to be relatively high, compared to previous studies in maritime. It is possible that in safety critical fields occupational safety level is considered to be higher than it actually is since the risks are compared to operational risks.

Conclusions.

In this study we have applied The Nordic Safety Climate (NOSACQ-50) survey tool. For this study NOSACQ-50 provided a factor structure of safety climate which seems to be consistent also in maritime contexts. The survey tool enables comparisons of the safety climate dimensions between occupational groups and between shipping companies. The NOSACQ-50 survey was performed twice during the study. The second

round of the survey indicated higher scores for the safety climate dimensions. A conclusion could be drawn on that that the maritime organisations and the authorities would benefit if the safety climate surveys will be carried out at the regular intervals (see also, Ek & Arvidsson, 2012; Fenstad et al. 2016). The safety climate questionnaires could be utilised as a proactive safety indicator in order to facilitate the process of continuous improvement of safety.

References.

Ajslev, J., Dastjerdi, E. L., Dyreborg, J., Kines, P., Jeschke, K. C., Sundstrup, E., ... & Andersen, L. L. (2017). Safety climate and accidents at work: Cross-sectional study among 15,000 workers of the general working population. Safety science, 91, 320-325.

Antonsen, S. (2012). Safety culture: theory, method and improvement. Ashgate Publishing Farnham. (Available at ProQuest ebrary.)

Bergh, M., Shahriari, M., & Kines, P. (2013). Occupational safety climate and shift work. Chemical Engineering Transactions, 31.

Bhattacharya, S. (2009). Impact of the ISM Code on the Management of Occupational Health and Safety in the Maritime Industry. (Doctoral Thesis), Cardiff University, Cardiff.

Bhattacharya, Y. (2015). Measuring Safety Culture on Ships Using Safety Climate: A Study among Indian Officers. International Journal of e-Navigation and Maritime Economy, 3, 51-70.

Borgersen, H. C., Hystad, S. W., Larsson, G., & Eid, J. (2014). Authentic leadership and safety climate among seafarers. Journal of Leadership & Organizational Studies, 21(4), 394-402.

Bosak, J., Coetsee, W. J., & Cullinane, S. J. (2013). Safety climate dimensions as predictors for risk behavior. Accident Analysis & Prevention, 55, 256-264.

Cooper, M. D. (2000). Towards a model of safety culture. Safety Science, 36(2), 111-136.

Ek, Å., & Arvidsson, M. (2012). Enabler for safety improvements in air traffic control. Aviation Psychology and Applied Human Factors; Vol. 2(2):82–94

Fenstad, J., Dahl, Ø., & Kongsvik, T. (2016). Shipboard safety: exploring organizational and regulatory factors. Maritime Policy & Management, 1-17.

Gao, R., Chan, A. P., Utama, W. P., & Zahoor, H. (2015). Review and adopt a tool for measuring safety climate in international construction projects. Implementing Innovative Ideas in Structural Engineering and Project Management.

Giskegjerde, G. (2011). Expertise or Safety Climate? Approaching Human Factors in Demanding Maritime Operations. (Master's thesis). Department of Psychology, University of Oslo.

Glendon, A. I. & Stanton, N. A. (2000). Perspectives on safety culture. Safety Science, 34(1), 193-214.

Grote, G. (2012). Safety management in different high-risk domains–All the same?. Safety Science, 50(10), 1983-1992.

Guldenmund, F. W. (2010). Understanding and exploring safety culture. TU Delft, Delft University of Technology.

Guldenmund, F.W. (2014). Organisational safety culture principles. In Waterson, P. (Ed.), Patient Safety Culture: Theory, Methods and Application, (pp. 15-42), Ashgate, Farnham.

Haukelid, K. (2008). Theories of (safety) culture revisited — An anthropological approach. Safety Science, 46(3), 413-426

Hystad, S. W., Saus, E. R., Sætrevik, B., & Eid, J. (2013). Fatigue in seafarers working in the offshore oil and gas resupply industry: effects of safety climate, psychosocial work environment and shift arrangement. Int Marit Health, 64(2), 72-79.

