Safety Onboard Norwegian Vessels: Investigating The Risk Assessments Of Maritime Operators

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MAPSYK360, masterprogram i psykologi,

Studieretning: Sosial- og Kognitiv psykologi

ved

UNIVERSITETET I BERGEN

DET PSYKOLOGISKE FAKULTET

SPRING 2021

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The present study follows The American Psychological Association's 7th edition manual style.

Abstract

This study examined how operators in the Norwegian maritime industry assess risks associated with their work. The topic of subjective risk assessments was expounded upon and debated, before tested on Norwegian seafarers. A large scale, self-completion questionnaire was carried out. A sample of 3570 responses were recorded across three vessel types: passenger ships, cargo ships and fishing vessels. Using a scoring system developed for this study, subjective risk assessment was measured against objective risk as determined by the likelihood that certain accidents will occur. Results from the study indicates that Norwegian seafarers tend to be skewed toward accidents with outsize consequences but with a historically low chance of happening when considering which accidents they were most concerned with preventing. Implications of this finding was discussed based in psychological theories regarding individual's decision making, situational awareness, and other factors that might influence how risk is assessed. Experience, measured as time spent sailing, and participation in *job safety analysis* was also tested to see whether they could predict higher or lower scores. The results from the latter two tests were inconclusive, which could indicate that having been subject to more incidents as a result of simply having sailed more, or being told about potential risks in specific work operations, might not lead the operator to act in a safer manner.

Keywords: risk assessment, risk perception, situational awareness, cognitive bias, safety focus, accident prevention, objective risk, human factors, job safety analysis, maritime industry

Sammendrag

Dette studiet undersøkte hvordan norske sjøfolk vurderer risiko som er assosiert med deres arbeid. Nærmere bestemt om deres subjektive vurdering av risiko stemmer overens med den objektive risikoen, og om de fatter beslutninger i tråd med bransjens uttalte ønske om å redusere ulykker og skape en sikker arbeidssituasjon. Dette ble testet ved å utvikle en skåre basert på historiske forekomster av ulykker, og tildele denne skåren til sjøfolkene for å få et inntrykk av hvilke hendelser de er mest opptatt av å avverge. Utvalget besto av 3570 personer fordelt på tre fartøytyper: passasjerskip, lasteskip, og fiskefartøy. Overordnet ble det funnet at sjøfolkene er uforholdsmessig opptatt av ulykker med katastrofepotensiale relativt til de hendelsene som forekommer oftest og som oftest sørger for personskader og fravær fra jobb. Relevant psykologisk litteratur om beslutningstaking og andre faktorer som påvirker risikoforståelse ble diskutert. I tillegg ble risikoskåren testet på variabler knyttet til situasjonsbevissthet, herunder fartstid som et mål på erfaring, og deltakelse i sikker jobbanalyse som et mål på bevissthet rundt risiko og usikkerhet. Vi fant ikke at disse variablene kunne forutse om enkelte grupper hadde bedre risikovurdering enn andre. Dette kan antyde at erfaring med hendelser eller konkret bevisstgjøring om potensielle hendelser ikke nødvendigvis leder til færre ulykker i sektoren.

Nøkkelord: risikovurderinger, risikopersepsjon, situasjonsbevissthet, kognitive bias, sikkerhetsfokus, ulykkesforebygging, objektiv risiko, menneskelige faktorer, sikker jobb analyse, maritim industri.

Acknowledgements

This has been a thoroughly interesting and instructive project which has increased the authors' knowledge, not only about psychological theories, but about their practical implications as well. The latter was made possible by the good people in the Norwegian Maritime Authority who, since our initial meeting during the summer of 2020, have been nothing but helpful and swift in providing us access to data as well as their resourceful employees to answer our questions. In particular, we would like to thank Vegar Berntsen and Sverre Flatebø who have followed the project from the start. Through them we were also introduced to Safetec and Leif Inge Sørskår who provided us with valuable insights into the work of risk reduction. We would like to thank him for his genuine interest in our thesis, and his useful input. Furthermore, we would like to acknowledge Rachel Johnson and Kristin Oeding for taking the time to read drafts of the thesis and their precise and apt comments.

We have great appreciation for the input from our supervisors, Bjørn Sætrevik and Evelyn-Rose Saus, which have been both honest, useful and motivating. Thank you.

On a final note, we would like to thank any and all digital aids that has facilitated the production of this thesis the past year, through several covid-19 related lockdowns.

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Introduction

The case of the cruise vessel Viking Sky

On the 23 of March 2019, Viking Sky, a cruise vessel carrying 915 passengers and 458 crew, sent out a distress signal following a loss of engine power crossing a particularly treacherous area of western Norway called Hustadvika. A shallow, uneven seabed combined with gale force winds and an unsheltered fairway (a term describing the recommended route for sailing) caused the ship to roll from side to side. Viking Sky, a large and modern cruise liner, should not have any difficulty sailing across Hustadvika. Even with waves of up to ten meters striking its starboard side, several safety protocols and an accurate weather forecast should have been sufficient for a prepared, well-trained crew to navigate across this stretch of water. As the ship lost propulsion following the sudden loss of power from all its engines, the engineers working in the engine control room at first could not explain what had happened and indicated to the bridge that they could not estimate when the power could be restored. Following this, the captain decided to drop both anchors in order to maintain the ships position. The anchors, however, did not hold, causing the ship to drift towards shore. At this point, the captain decided to sound the alarm and started preparing crew and passengers for evacuation. Meanwhile, an emergency generator fired up, letting the engineers assess the situation. It became clear that the engines had shut down following a reported lack of oil. Measures were implemented to provide oil to the engines, but a number of factors prevented the generators to operate at sufficient capacity to propel the ship out of harm's way. The anchors being lowered, now worked as a drag, further impeding forward movement. Approximately 45 minutes after the captain had sent out a mayday-signal, the first helicopter arrived at the ships position to airlift away the first passengers. Due to the rough seas and harsh winds, it was deemed unsafe to evacuate using the life rafts. For the same reason, tugboats scrambled from nearby, were unable to get close enough to attach ropes to tow the ship into safer waters.

The engine power that could be generated was now used to hold the ship in position, so that the rescue operation could continue as efficiently as possible. For the next 18 hours, helicopters would airlift 479 passengers onshore before it was deemed safe to attach cables to the ships fore and aft and tow it to the nearby port of Molde.

Reactions of the Accident Investigation Board

A preliminary report issued by the Accident Investigation Board Norway (AIBN) (Accident Investigation Board Norway, 2019), on which the abovementioned narrative is derived from, found that Viking Sky, at one point, was as close as one ships length (228 meters) from hitting ground. Given the potential consequences of a grounding, the fact that no lives and no serious physical injuries were reported from this occurrence, is testament to a resourceful crew and capable emergency services.

While the AIBN continues to investigate the incident second by second, they have already provided a cause for the generators shutting down, leading to the loss of propulsion and power-outage. The rolling and pitching resulting from the ten-meter-high waves caused the oil in the tanks providing lubrication to the generators to splash from side to side. When the oil rocked away from the generator intake, it would instead suck in air, causing an automatic shut down so as to not damage the machinery. In their interim report, the AIBN states that the oil tanks were kept at 28-40% capacity, whereas the generators manufacturer recommends keeping it at 68-75% capacity.

Conclusions are yet to be drawn, and explanations yet to be established in the case of Viking Sky. However, in the aftermath of this accident, the Norwegian Maritime Authority (NMA) have established *safety culture and risk understanding* (literal translation from

Norwegian) as focus areas for 2021 (Sjøfartsdirektoratet, 2021). In their announcement of the new focus area, they stated that investigations of accidents have suggested that different understandings or perceptions of risk are common underlying factors of many accidents in the Norwegian maritime industry (S.H. Engelsvold, personal communication, October 14th, 2020). This suggests increased attention and examinations of perceived blind spots in the industry, from operator/seafarer level, through ship-owner level and regulator level on the subject.

Norwegian Law and its Limitations

Any ship sailing under the Norwegian flag, such as Viking Sky, is subject to a host of laws and regulations put in place to ensure the preservation of life, health, environmental and material values. It is also, arguably, a competitive advantage for a ship owner to be able to advertise to its customers that they have a good record of providing both a secure working environment, and a good, stable service to their clients. For instance, Norwegian law dictates, in accordance with international conventions, that most vessels sailing in Norwegian terrestrial area must have in place a safety management system (SMS), and for it to be reviewed at regular intervals (Forskrift om sikkerhetsstyring for mindre lasteskip, passasjerskip og fiskefartøy mv., 2016; Forskrift om sikkerhetsstyringssystem for skip m.m., 2014).

However, any SMS is dependent on the individuals in charge of implementing its various controls. It is not enough to have one in place, it must be well understood and respected as a whole, as well as in its individual parts. As a tool put in place to reduce the risks associated with a particular action, a well-developed SMS should lead to a reduction in accidents, pollution, machine -and equipment wear etc.

Still, all risks mentioned above are prevalent parts of the maritime industry in general, and not something that can be attributed to particular factors such as outdated equipment and technology, poor maintenance, lack of regulations or oversight, sailing conditions or poor infrastructure – at least not for the Norwegian maritime industry, which this thesis will be concerned with. In fact, most of the reported accidents in the industry can be attributed to human action or, just as likely inaction.

However, it is not productive to tie accidents to particular individuals. This sort of culprit/scapegoat way of evaluating unwanted incidents and accidents will more likely than not betray a larger, systemic fault that created the environment in which they could occur and represents an outdated way of investigating accidents (Sklet, 2004; Røed-Larsen, 2004). That is not to say that decision-making on the individual level can be excused in the event of an accident with grave consequences. The capsizing of the Costa Concordia off the coast of Italy in 2012, resulting in 32 deaths and the complete wreckage of the ship was deemed to be caused in large part due to reckless decisions by the captain (Ministry of Infrastructure and Transport & Marine Casualties Investigative Body, 2013), leading to his arrest on the charge of manslaughter.

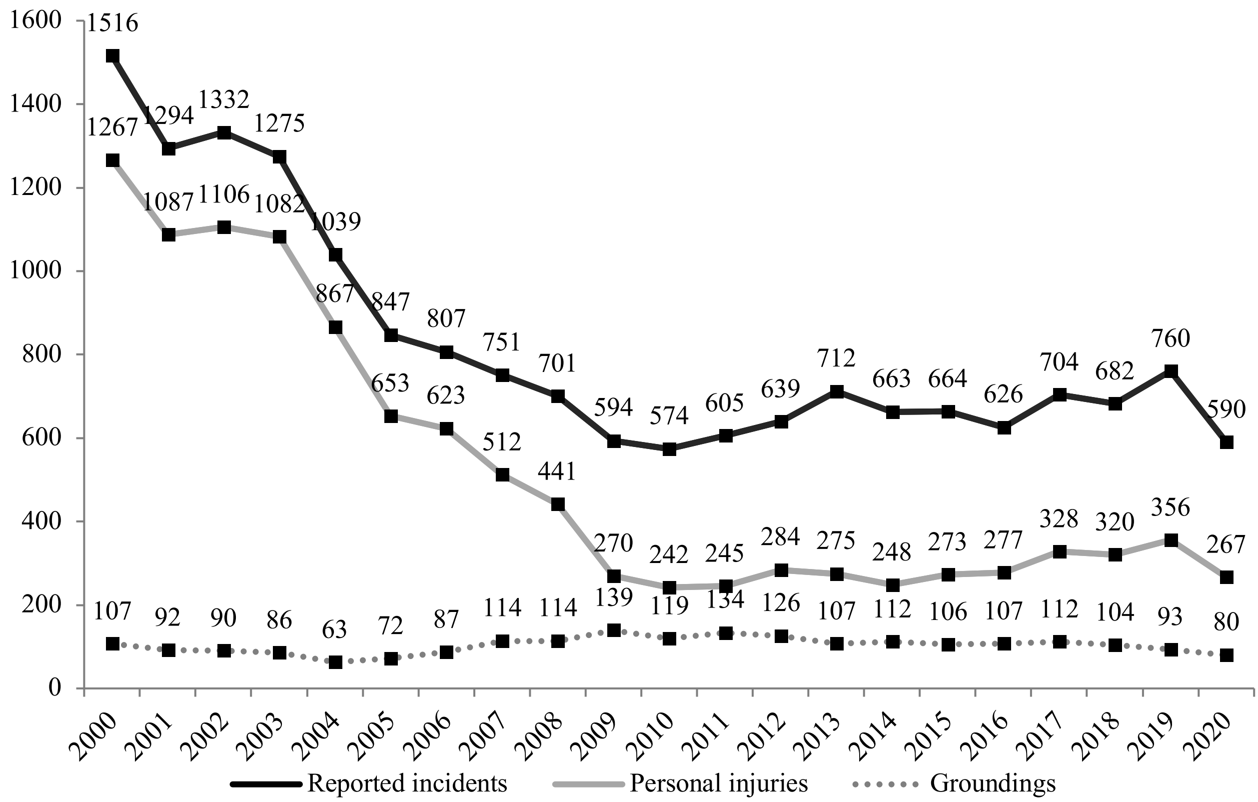
Frequency of Accidents

The confluence of events that led to the catastrophic grounding of the Costa Concordia, where every decision made by the captain or the ship owner led to higher risk, would to most trained seafarers look like obvious negligence. That is why these types of disasters are relatively rare occurrences. Most accidents and unwanted occurrences at sea are just that, accidents. The consequences of those accidents can still be disastrous, but are, by nature, not premeditated. What is important is that accidents are examined with the intention of preventing that same accident from happening again.

From the 1st of January 2000 until the 1st of October 2020, the NMA registered and categorized 17375 incidents in their database. The majority of the reports were received in the first ten years of the period. A steady decline can be seen throughout the first decade, before stabilizing at an average of 664,5 reports per year from 2011 and forward (Figure 1). This trend can probably be ascribed to improved safety across the industry, both as a result of increased focus and dedicated measures invoked to improve on board safety, as well as more modern ships with better technologies. The category that contributes most to the decline in reported incidents is *personal injuries*. Whereas ship accidents, such as *grounding*s, have remained relatively stable throughout the period, there has been a marked decrease in personal injuries. In 2000, personal injuries accounted for approximately 84% of all reported incidents. In 2019 (the last full year of data we have access to) the same category accounted for approximately 45% of all reported incidents. This is a motivating statistic. Firstly, because

Figure 1

Accident frequencies over time



it means that fewer people are injured in the line of work, which in turn means fewer hours lost in service, and thereby higher output. It also suggests that the mantra often repeated by seafarers that "accidents happen" and "accidents are an inevitable part of the job" should not be considered as true, and not lead to complacency. Table 1 describes how many accidents are found within each category in the NMAs incident database for the three vessel groups present in our analyses for the entire period (2000 – 2020).

Table 1
Distribution of incidents across the various vessel groups

	Passenger ships		Cargo ships		Fishing vessels	
	No.	%	No.	%	No.	%
Other accident	249	5,02 %	245	3,38 %	87	1,90 %
Work accident/personal injury	2938	59,22 %	4552	62,73 %	3309	72,45 %
Fire/Explosion	135	2,72 %	193	2,66 %	178	3,90 %
Missing ship	1	0,02 %	2	0,03 %	19	0,42 %
Grounding	563	11,35 %	1032	14,22 %	533	11,67 %
Weather damage	27	0,54 %	21	0,29 %	10	0,22 %
Capsizing	2	0,04 %	34	0,47 %	49	1,07 %
Collision	160	3,23 %	426	5,87 %	173	3,79 %
Impact injury (collision with quay, bridges etc.)	551	11,11 %	281	3,87 %	42	0,92 %
Leakage	30	0,60 %	59	0,81 %	70	1,53 %
Machine breakdown	197	3,97 %	201	2,77 %	64	1,40 %
Environmental damage/pollution	106	2,14 %	199	2,74 %	31	0,68 %
Loss of stability without capsizing	2	0,04 %	12	0,17 %	2	0,04 %
Total	4961	100 %	7257	100 %	4567	100%

Note. The table shows the number of accidents found within each category for the period 2000 – 2020 across the vessel groups.

Subjective assessments of risk

In the important work of reducing accidents, understanding the risks associated with various work operations is crucial. At the same time, it is important that those tasked with conducting the operations are aware of the risks and perceive them as something that may lead to an unwanted situation. It is likely that an imprecise assessment of the risks associated with the operation of crossing Hustadvika in the particular conditions on the 23 of March 2019 caused the incident. Whether this risk assessment was a result of systemic failure across the organization (ship-owner) or came about as a consequence of actions taken or not taken by the crew on board will probably be determined by the AIBN (Accident Investigation Board Norway, 2019). Seeing as the engine producer recommended a substantially higher oil level, in particular related to operations in rough weather, there should have been in place routines in the SMS to prepare or prevent the engine from shutting down. If such a routine was indeed present, it appears it wasn’t activated fully.

It is well-established from decades of research that humans are not particularly good at thinking about risk, particularly in the abstract. For instance, Slovic (1987) explains how recent accidents in the nuclear industry (notably Three Mile Island and Chernobyl) led to a drastic change in public perception regarding the use of atomic power. To this day, scientists and other researchers promote nuclear power as a safe, efficient and clean alternative to fossil fuel sources, all the while nations leaders continue to shut down plants (Jorant, 2011). In this example, the public opinion necessitated action from politicians. And, of course, given the catastrophic human and environmental potential of nuclear accidents, it is not hard to fault the public for expressing such sentiments. It might be that the rewards associated with nuclear power are too nebulous to understand so long as the lights continue to stay on, and the downsides to visible and frightening for reasonable, scientific voices to make an impact.

In a similar, but opposite example, the circumstances under which the present thesis is written – a global pandemic – could be examined. Organizations, both governmental and non-governmental, as well as influential individuals have consistently sounded the alarm regarding our common preparedness for uncontrolled spread of new viruses (Lederberg, 1988). Even with warning shots such as SARS, MERS, and Ebola happening more or less within the same decade as covid-19, and HIV/AIDS, Polio and other virulent diseases being prevalent at the end of the last century, governments and most of their countryfolk were arguably poorly prepared for the sheer scale of the problems occurring in the wake of an epidemic.

In the first example, the public have drawn their conclusions based on concrete examples, as well as media coverage on a massive scale expounding the dangers of nuclear energy over many decades. Having a potential nuclear bomb in the neighborhood just is not worth the risk in the assessment of most people. In the latter example, no such conclusion has been dominant and thus not of consequential priority to policymakers.

These examples show us the subjective nature of risk assessment. They show how calculations of risk made by human beings are often generalist and impressionistic and involve unrelated variables such as perceptions of reward or incentive. For those involved in risk-reduction, it is important to bear in mind the subjective nature of perceptions of risk. More specifically to understand the various biases and skewed perceptions often inherent in the subjective understanding of risk. In many cases it is not enough to merely say that *this* is risky, and *this* isn't. Often, it is the imaginable consequences of any particular risk that determine the individual's attitude. Having said that, imagination and reality are often at odds. Another, separate but related topic that will be discussed, relates to how decisions are made in relation to risks and how those decisions can be shaped by the individual's experience. Ways of measuring and understanding these factors will be discussed and tested on people whose jobs and place of work is, perhaps, one of the most risk prone out there, namely the maritime industry. A wrongful or imprecise understanding of the risks associated with operations at sea could have consequences on many levels, as we demonstrated at the start, however, the chance of them occurring is relatively low and relatively stable compared with personal injuries and other non-ship related incidents. Even though the potential risks of a grounding, a fire, capsizing or other incidents can be grave, it might not be the most useful area to focus on with regard to reducing accidents. Hence, the main aim of this thesis is to investigate how maritime operators assess risks associated with their work, and how these assessments might lead to increased or decreased risk.

Literature

Offshore vessels represent one of the most dangerous working environments in the Norwegian industrial sector (Dahl et al., 2013). Working conditions are often challenging and tasks often involve using heavy duty instruments, complex technological systems, unpredictable, moving equipment or situations requiring strenuous physical activity. These factors are all associated with increased risk and therefore also accidents within this industry. Hence, knowing what can be done to reduce the severity of consequences when accidents occur is crucial (Rundmo, 2018), and having a well-established system of emergency preparedness is therefore not only useful but also a necessity as long as accidents continue to happen. Consequently, emergency preparedness and other efforts to mitigate unwanted incidents serves as a high-priority task at every level in the industry (Rundmo, 2018). One of the motivations for which might also be that the aftermath of an accident with larger than average consequences may be costly, both financially and reputationally. One topical, if extreme, example from the period in which the present thesis is written, is the blockage of the Suez Canal by the containership Ever Given. After hitting the banks of the canal at an odd angle following navigational issues resulting from a sandstorm, it grounded and was stuck diagonally across one of the most trafficked waterways in the world, causing a backup of hundreds of ships at each end of the canal and delays to shipments calculated to cost global trade approximately $400 million for every hour it was stuck (Baker et al., 2021). From this short account we see that efforts directed at preventing accidents from occurring in the first place is the most fruitful for all parties involved.