Hystad, S. W., Bartone, P. T., & Eid, J. (2014). Positive organizational behavior and safety in the offshore oil industry: Exploring the determinants of positive safety climate. The journal of positive psychology, 9(1), 42-53.

IMO (1993). The international management code for the safe operation of ships and for pollution prevention (International Safety Management (ISM) Code), Resolution A.741(18).

Kines, P., Lappalainen, J., Mikkelsen, K. L., Olsen, E., Pousette, A., Tharaldsen, J., ... & Törner, M. (2011). Nordic Safety Climate Questionnaire (NOSACQ-50): A new tool for diagnosing occupational safety climate. International Journal of Industrial Ergonomics, 41(6), 634-646.

Kirby, M. F., & Law, R. J. (2010). Accidental spills at sea–Risk, impact, mitigation and the need for co-ordinated post-incident monitoring. Marine pollution bulletin, 60(6), 797-803.

Lappalainen, J. (2016), Finnish maritime personnel's conceptions on safety management and safety culture, (Doctoral thesis, monograph), Annales Universitatis Turkuensis A II 316, University of Turku, Turku.

Lu, C. S., & Tsai, C. L. (2010). The effect of safety climate on seafarers' safety behaviors in container shipping. Accident Analysis & Prevention, 42(6), 1999-2006.

Lu, C. S., & Yang, C. S. (2011). Safety climate and safety behavior in the passenger ferry context. Accident Analysis & Prevention, 43(1), 329-341.

NFA, (2017). How to use NOSACQ-50. Interpreting the Nordic Occupational Safety Climate Questionnaire NOSACQ-50 results (2017, February 27). Nationale Forskningscenter for Arbejdsmiljø (NFA) (National Research Centre for the Working Environment). Retrieved from http://www.arbejdsmiljoforskning.dk/da/publikationer/spoergeskemaer/nosacq-50/how-to-use-nosacq-50/interpreting-nosacq-50-results

Oltedal, H. A. (2011). Safety culture and safety management within the Norwegian-controlled shipping industry. State of art, Interrelationships and Influencing Factors". (Doctoral Thesis), University of Stavanger, Stavanger.

Reason, J. T. (1997). Managing the risks of organisational accidents. Ashgate, Aldershot.

Reiman, T., Pietikäinen, E. & Oedewald, P. (2008). Turvallisuuskulttuuri: Teoria ja arviointi. VTT Technical Research Centre of Finland, Espoo.

Richter, A. & Koch, C. (2004). Integration, differentiation and ambiguity in safety cultures. Safety Science, 42(8), 703-722.

Schröder-Hinrichs, J. U., Hollnagel, E., & Baldauf, M. (2012). From Titanic to Costa Concordia—a century of lessons not learned.

WMU Journal of Maritime Affairs, 11(2), 151-167.

Schwatka, N. V., Hecker, S., & Goldenhar, L. M. (2016). Defining and measuring safety climate: a review of the construction industry literature. Annals of occupational hygiene, 60(5), 537-550.

Smircich, L. (1983). Concepts of culture and organisational analysis. Administrative Science Quarterly, 28(3), 339-358.

Strauch, B. (2015). Can we examine safety culture in accident investigations, or should we?. Safety Science, 77, 102-111.

Törner M., Pousette A., Kines P., Mikkelsen, K.L., Lappalainen J., Tharaldsen J. & Tómasson K. (2008). A Nordic questionnaire for assessing safety climate (NOSACQ). Proceedings of 4th International Conference Working on Safety, Crete, Sept 30-Oct 3.

Vu, T., & De Cieri, H. (2015). A review and evaluation of safety culture and safety climate measurement tools.

Wiegmann, D., Zhang, H., von Thaden, T., Sharma, G. & Mitchell, A, (2002), A synthesis of safety culture and safety climate research. University of Illinois, Aviation Research Lab, Savoy.

Zohar, D. (2010). Thirty years of safety climate research: Reflections and future directions. Accident Analysis & Prevention, 42(5), 1517-1522.