However, different perspectives may lead us to identify different causes for a given incident (Rasmussen, 2003), and to focus on different preventive factors (Hjellvik & Sætrevik, 2020). Our review of the literature suggests that the impact of preventative measures is difficult to measure. Retrospective analysis is always hypothetical, and "lack of accidents" difficult to attribute to implementation of a measure. Morrow and Crum (1998) points out that many of the financial calculations regarding accident prevention are questionable. However, they do point out that a more grounded rationale for an interest in accident prevention and safety should be employee outcomes (see also e.g., Kirschenbaum et al., 2000). Employee outcomes, in this context, refer to measures such as job satisfaction, motivation and work commitment, which have been linked to latent costs when these are at a low level (Morrow & Crum, 1998), though they are also affected by perceptions regarding risk and safety (McClain, 1995). The relationship between employee outcomes and perceptions of safety can be explained through the psychological observation that safety is a basic human need (Maslow, 1943). This implies that safety is not only a technical concept, but a universal human concern.

Measuring objective risk

In the important effort of improving safety, risk factors must be identified, understood, and attenuated. Within *high reliability organizations (HRO),* such as those operating in the maritime industry, the intricacies of the work operations combined with the tools used to conduct them and the conditions in which they happen, make it complicated to map out each individual source of objective risk (Fischhoff et al., 1984; Reason, 1990). First, such depictions rely on extensive knowledge about how to define the problem, second – a correct assessment of the facts and third, an assessment of which values (e. g. loss of life, prevention of injuries, economic outcomes, environmental outcomes) are important (Fischoff et al., 1984; Brehmer, 1994). Different frameworks to assess risks and uncertainty within the maritime industry have been proposed (see e.g., Merrick & Dorp, 2005; Ung, 2013; Fischhoff et al., 1984; Yang et al., 2013), placing weight on different information/input. The generic problem related to such quantifications of risk emerge when using different frameworks result in different estimations. Different risk estimates may indicate different impressions of the overall state of risk, depending on what is included in the estimate; for example, including *consequences* in a risk estimate may lead to different priorities compared to an estimate based solely on the probability of an accident (Rundmo, 1996; Goerlandt & Montewka, 2015). Therefore, many attempts of measuring objective risks have been viewed with skepticism, and the assumption that risk can be given an operational definition and measured in the same way as we measure e.g., length and that simple rules can define when measures should be implemented have been criticized (Rundmo, 1996).

Arguably, a more useful approach when considering objective risk is measuring which accidents that have the highest probability of occurring. Indeed, looking at the frequency at which unwanted incidents and accidents occur is often seen as a measure of objective risk in HRO's and other industries (Rundmo, 1996). Of course, risks need to be understood in the correct context, so varying responses and theories are useful and necessary. This being said, the best predictor of future events is past events if the events are directly relevant to each other over time (Goerlandt & Montewka, 2015) and so estimating the probability of certain events is mostly done through empirical observations about "historical risk", more precisely it is usually reports of previous occurrences that helps us assess what the probability of certain types of accidents are.

Historical risk data

In the Norwegian maritime industry, reporting systems are in place to capture data about various incidents at sea. Both accidents harming the ship, the person or the environment is to be submitted to the NMA. The same is true for accidents that were avoided and near misses. The collected data serves as a tool for regulatory oversight, but equally important, for learning. This is perhaps the most definitive measure of objective risk in the Norwegian maritime industry, as it provides detailed descriptions of the sequences of events that led to the accident, which vessel and vessel category it occurred within, in which department on board and what the consequences were. Collectively details from past events are useful in examinations of "causal factors", which may make it possible to counteract them and hence preventing the same type of accidents from happening in the future (Rundmo, 2018).

The literature suggests that any dataset reliant on self-reporting is subject to issues of confidence, especially in reporting minor incidents with few and small consequences (Pasrros et al., 2010; Kongsvik et al., 2012; Conway & Svenson, 1998; Sætrevik & Hystad, 2017). The NMA's role as regulator does however provide incentive to not forego reporting and the size and scope of the data within their possession should counteract a lot of the issues that might impact the precision of the objective data.

The aforementioned high-profile cases of Viking Sky and Costa Concordia are not representative accidents of the Norwegian maritime industry, and although there are several consequential threats to the physical integrity of a ship which may cause extreme hazard, these are not common occurrences. These are regarded as unique events and occur so infrequently that they may be more challenging to use as input to manage safety (Hjellvik & Sætrevik, 2020). For the same reason this category of accidents is distinct in that they are more challenging to foresee, leading to challenges in estimating the probability of their occurrence and severity of consequences should they occur. Measuring risks of unforeseen events call for several data sources in addition to, or in place of past accidents (Rundmo, 2018). Risk assessments based solely on historical occurrences are therefore limited to common occurrences and prevention of these. However, this is not insignificant considering that the scope of these is also substantial. The vast majority of incidents are of smaller consequences or near misses, and most are personal injuries (see table 1). This is to be expected to a degree due to the working conditions of a seagoing vessel, but there may be other underlying causes as well which merit further exploration.

Accidents and The Swiss Cheese Model

Accidents take place in a complex interplay of technological, individual, and organizational factors (Sætrevik & Hystad, 2015; Dekker et al., 2010; Reason, 1990). The Swiss Cheese Model (Reason, 1990) is a graphical interpretation which depicts the complexity of these interactions by distinguishing between active and latent failures in an organization which may lead to accidents. It is represented by slices of cheese, each representing a defensive structure in place to avoid the accident from happening. Although there are holes in the cheese, representing an unintended weakness in the slice, the next slices should stop the weakness from developing into an accident. Unless all the holes align allowing the error to get through to the other side, the accident should be avoided. The cheese slices might represent organizational factors, such as leadership and safety focus, technological factors such as complex machinery or novel work methods, psychological factors such as communication, stress, workload, lack of sleep etc. The interaction between the various factors that influence whether accidents occur or not is made easily understandable with this model, and the interplay between the disciplines required to prevent them is made evident. However, the model is perhaps most used with avoiding catastrophes and major accidents in mind, where more practical routines and redundancies can be implemented into a safety management system (SMS) (Larouzee & Le Coze, 2020). Therefore, also being able to operationalize such routines in order to prevent personal injury is an important part of accident reduction.

The analogy of the swiss cheese shows how accidents in complex, defended systems usually do not arise from single causes (Dekker et al., 2010; Reason, 1990; Weaver, 1980). However, even the most advanced systems have flaws and defenses which might fail in critical moments. Furthermore, systems are vulnerable because they depend on the decisions made by individual operators. Operators are fallible and capable of breaching the system´s defenses.

Accidents and the human condition

From what we know about making decisions in uncertain or unpredictable circumstances, human errors often arise as a result of a mismatch between system demands and individual behavior (Rundmo, 2018), or limitations in human processing capacity (see e.g., Deutsch & Deutsch, 1973; Neisser, 1967; Kahneman, 1973). Hence, the maritime sector and others are concerned with creating good conditions for processing information and making decisions. This can be exemplified as having a good work/rest balance, giving clear instructions, and having a well-defined system of communication, but also as transferal of knowledge and experience at the relevant levels. Hopkins (2011) found that lacking compliance with rules and procedures often led to accidents at work, which suggest that individual’s analysis of such routines might be lacking. One way of mitigating these types of independent analysis could be a pre-evaluation of the operation with the crew so that previous experiences can come to light and the motivations underlying the procedures are better understood. In the Norwegian maritime industry, it is common to perform *job safety analysis* before unfamiliar operations for this reason.

Familiarity with risk analysis tools such as "Job safety analysis". Job safety analysis (JSA) is a tool put in place to investigate job-specific risks, through systematic analysis of risk elements involved with a particular task. The main aim is to inform operators about potential hazards so that they can perform their work in a safe manner, aiding operators in tasks so that their estimations of risk do not rely solely on their subjective risk assessments. Research has found JSA to be a reliable tool in general, but it might not be suitable for more complex operations (Albrechtsen et al., 2019). By having increased awareness of the potential risks associated with the operations, the seafarer should be able to make better decisions. This is not just the case for physical operations, but also for digital ones, which are equally prevalent in modern seafaring. Computer driven systems often requires the worker to simply monitor that the operation is happening within certain levels (Reason, 1990), but it still requires knowledge of what those levels should be and what happens if they are breached, as was the case with the oil indicators in the engine room of Viking Sky.

Situation Awareness

Factors that influence the individual's understanding of information in the present moment is often referred to as situation awareness (SA). One study found that 18 out of 23 examined accident reports for collisions in the Norwegian maritime sector could be ascribed to lacking SA (Sandhåland et al., 2015). SA can be a useful theory in understanding how decisions are taken in new and uncertain situations. Endsley (1995) (see also Endsley, 2004;

Sarter & Woods, 1991) describes such a process as a feedback loop consisting of three levels of SA, followed by a decision and the implementation of this decision. Level 1 is the perception of elements in the current situation or environment. On the bridge of a ship for instance, the captain needs to be attentive to other ships, shallows and grounds, technical instruments, weather conditions etc. Level 2 of SA relates to the operator's comprehension of the current situation by considering all the elements perceived in level 1 and interpreting them holistically. For instance, a deck worker on a fishing vessel should know how ordinary work operations may change depending on factors such as weather or even the weight and fill level of the net and how this might cause the vessel to lean. Further, level 3 is related to the projection of the situation into the near future. This is the highest level of SA and requires enough knowledge about various and shifting situations to foresee and act in relation to potential outcomes. In Sandhåland et al.'s (2015) experiment, all three levels of SA were violated. Hence, SA can also be considered an integrated concept, combining the physical environment and the individual's subjective understanding of it. The basis for the decisions that are made depend on whether the operators have a precise understanding of the current situation (Sætrevik & Hystad, 2017), and the decisions and the understanding can be dependent on the quality and amount of input from the environment (Johnsen, 2018a).

Situation awareness and individual decision making

While some decisions are deliberate, some are more spur of the moment in the face of hazard. In these circumstances, research suggest that increased knowledge and experience leads the operator to make better choices. These kinds of automatic responses are commonly referred to as heuristics and explains how we make more or less suitable judgments based on missing knowledge (Goldstein & Gigerenzer, 2002). These mental shortcuts are necessary in that they allow us to save both time and mental capacity, though they may lead to errors, and incite decision traps. Thus, the effect of automatic responses may in other situations lead to unfavorable decisions (Johnsen, 2018a). Whether or not the “rehearsed” response is appropriate is dependent on the situation at hand, considering that one situation might seem similar to previous ones, yet be fundamentally different. Consequently, when confronted with a situation one should consider whether “standard procedure” is the most suitable based on SA and not on the presence of certain input (Johnsen, 2018a). If a vessel is on a collision course, there may be various indicators of this that the captain can notice and understand and take appropriate action in time to prevent a collision. It is likely the captain’s manner of characterizing the situation that leads to, and forms the basis of, their decisions.

The captain’s precise situational awareness increases the likelihood that they will make favorable decisions (Johnsen, 2018a). In this case, the most important decision is to steer the vessel away from collision course. This is not to say that they could not have made a favorable decision without a precise awareness of the situation. Navigating out of harm’s way without knowing they were ever in harm’s way is a good outcome, but more likely ascribed to luck. Similarly, a captain with good SA can also result in an unfavorable outcome, perhaps as a result of other people’s bad SA. The captain of the oil tanker Sola TS might have been fully alert and attentive when the military vessel Helge Ingstad collided into them, for instance (Accident Investigation Board Norway & Defence Accident Investigation Board Norway, 2019). However, as a rule of thumb, the likelihood of good outcomes increases with better situational awareness (Johnsen, 2018a).

Situational awareness can itself be a problem. Being familiar with and having knowledge about present hazards and risks could also contribute to quick expectations leading to the operator overlooking information that could be important in novel and unfamiliar situations (Johnsen, 2018a). A knowledgeable and/or experienced seafarer might also be susceptible to increased stress or strain simply by knowing what they know (Fischhoff et al., 1984; Rundmo, 1996). Being aware of potential hazards over time, or constantly working in perceived risky conditions should keep the operator on edge and prepared, which is very resource demanding on a human level (Eid, 2018). Thus, operators might become tired and unmotivated leading to lower SA. Indeed, knowing about present hazards and risks was found to increase the likelihood of accidents occurring (Mearns & Flin, 1995).

SA can explain many of the mechanisms that underlie the seafarer's impression of risks in their environment. However, whether SA can be relied upon to predict actions associated with those risks can vary. Being aware of risks and conducting oneself in accordance with those risks are two separate topics, the latter of which speaks to human judgments and assessments made about possible outcomes and consequences. Hence, examining risk assessments through the lens of the operator is necessary if the goal is to reduce accidents and produce better working environments (Morrow & Crum, 1998; McLain, 1995).

Subjective Risk Assessments

The three levels of SA will have an impact on the subjective assessment of risk for operators in the maritime industry. Sætrevik and Hystad (2017) found a negative correlation when measuring SA and subjective risk assessment on a sample of offshore workers, suggesting that higher levels of SA is associated with feelings of increased control over perceived risks in their line of work. More than this, subjective risk assessment is a term often associated with the operator's beliefs, attitudes, judgments of hazards and dangers, and hence, risk taking (Mearns & Flin, 1995). Sitkin and Pablo (1992) identifies risk perception as one of the individual characteristics in predicting risk behavior, and states that probabilistic estimates of risk is an important determinant in this regard. They also cite several testable variables that might mediate risk perception, such as social influence, organizational control systems, management attitude, and problem framing. Iterations of these variables are tested in

Aalberg et al., (2020), where it is indicated that subjective safety perception is associated with feelings of control over risks and high levels of safe work practices. Similarly, Mearns and Flin (1995) found that individuals with higher perceptions of risk were more likely to adopt safe work practices.

Safe work practices are something commonly implemented at management level and throughout the safety management systems and should inform the attitudes of the operators in confronting what they deem to be situations associated with higher risk. However, as has been indicated previously, risk reduction is not necessarily synonymous with accident reduction. The precision at which the operators assess risk must also be understood if this aim is to be fulfilled. Biases in risk behavior is well established, and humans are not considered to be rational – or objective – in thinking about risk (Kahneman & Tversky, 1979). The operator might misjudge where the risks in the operation lies, and end up with an accident regardless of the care they took to prevent one. Understanding the correspondence between the operator's subjective assessment of risk and the actual, objective risk associated with the practices of their work is therefore of importance.

Measuring subjective risk

Attempts at coming up with a suitable measure of subjective risk is as intricate and complicated as stating the exact obvious risks (Rundmo, 1996). Attitudes toward potential consequences associated with the risks is one of the more common ways of conducting such measurements. Most of these are self-report studies where respondents rate the probability of certain hazardous risk sources, whereafter the responses are compared with a measure of objective risk; usually comparing them with incident report databases (see e.g Rundmo, 1996; Flin et al., 1996).

Subjective risk assessments and objective risk. In general, research has shown that individuals have what would appear to be a good awareness of the relative risks in their environment. For example, Flin et al (1996) found that operators working offshore perceived that the most likely injuries were cuts, slips/falls, eye injuries, sprains, bruises and back injuries, which indicated that these operators were aware of the most likely causes of injury. Similarly, another study found that employees were generally aware of the risks they were running at their workplace, and that those perceptions were relatively accurate compared to a commonly used risk assessment tool as well as accident statistics (Mearns & Flin, 1995). Similarly, Rundmo (1995) posited that the more unsafe the employee felt, the more objective risk they experienced, which further confirms the accuracy of the subjective risk assessment.

Subjective risk assessment and safety. Several attempts to model the relationship between subjective risk assessment and safety have been made. Rundmo (1996) demonstrated that factors which predict risk behavior was correlated with risk perception, although risk perception itself was not found to predict risk behavior. A correlation between risk behavior and objective risk was also identified. However, the objective measure for risk was based on a predictive model rather than objective risk seen as an actual, historically frequent occurrences. Hence, it is concluded that it is the underlying factors of risk behavior which must be attended to, not risk perception. However, Sitkin and Weingart (1995) found that they could influence the way their subjects assessed risk by framing situations in a negative or positive way. This is in accordance with prospect theory (Kahneman & Tversky, 1979), where negative outcomes are weighted as approximately twice as consequential than positive outcomes. Framing a risky situation in a positive or negative way was found to influence risk perceptions. However, the sampled respondents – a cohort of about 100 college students – cannot be said to be representative for the purposes of this thesis. Hoffman and Stetzer (1996) were able to establish a relationship with perceptions of safety climate, a predictor of risk, and other related factors with unsafe behavior.

Subjective risk assessment and unsafe behavior. Research has also found that workers engage in unsafe behavior even though they knew that it was so (Mullen, 2004), suggesting that risk assessment might not always result in decreased risk. Thankfully, unsafe actions do not always result in an accident, especially when they are rather minor violations of safety procedure (Hofmann & Stetzer, 1996). Furthermore, when unsafe actions are conducted or safety procedures violated without notable consequences, operators might feel a sense of reward or efficiency because they have accomplished the work more quickly and comfortably (for example by not wearing safety equipment) (Slappendel, 1993). Thus, to what degree the rationale behind safe work practices is respected can also said to be dependent on the operator's risk assessment. Considering that in order to knowingly reject safety procedures, one must know that such procedures exist, and hence to some degree be aware that there are risks involved with the action.

Rundmo (1995) have identified previous experiences and high/low risk working conditions a measurable effect on risk assessments, confirming that various psychological factors influence how risks are assessed. Although such associations are interesting as possible explanatory variables of increased risk on the individual level, it often leads to tautological conclusions – more perceived risks predict dissatisfaction with safety in the workplace (McLain, 1995; Morrow & Crum, 1998) and an increased experience with actual accidents or near-accidents (Rundmo, 1995; Mearns & Flin, 1995). Arguably, such finding can be difficult to engage with without knowing exactly where the misperceptions of risks are found.

Factors influencing subjective risk assessments

Individuals vary in their ability to assess situations as well as risks (Mclain, 1995; Powell, 2007), even though they are provided with the same input (Mearns et al., 2004). Thus, the basis for making precise assessments vary from individual to individual. This ability has been suggested to be under influence and predicted by individuals internal and external factors such as personality, cognitive and physical capability, previous experiences, and contextual factors (Eid, 2018). Although these factors may come in endless variations, some generalizations have been manifested in previous studies.

Risk attitudes. Previous studies have suggested that an individual's assessments of risks are related to their attitudes and beliefs, which have been suggested to act as a filter to risk information (Powell, 2007). Theories of cognitive biases is perhaps the most well know examples of this, as perhaps most associated with Tversky and Kahneman (1974). As with other cognitive biases, information about risks that goes against attitudes and beliefs may be downplayed, and greater emphasis may be placed upon information that supports a chosen response to risk. For example, most individuals tend to evaluate the probability of being involved in traffic accidents to be lower for themselves than for others (Lund & Rundmo, 2009), this is commonly referred to as "optimism bias". Another study (Mearns et al., 2004) investigated differences in safety attitudes between UK and Norwegian seafarers. The results indicated fundamentally different beliefs about the nature of safety. Norwegian respondents had a more fatalistic ("accidents are beyond my control/ an inevitable part of the industry") attitude to safety, whereas UK workers regarded themselves as having more personal control over safety. However, they did not find any differences in the accident rate between the two sectors.

Experience with risk. Experienced personnel are better at picking up critical signals from the environment compared to more inexperienced personnel (see e.g., Johnsen, 2018b). Another study found that risk assessment was more developed among individuals with multiple experiences, rather than first time work accidents (Kirschenbaum et al., 2000) and that the perceived lack of safety in the workplace increased with injury experience (Kirschenbaum et al., 2000; Nelkin & Brown, 1984). The ways in which experience may affect risk assessment is not clear, though some suggestions have been made. First, it has been suggested that experience with certain types of accidents may cause skewed risk assessment. For example, repeated exposure to various hazards may cause adaptation to said types of risk, a study found that workers who are subject to lower accident frequencies have perceptions of less accident risk than those with higher accident rates (Oah et al., 2018). Second, skewed assessment may occur as a result of having been involved in an accident. In a study on employees on offshore petroleum installations results showed that risk perception among non-injured employees was more in accordance with objective risk than among those who had not experienced an injury themselves (Rundmo, 1995).

Risk exposure. Comparisons of personnel on higher risk vs lower risk vessels have provided some insights into how exposure to risk may affect operators risk assessment. Studies have found that the level of risk on an operator's vessel/previous exposure to risk may affect their risk assessment, where a greater feeling of safety and less job stress on low-risk platforms as compared to those having a great number of accidents (Rundmo, 1995). This is confirmed by studies on operators working on high-risk installations in the petrochemical industry (see e.g Mearns & Flin, 1995). Similarly, studies have found that personnel who work on less safe installations also feel less safe regarding hazards compared to those on safer installations (Rundmo, 1995; Flin et al., 1996). This could be ascribed to workers feeling safer having better knowledge about the probability of major hazards, since they are unlikely to happen. It might also suggest that experienced workers have lower exposure to hazards. Furthermore, the level of risk may also depend on which department/which work tasks the operators are involved in. Operators who are involved in administrative, management and catering jobs tend to feel safer from occupational accidents than drillers, deck crew, technicians, mechanics, maintenance, construction and production staff. This is likely due to the relative exposure to outdoor and industrial work conditions (Flin et al., 1996).

Summary of Literature

The evidence presented herein indicate that an increased focus on subjective risk assessments may promote an understanding of why accidents occur and also what can be done to prevent them. The predominant rationale is perhaps that behavior toward risks have been shown to be more influenced by subjective interpretation than by objective evidence describing actual risk (McLain, 1995; Slovic, 1987; Slovic et al., 1980). Furthermore, as have been outlined, the research in this field has led to an understanding that individuals interpret the risks of their environment in in a variety of ways (see e.g Rundmo, 1996; Flin et al., 1996; Powell, 2007), and that biases and skewed assessments such as previous experience (Kirschenbaum et al., 2000; Nelkin & Brown, 1984), potential consequences, and individual factors that should be associated with increased awareness of risks (sailing time, participation in JSA, etc.), influence this.

Aim of study

The aim of the present study is to examine risk assessment and attitudes to risk among operators in the Norwegian maritime industry. Based on existing research, we will attempt to provide further insight that might be helpful in the important work of reducing accidents at sea. By comparing a measure of the operator's subjective risk assessment with a measure of objective risk and investigating potential underlying factors which may mediate this relationship, we hope to be able to make some inferences about how risk is considered by the seafarers.

Research question

As has been accounted for in the literature presented herein, maritime operators have been found to have a decent understanding of the risks associated with their work. However, research has also shown that operators are known to violate routines, forego using personal protective equipment or take shortcuts in conducting various work-related tasks. There are at least two explanations for these types of behavior. One is that the operator does not know that what they are doing is associated with increased risk. The other is that they do know, and through a subjective assessment of those risks conclude that the increase in risk is worth the benefit of cutting a few corners.

As has also been demonstrated by the literature review, post hoc examinations of accidents often conclude that they could have been prevented if different choices were made at different times in the timeline leading up to the accident, and that these particular choices were made due to a misjudgment of the risks associated with them. Of course, the perception of risk and the following assessments of those risks is not something that can be generalized. It must be understood as something that happens in the interplay between an individual and the task they are conducting. Hence, the most useful way of determining which judgments are being made is to examine them in a specific and relevant context.

For the purposes of this study, that context is the Norwegian maritime industry and the people who populate it. Being a seafarer is associated with substantial risk of getting injured, and for some type of work, death (Oldenburg et al., 2010). This is true in general, as well as for the Norwegian industry. The risks typical for the work operations in this industry are precipitated by the environment they happen in – ships of increasing complexity, small or large, sailing in shifting conditions, performing tasks with often inherent danger, with crews commonly speaking different languages. Superficially, these working conditions no doubt affect the operator's situation awareness. Yet, reported accidents and casualties have continued to decline year by year for the past decades (Figure 1) (Sjøfartsdirektoratet (NMA), 2011), without the work operations necessarily becoming any less dangerous. The NMA ascribes this to a long-term, systematic process of making ship-owners take responsibility for the safety of their employees, their customers, and their surroundings. This is not to suggest that the opposite was true when accidents were more common, but it is a good indicator that increased focus on safety on every relevant level save lives and increase health.

In the continuation of this thesis, we will examine whether maritime operators in the Norwegian maritime industry assess risks in accordance with the actual risks and how this might be associated with accident reduction. This will serve as our main research question. From the answer to this question, further investigation into the operator's assessment will be conducted. For instance, factors that affect the individual risk assessment in any direction should be examined. Providing a definitive answer to the latter topic cannot be done in a single master thesis, but hopefully the present one can give some indication and provide some method of establishing if it is possible.

Hypotheses

Among the abundance of factors that could inform an individual's risk assessment, it is relevant to look at common themes from research into situation awareness. Such themes include, but are not limited to, communication, leadership, experience, physical surroundings, mental stressors, motivation, sleep/rest, cooperation, etc. However, another component of risk assessment is the day-to-day assimilation of knowledge and experience that may shape an individual's risk assessment. Although associated with the aforementioned themes, they are, perhaps, more often investigated for the sake of fact finding or compliance, rather than as contributing factors to mental representations of risk. For instance, the NMA are, in their biennial Safety at Sea-survey concerned with finding out how many of the respondents that partake in so-called Job Safety Analysis (JSA). This is a tool designed to familiarize the crew with novel work operations and to establish the potential risks associated with it. Knowing how many seafarers that partake in actual risk assessments on a systemic level is an interesting statistic in and of itself, but it could perhaps also function as a predictor of risk assessment, given its function as a tool for raising awareness of potential hazards. Analyzing this factor, and other systematic procedures, could also indicate whether regulations or requirements serve as something that affects individual risk assessment in a positive or negative way, and if so, which.

Seeing as the maritime industry still can be described as high-risk, with both personal injury and damage to ships being relatively common occurrences, combined with knowing that operators have quite a good understanding of the risks associated with their work, we suspect that operators might make judgments about risks that increase the likelihood of accidents occurring. Hence, we hypothesize that –

H1: Misjudged assessments of risks increase the likelihood of accidents occurring

Further, we expect that, through investigating the subjective risk assessment of the operators, we will find associations between both individual factors – such as those contributing to situation awareness – and systemic factors implemented to improve risk assessment and overall safety management. As an example of the former, time spent sailing could be a determinant. As an example of the latter, we believe it to be both interesting and of practical effect to examine if participation in job safety analysis can be associated with risk and accident reduction. Thus, we further hypothesize that –

H2: Individual and systemic factors influence subjective risk assessment.

H2A: Increased sailing time (experience) leads to better judgments about risk.

H2B: Participation in on-board risk assessments (JSA) leads to better judgments about risks.

Methods

To test our hypotheses, a partnership with the NMA was established. Through this cooperation we were granted access to both historical data of incidents in the Norwegian maritime industry (see e.g., figure 1 and table 1), as well as influence on a survey researching safety culture and other factors related to the working conditions of maritime operators.

Participants

The Norwegian Maritime Authority collaborates with several employee organizations and government agencies on the present survey. Hence, the reach of the survey is, probably, the widest in the Norwegian industry, and possibly also among largest samples researched in the intersection between psychology and the maritime industry. In total, the questionnaire was sent to 28 431 e-mail addresses of maritime operators. 7329 responses were recorded, giving a response rate of 25,8%.

A further advantage of the sample is its variety. The sample size should be large enough to be representative of the industry, but even more important, still representative when split into responses from different vessel types. This is important because the various vessel categories have different risk profiles. Participants that did not respond to the items required for analysis were excluded (N= 2937).

The survey let the respondents choose between five vessel types to best fit their situation: *Cargo vessel (e.g., short sea, deep sea, offshore, aquaculture), passenger vessel, fishing vessel, military vessel,* and *other.*167 responses were recorded from military vessels but seeing as these are under no legal obligation to report accidents to the NMA, we have no comparable data for those respondents. They were therefore also excluded from further analyses. For the same reason, *other* (N=558) was also excluded. This left a total of 3570 respondents.

Among the current sample of 3570 respondents, 59,41% reported working on a cargo vessel (N=2121), 36,92% reported working on a passenger vessel (N=1318) and 3,67% reported fishing vessel as their current place of work (N=131). The fishing vessel category is substantially smaller than the other two due to responses in this category largely being collected via telephone interviews. For the sake of efficiency, several survey items were excluded from these interviews, including the one central to our analysis.

The age group most represented in the sample are between the ages 46-55 (N=1022, 28,63%) (Table 2). The age groups with the fewest respondents are *below 26* (N=274, 7,68%) and *above 56* (N=8, 0,22%). 93,56% (N=3340) of the sample were male, and 6,25% were female (N=223). Norwegians constituted the largest nationality (N=3062, 88,06%). 33 other nationalities made up the remaining 11,94% (N=415) of the sample.

Table 2

Sample age distribution

	Ages						Total
	Under 26	26-34	35-45	46-55	Over 56	Prefer not to say	
N =	274 (7,68%)	677 (18,96%)	819 (22,94%)	1022 (28,62%)	770 (21,56%)	8 (0,22%)	3570

Measures

Objective risk

As a measure of the potential risks associated with being a maritime operator, the NMA's accident database was used. We considered that the database could serve as a reliable indicator of the most prevalent types of incidents in the industry based on collected reports. Further to this, the fact that it contains all types of vessels and all types of incidents, it serves as a comprehensive medium that data more easily can be compared against.

The NMA continuously receives and collects accident reports from the industry. According to relevant legislation (FOR-2008-06-27-744 Forskrift om melde- og rapporteringsplikt ved sjøulykker og andre hendelser til sjøs, 2008), any ship sailing in Norwegian waters are required to report incidents in the following categories:

- loss of ship or life
- considerable personal injury or severe damage to vessel
- work accident when evacuation of the injured person is required
- emissions or probable emissions of oil or hazardous substances
- fire, explosion, collision or similar
- when a ship has run aground or collided

Relevant onboard personnel or the ship owner must submit their report to the NMA within 72 hours of the incident happening. From there, the NMA classify the incoming reports into the most fitting accident category and review their severity. Over time, this database serves as an important tool for understanding the various risks in the industry, but it also serves as a working tool. For instance, the NMA will take note if repeated incidents take place on the same ship or in the same ship owning company and perform inspections and, further, require improvements to the SMS if it is found insufficient.

From the NMA we received unfettered access to the database going back 20 years. The categories used to sort the accidents as well as typical examples of incidents within the categories are provided in table 3.

In summary, the first classification the NMA does when it receives a report is to determine whether it is a vessel accident or a personal injury. Thereafter, the vessel accidents are further classified whereas the personal injuries remain in the first sorting. To test our hypotheses on seafarers, the category “personal injury” was deemed insufficiently detailed. Therefore, a process of further sorting this category was undertaken, so that we could better understand what constituted a personal injury in the maritime context.

Table 3

Examples of commonly reported accidents

Category		Example outcome
Work accident/personal injury		Examples are presented in Table 2.
Vessel accident	Fire/explosion	Explosions resulting from pressure increases are commonplace. Welding work or fuel/gas leaks often cause fires.
Vessel accident	Missing ship	Indicates that the ship has sunk.
Vessel accident	Grounding	The ship hits land or shallows unexpectedly.
Vessel accident	Weather damage	Damage to the ship caused by, for instance, flying objects lifted by the wind, or wind causing equipment to loosen and fly off the ship.
Vessel accident	Capsizing	The ship turns on its side due to adverse conditions or unbalanced cargo, causing the ship to keel over. The ship might sink as a result but might also stay afloat upside down.
Vessel accident	Collision	Represent damage and consequences from impact with other vessels.
Vessel accident	Impact injury (collision with quay, bridges etc.)	Ships impacting with the quay or other permanent installations, resulting in injuries on the vessel.
Vessel accident	Leakage	Vessels taking in water as a result of holes in the hull, or faults to pumping systems.
Vessel accident	Machine breakdown	Engine failure resulting in loss of propulsion.
Vessel accident	Environmental damage/pollution	Spills to sea when taking on fuel, or hydraulic oil leaking overboard from burst pipes or lines.
Vessel accident	Loss of stability without capsizing	Ships careening from side to side in adverse conditions where capsizing is avoided. Often associated with evacuation of personnel.
Vessel accident	Other	Accidents that do little or no harm to the ship, but which might cause injury to cars on ferry decks or accidents caused by flotsam getting stuck in propellers.

The personal injury category account for 63% (N= 11023) of all incidents within the accident database. To see which personal injuries were most prevalent, the category was sorted into new categories based upon accidents commonly identified. Each accident report in the personal injury category was read (N= 5630). Many of the older accidents in the dataset were reported without a sequence of events, which made them indiscernible. The level of detail in the reports varied; it was sometimes hard to judge the exact outcome or consequence. These were sorted as *other* or *not relevant*. Leisure vessels were also excluded from sorting as they were not relevant for the present analyses. Personal injuries that occurred outside of ordinary working procedures were also categorized as not relevant. Examples of accidents after re-sorting can be seen in table 4.

Table 4

Examples of common personal injuries identified within the NMA's incident database

	Examples
Impact/crush injuries	Accidents where limbs get caught in-between or smashed against mechanical equipment, doors, falling objects etc.
Fall overboard	Often occurs when embarking or disembarking the ship using unsuitable landing equipment.
Fall onboard	Slips due to wet deck or chemical spills, or other loss of balance situations.
Cut/puncture injuries	Cuts occurring when handling knives, sharp edges and angle grinders are common.
Electricity/Fire/Chemicals	Eye and skin harm often caused by industrial cleansers with corrosive capacities or burns resulting from hot spills in the galley.
Not relevant	Often reports of deaths where the cause is unclear.
Other	Could be strains and dislocations caused by twisted ankles, etc.

Subjective risk

Every two years, the NMA surveys the working conditions, safety culture and various demographic factors present in the industry. The survey is developed and administered by a third-party contractor – Safetec – who specialize in risk management for the maritime industry and other high reliability organizations.

The survey was made up of approximately 150 questions, including demographic variables and other relevant background information. For the most part, participants are asked to consider Likert-formulated statements ranging from *one* to *five* – completely disagree to completely agree. The respondents may also answer *do not know* or *not relevant.* A special addition to this year's questionnaire was a section with statements about covid-19. Apart from that, the questions are mostly similar to previous iterations of the survey. A number of the responses were recorded as telephone interviews. The survey was conducted between the 12th of January 2021 and the 10th of February 2021. An exported version of the full questionnaire is appended to this thesis (Appendix A).

As is the case with any survey, keeping the balance between gathering as much information from the respondents as possible while keeping their attention was an issue. In the present survey, there were several interested parties, aside from the NMA. A number of employee unions and other government agencies have a say in drafting the questions, often based on what is most relevant to themselves. Hence, we were both glad and lucky to be able to attach a question of our own to the survey.

Combining and comparing the datasets

In order to provide an answer to our research question and our hypotheses, establishing a way of comparing what can be described as risks based on the incidents reported recently and historically, with the seafarer's own thoughts and assessments on the topic was necessary. By taking some components of the accident database provided by the NMA and including it in the questionnaire by way of making the answer options recognizable and less technical was seen as a solution. In this process, several issues needed to be attended. First, in formulating the question, it was important to ensure that the seafarer reflected upon his or her own situation and experiences (the subjective), while concurrently providing an assessment of which incidents they consider most unsafe or high-risk (the objective). The rationality being that the seafarer should be most motivated to ensure that those particular incidents won't occur. Secondly, the answer options needed to be as closely related to the NMA incident database, and at the same time be as relevant as possible for the respondent. For the most part, this was done by excluding the overarching personal injury-category but including the most common personal injuries as established by our read-through and sorting. The other categories included as options were the most prevalent vessel accidents. We were also interested in the respondents ranking the options, or at least deliberating on what was most important for them, to avoid them from picking just the first thing that comes to mind, or at the other extreme, all the alternatives. In consultation with our thesis supervisor, the NMA and Safetec, the following item was added to the questionnaire:

> **"Which type of accidents are most important to prevent? Choose at least one (1), maximum three (3)."**

With the following options:

- *fire/explosion*
- *fall accident on board*
- *fall accident overboard (to sea)*
- *grounding*
- *collision with other vessels*
- *collision with quay/bridge or similar (contact damage)*

- *capsizing*
- *environmental accident/acute pollution*
- *cut/puncture injuries*
- *impact/crush injuries*
- *other personal injuries, please specify:*

We judged these answer options to include the most prevalent incidents, both personal injuries and vessel accidents, as well as accidents where the potential risk is high, but prevalence low historically. The respondents answer to this question should, then, indicate whether their risk assessment adheres with the statistically more common accidents, or whether they are more concerned with preventing accidents that, according to historical data, has a small chance of taking place. Thus, we would be able to make some inferences about the judgments made by the seafarers.

Scoring. To operationalize the incident database as a measure of risk, a scoring system was developed. A score for each accident type identified in the database was established. This was done separately across various vessel types to get a precise score based on the risk in that particular vessel category. The score is based on a weighted average of how likely it is for an incident to occur based on historical prevalence.

Procedure. First, all of the accident types recognized in the incident database as well as the questionnaire was listed. As described in the section above, the category representing personal injuries was divided and specified into the most common personal injuries. Following this, the frequency percentage for each accident category was included (table 1). To account for our categorization of personal injuries, each of the new categories were reduced by the remainder of the total percentage of the original personal injury category. By doing this, all the accident categories counted equally toward the whole. After having a percentage number representing how often each accident occurs in the incident database, a weighted average was calculated. This was done by dividing the sum total of the percentage by the number of categories making up the total (N=17). Thereafter, each category percentage was divided by the weighted average in order to see how much each of the values contributed to the whole. Finally, the results were converted into whole numbers.

Table 5

Basis for scoring system

		A	B	C	D	E	F	G
Vessel type	Accident category	Personal injury dividend of E	Chance of occurring based on reported incidents	Chance of occurring after accounting for A (C= B ¸ A)	Total number of categories	Percentage D accounts of the entire dataset	Weighted average for each category (F= E ¸ D)	Score (G = B/C¸ F)
Fishing vessel	Grounding (vessel)	72%	11,67%		17	99,93%	5,88%	**1,99**
Fishing vessel	Cut/puncture injury (person)	72%	9,49%	6,88%	17	99,93%	5,88 %	**1,17**

Note. Table 5 demonstrates two examples of how the risk score was calculated. Both are in the fishing vessel category but are separated into personal injury and injury on vessel. Column G demonstrates how the risk score is calculated using column B for vessel injuries and column C for injuries on the person.

By using the scoring system outlined above (table 5), an overview of the survey respondents risk assessment will be reported. The score is based on the three events chosen by each respondent as what they deem the most important to avoid. The results will be divided by three main vessel groups, as the risk profile and working conditions associated with each will differ. The vessel groups are *passenger ships, cargo ships* and *fishing vessels.* For each group there is a top score based on the maximum attainable outcome from the three events that historically occur most often.

Table 6

Overview of scores

Incident type	Passenger ship	Cargo ship	Fishing vessel
	Score		
Fire/explosion	0,47	0,47	0,66
Fall accident on board	**2,72**	**2,82**	**2,89**
Fall accident overboard (to sea)	0,15	0,20	0,35
Grounding	**1,94**	**2,51**	**1,99**
Collision with other vessels	0,55	1,04	0,64
Collision with quay/bridge or similar (contact damage)	1,90	0,16	0,11
Capsizing	0,01	0,08	0,18
Environmental accident/acute pollution	0,37	0,48	0,12
Cut puncture injuries	0,88	0,62	1,17
Impact/crush injuries	**2,81**	**4,33**	**5,96**
Highest score possible	**7,47**	**9,66**	**10,84**

Note. The table shows the scores attainable for each incident across the vessel groups passenger, cargo, and fishing. The scores highlighted represent the three scores the respondents would have to choose in order to attain the highest score for each vessel type.

Table 6 demonstrates which score each of incidents represented in the survey, and the possible top scores if the respondents chose the three categories that are most prevalent historically on their vessel type. For passenger ships, 7,47 is the highest score possible. This is based on fall accident on board (2,72 points), grounding (1,94 points) and impact/crush injuries (2,81 points) added together. For cargo ships the highest score is 9,66 and for fishing vessels, it is 10,84. It is worth enforcing the point that the high score cannot provide the fullest possible explanation for the risk profile of the various vessel types. For example, the score is based on the accident categories identified within the accident database – 17 – including the recategorized personal injuries – see table 2, whereas the respondents in the survey needed only consider the ten that were deemed to be most recognizable and prevalent.

However, the survey items accounts for an average of 74,63% of the total number of accidents reported across the three vessel types, and the highest scores 43,61%, 54,75% and 63,74% for passenger ships, cargo ships and fishing vessels respectively. Furthermore, perhaps the most important feature of the score is to see how the respondents prioritize, and to draw some conclusions thereof.

Data processing

It was not deemed necessary for us to pre-register the project or apply for approval from relevant agencies. The Norwegian Maritime Authority owns the data in their incident database, and we only got access to it after signing a data processor agreement. The raw data from the survey is owned by Safetec before they release an anonymized version to the NMA. A data processor agreement was also entered into with Safetec so that we had access to the raw data. The data did not include, and we did not have previous access to the email addresses and telephone numbers of the respondents. Our thesis supervisors/the University of Bergen was not included in the data processor agreements.

The data was sorted using Microsoft Excel. Excel was also used in calculating the scoring system. Statistical analyses were conducted using SPSS for Mac version 27.

Results

Confirmatory analysis

Hypothesis 1 – Misjudged assessments of risks increase the likelihood of accidents occurring

Descriptive statistics are reported to show some indicators of the operator's priorities. Table 7 shows the total number of responses to each accident type as well as the share of reported incidents from the incident database. An average of 2,69 responses per participant was found.

1169 (33%) of the answers for passenger ships were apportioned in the category *fire/explosion.* The least chosen accident type for passenger ships was *cut/puncture injuries (N=68, 2%)*. Equally for cargo ships and fishing vessels, *fire/explosion* was the category most selected with 1766 out of 5826 (30%) total responses for the former, and 101 out of 361 (28%) for the latter. For cargo ships, the least chosen category was *collision with quay/bridge or similar (contact damage)* (N=121, 2%). The same category was chosen the least among respondents in the fishing vessel category (N=0, 0%).

Table 7

Number of independent responses to each accident category within the survey

	Passenger ships			Cargo ships			Fishing vessels		
Accident type	No. (1)	% (2)	Act. % (3)	No. (1)	% (2)	Act. % (3)	No. (1)	% (2)	Act. % (3)
Fire/explosion	1169	33%	2,72%	1766	30%	2,66%	101	28%	3,90%
Fall accident on board	210	6%	15,89%	601	10%	15,98%	29	8%	17,02%
Fall accident overboard (to sea)	266	7%	0,86%	550	9%	1,12%	84	23%	2,06%
Grounding	375	11%	11,35%	313	5%	14,22%	9	2%	11,67%
Collision with other vessels	314	9%	3,23%	470	8%	5,87%	13	4%	3,79%
Collision with quay/bridge or similar (contact damage)	450	13%	11,11%	121	2%	0,92%	0	0%	0,92%
Capsizing	84	2%	0,04%	235	4%	0,47%	25	7%	1,07%
Environmental accident/acute pollution	321	9%	2,14%	711	12%	2,74%	19	5%	0,68%
Cut puncture injuries	68	2%	5,14%	261	4%	3,49%	25	7%	6,88%
Impact/crush injuries	292	8%	16,38%	798	14%	24,55%	56	16%	35,04%
Number of responses, total	3549			5826			361		

Note. The table shows the number of independent responses to each incident across the vessel types (1), the share it represents of the sum total (2) and the actual share of the incidents as found in the NMA incident database (3).

The average score for an operator working on a passenger ship was 2,97 (SD=1,59). For operators working on cargo ships, the average score was 3,73 (SD= 2,42). For fishing vessels, the average score was 4,40 (SD= 3,19). The average scores for each of the vessel groups are all approximately the same size compared to the highest possible score. For instance, the average score for fishing vessels account for 40% of the highest score. For cargo ships, the same share is 38% and for passenger ships it is 39%. Hence, we can say that there is no substantial difference between the average operators across the vessel groups with regard to scoring. There are, however, differences in standard deviation across the vessel groups (table 8).

Very few respondents achieved the highest possible score across the samples. Two respondents out of the 1318 respondents in the passenger ship category chose the three incidents that would lead to a score of 10,84. Seven respondents attained the highest score (9,66) among the 2122 making up the cargo ship category. No respondents attained the highest score among respondents in the fishing vessel group.

Table 8

Descriptive statistics

	Number of respondents (N)	Average score	Median score	Standard deviation (SD)	Number of respondents with highest score
Passenger ships	1318	2,97	2,92	1,59	2
Cargo ships	2122	3,73	3,75	2,42	7
Fishing vessels	131	4,40	3,36	3,19	0

Note. Descriptive statistics from the results are presented in table 8 for the various vessel types.

To put this further into context, four thresholds for determining how precise the risk understandings are, are laid out in table 9. In it is reported the number and share of respondents that fall into quartiles based on the maximum attainable score. From the results, it is clear that operators working on fishing vessels have the most extreme scores with both the largest share falling into both the lowest (45%) and highest quartile (15%). Passenger ships have the most respondents within the two lowest quartiles (70,4%).

Table 9

Score thresholds for each vessel group

	Number and share of respondents at various thresholds				
	N	Lower 1/4	Lower 1/4 to 2/4 threshold	2/4 threshold to 3/4 threshold	3/4 threshold to upper 4/4 threshold
Passenger ships Lower 1/4: 0 → 1,8675 2/4 threshold: 1,8675 → 3,735 3/4 threshold: 3,735 → 5,6025 4/4 threshold 5,6025 →7,47	1318	344 (26,1%)	584 (44,3%)	325 (24,7%)	65 (4,9%)
Cargo ships Lower 1/4: 0 → 2,415 2/4 threshold: 2,415 → 4,83 3/4 threshold: 4,83 → 7,245 4/4 threshold 7,245 → 9,66	2122	741 (34,9%)	628 (29,6%)	478 (22,5%)	274 (12,9%)
Fishing vessels Lower 1/4: 0 → 2,71 2/4 threshold: 2,71 → 5,42 3/4 threshold: 5,42 → 8,13 4/4 threshold 8,13 → 10,84	131	60 (45%)	15 (11%)	36 (27%)	20 (15%)

Note. Table 9 presents the number and share of participants divided into quartiles based on their attained risk score. The intervals between each quartile is presented in the column farthest to the left. For instance, 628 operators working on cargo ships had a risk score between 2,41 and 4,83, placing them in the lower 1/4 to 2/4 quartile.

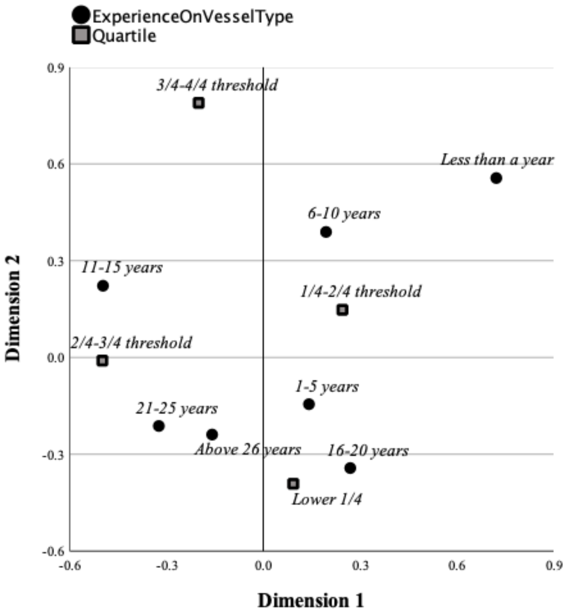
Hypothesis 2 – Individual and systemic factors influence subjective risk assessment

H2A – Increased sailing time (experience) leads to better judgments about risk. To test whether experience could predict a better risk assessment score, two analyses were conducted; a crosstabulation showing the number of respondents that fall within each cell, and a correspondence table that visualizes the same numbers graphically.

For table 10, representing the associations found between experience and risk assessment score on passenger ships, there are few very clear associations. As can be surmised from the crosstabulations, there are substantially fewer responses in the first row – *less than a year* – and the fourth column, *3/4 – 4/4 threshold,* than in the other cells. Results from a Chi square test were found to be insignificant, X^2 (18, N = 1318) = 21,119, p = .283. Hence, we cannot say with certainty that there is a correlation between experience and the risk assessment score, at least not for the uppermost quartile of the risk score.

Table 10

Correspondence table and crosstabulation of risk score quartiles, sailing time on vessel (passenger)



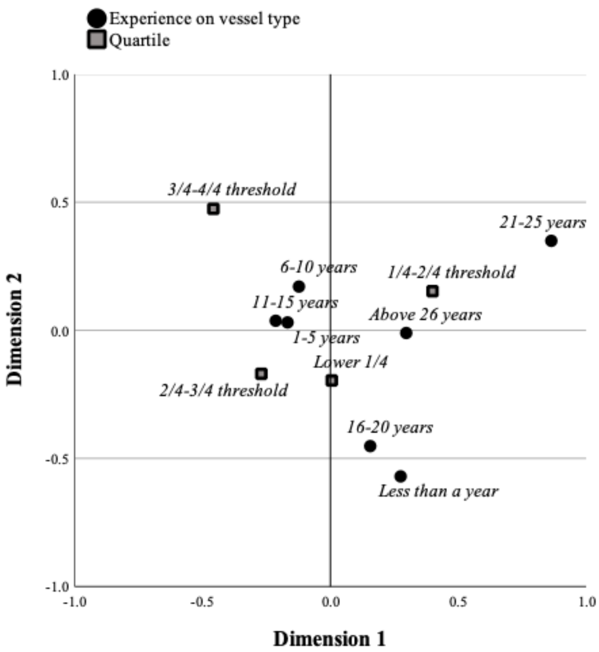
	Lower 1/4	1/4 - 2/4 threshold	2/4 – 3/4 threshold	3/4 – 4/4 threshold
	No.			
Less than a year	9	19	5	3
1-5 years	93	145	74	15
6-10 years	58	134	61	15
11-15 years	52	89	68	15
16-20 years	57	86	41	6
21-25 years	34	51	37	5
26 years or more	41	60	39	6
		df	Sig.	
Chi square	21,119	18	0,283	

Note. Table 10 shows the crosstabs between score quartile and years spent sailing on passenger vessels (right). To the left, a correspondence table lays out possible relationships between the variables.

Similarly for cargo ships, Chi square was not significant, but by a smaller margin relative to the passenger ship dataset, X^2 (18, N = 2122) = 26,692, p = .085. As can be seen from the correspondence table (table 11), most of the datapoints are clustered in and around the origin, which suggests that the associations are more or less indistinct relative to each other. The points that stand out, such as the *3/4 – 4/4 threshold* column point have no row points in its immediate vicinity, making it hard to draw any conclusions.

Table 11

Correspondence table and crosstabulation of risk score quartiles, sailing time on vessel (cargo)



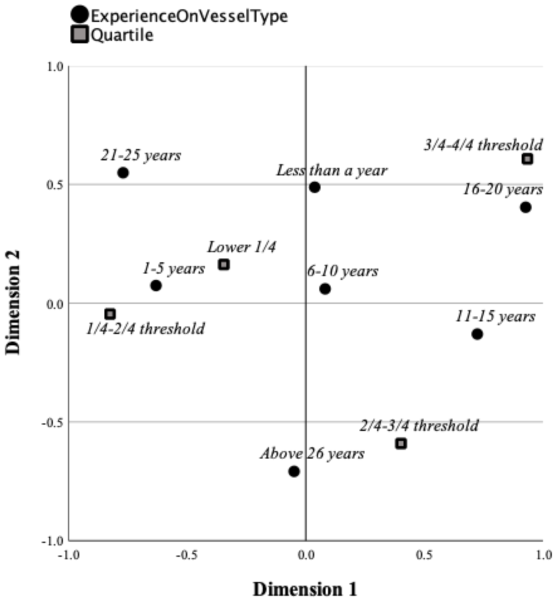
	Lower 1/4	1/4 - 2/4 threshold	2/4 – 3/4 threshold	3/4 – 4/4 threshold
	No.			
Less than a year	35	29	23	7
1-5 years	177	136	112	71
6-10 years	159	135	105	69
11-15 years	167	140	126	71
16-20 years	99	76	60	24
21-25 years	52	69	28	16
26 years or more	52	43	24	16
		df	Sig.	
Chi square	26,692	18	0,085	

Note. Table 11 shows the crosstabs between score quartile and years spent sailing on cargo vessels (right). To the left, a correspondence table lays out possible relationships between the variables.

Correspondence analysis was also conducted on the fishing vessel category and is presented in table 12. As most of the cells have values equal to or lower than five, it was determined that an ordinary Chi square would be insufficient. Instead, a Monte Carlo simulation was run to provide a value for both Chi square (X^2 (18, N = 131) = 16,757 p = .551) and Fisher Exact (X^2 (18, N = 131) = 16,640 p = .502). There was no major difference in the outcome of the two tests, and both were insignificant.

Table 12

Correspondence table and crosstabulation of risk score quartiles, sailing time on vessel (fishing)



	Lower 1/4	1/4 - 2/4 threshold	2/4 – 3/4 threshold	3/4 – 4/4 threshold
	No.			
Less than a year	5	1	2	2
1-5 years	18	5	6	2
6-10 years	9	3	6	4
11-15 years	5	1	6	4
16-20 years	6	0	5	5
21-25 years	6	2	1	1
26 years or more	11	3	10	2
	Monte carlo significance simulations			
		df	Sig.	
Chi square	16,757	18	0,551	
Fisher-Freeman-Halton Exact Test	16,640	18	0,502	

Note. Table 12 shows the crosstabs between score quartile and years spent sailing on fishing vessels (right). To the left, a correspondence table lays out possible relationships between the variables.

H2B – Participation in on-board risk assessments (JSA) leads to better judgments about risks. Analyzing the results relevant for this hypothesis was done in three ways; using frequency analysis, a crosstabulation and a logistic regression analysis.

Table 13 demonstrates that 91,6% (N = 1207) of the surveyed operators working within the passenger ship category responded that they took part in JSA’s. A similarly high share (91,8%, N = 1953) was found among cargo ship respondents. For respondents operating within the fishing vessel category, a lower share partook in JSA’s. 86 individuals accounting for 65,6 % of the total responded that SJA’s was conducted. Overall, we consider these findings to be a positive indicator of the safety focus in the industry. We have not considered variables that might explain the discrepancy in share between the groups.

Table 13

Frequency table for participation in job safety analysis

	Passenger ship	Cargo ship	Fishing vessel
		No.	
Job safety analysis conducted	1207 (91,6%)	1953 (96,3%)	86 (65,6%)
Job safety analysis not conducted	111 (8,4%)	74 (3,7%)	45 (34,4%)
N =	1318	2027	131

Note. The table presents the frequencies at which the operators say they participate in job safety analysis across the vessel groups.

Respondents belonging to the highest quartile of risk assessment scores were least likely to have participated in a JSA (table 14). 1207 operators belonging to the passenger ship category participate in JSA's – 4,9% of these (N=59) belong to the highest quartile whereas the most numerous category (N=538, 44,6%) is the second lowest quartile of risk assessment scores. 1953 operators belonging to the cargo ship category participate in JSA's – 13,5% of these (N=264) belong to the highest quartile whereas the most numerous category (N=704, 36%) is the lowest quartile of risk assessment scores. 86 operators belonging to the fishing vessel category participate in JSA's – 17,4% of these (N=15) belong to the highest quartile whereas the most numerous category (N=42, 48,8%) is the lowest quartile of risk assessment scores.

Table 14

Crosstabulations between the risk score quartiles and participation in job safety analysis (SJA)

	Passenger ship				Cargo ship				Fishing vessel			
	JSA conducted		JSA not conducted		JSA conducted		JSA not conducted		JSA conducted		JSA not conducted	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Lower 1/4	323	26,8%	21	18,9%	704	36%	11	14,9%	42	48,8%	18	40%
1/4 – 2/4 threshold	538	44,6%	46	41,4%	533	27,3%	34	45,9%	9	10,5%	6	13,3%
2/4 – 3/4 threshold	287	23,8%	38	34,2%	452	23,1%	21	28,4%	20	23,3%	16	35,6%
3/4 – 4/4 threshold	59	4,9%	6	5,4%	264	13,5%	8	10,8%	15	17,4%	5	11,1%
Total	1207	100%	111	100%	1953	100%	74	100%	86	100%	45	100%

Note. Table 14 shows the crosstabs between the risk score quartiles and participation in job safety analysis (JSA) for the various vessel groups.

A logistic regression was conducted to see if a relationship could be established between participation in JSA and the risk assessment score. For every vessel group, an inverse relationship between the risk assessment score and execution of JSA was found (table 14).

For passenger ships, the Beta coefficient for the constant was ß = (2.971), S.E = .279, Wald = 113.351, p= .000. For the predictor variable (risk score quartile) the beta coefficient was ß = (-.270), S.E = .116, Wald = 5.402, p= .020. The odds ratio favored a decrease of 23,7% [Exp. ß = .763, 95% CI (.608, .959)] in JSA conducted for every one unit increase in risk score threshold (table 15).

For cargo ships, the Beta coefficient for the constant was ß = (3.690), S.E = .284, Wald = 168.651, p= .000. For the predictor variable (risk score quartile) the beta coefficient was ß = (-.186), S.E = .110, Wald = 2.834, p= .092. The odds ratio favored a decrease of

16,9% [Exp. ß = .831, 95% CI (.669, 1.031)] in JSA conducted for every one unit increase in risk score threshold (table 15).

For fishing vessels, the Beta coefficient for the constant was ß = (.783), S.E = .388, Wald = 4.071, p= .000. For the predictor variable (risk score quartile) the beta coefficient was ß = (-.064), S.E = .159, Wald = .160, p= .690. The odds ratio favored a decrease of 6,2% [Exp. ß = .938, 95% CI (.687, 1.2812)] in JSA conducted for every one unit increase in risk score threshold (table 15).

Table 15

Results from a logistic regression outlining the relation between participation in JSA and risk score quartiles.

	Quartile								Constant					
							95% C. I for Exp. ß							
	ß	*S. E*	*Wald*	*df*	*Sig.*	*Exp. ß*	*Low.*	*Up.*	*ß*	*S. E*	*Wald*	*df*	*Sig.*	*Exp. ß*
Passenger ship	-.270	.116	5.402	1	.02*	.763	.608	.959	2.971	.279	113.351	1	.000	19.507
Cargo ship	-.186	.110	2.834	1	.092 ns	.831	.669	1.031	3.690	.284	168.651	1	.000	40.030
Fishing vessel	-.064	.159	.160	1	.69 ns	.938	.687	1.2812	.783	.388	4.071	1	.044	2.189

	Model evaluation								
	Passenger ship			Cargo ship			Fishing vessel		
	Score	*df*	*Sig.*	*Score*	*df*	*Sig.*	*Score*	*df*	*Sig.*
Chi square	5.346	1	.021	2.801	1	0.94	.159	1	.690
Nagelkerke R square			.009			.005			.002
Hosmer and Lemeshow Test (chi square)	1.564	2	.458	17.824	2	.000	2.910	2	.233
Correct predictions	91,6%			96,3%			65,6%		

Note. The uppermost part of table 15 demonstrates the outcome of the logistic regression analysis conducted to establish whether participation in job safety analysis could predict better risk assessment.
* indicate significance at P ≤ 0,05
ns indicate non-significant findings.

The best predictive model based on the logistic regression is for the passenger ship group based on the evaluative tests (Chi square > .05, Nagelkerke R^2 > .25, Hosmer and Lemeshow < .05) (table 15).

Discussion

The overarching research question we attempted to answer was whether operators in the Norwegian maritime industry assess risks in accordance with the actual risks they are susceptible to, as determined by historical prevalence, and the judgments made about these risks. The first hypothesis sought to determine if subjective risk assessment could lead to more accidents. The second hypothesis and associated under-hypotheses sought to confirm if factors related to risk assessment could predict how the seafarer's judgments are being shaped. The hypotheses required two measures. One representing objective risk, and one representing the subjective assessment of those risks. The NMA's database of reported incidents served as the measure for objective risk. Incident categories commonly identified in the database were included in a survey of maritime operators, who in turn were asked to choose up to three categories that they deemed most important to prevent from happening. The results indicate that maritime operators tend to be skewed toward accidents with outsize consequences but with a historically low chance of happening. However, it was not clear that increased sailing time (experience) nor situational awareness, operationalized by participation in job safety analysis was associated with a good risk assessment score.

H1: Misjudged assessments of risks increase the likelihood of accidents occurring.

The first hypothesis (H1) sought to determine whether misjudgments based on subjective risk assessments could increase the likelihood of accidents happening. This hypothesis was tested by having Norwegian seafarers report which three types of accidents they deemed most important to prevent from happening. The results indicate that the seafarers tend to be biased toward incidents with a small chance of occurring, but which, if they did, could have severe consequences.

The accident category most frequently chosen across the three vessel groups within the sample was *fire/explosion* (avg. 30,3% for the three vessel groups). Across the vessel types, the average number of fire/explosion related incidents reported to the NMA over the past 20 years makes up a share of 3,09%. According to the incident database (NMA), impact/crush injuries on the person is most commonly reported. A discrepancy between this number and the weight assigned to it by the seafarers was found. The respondents were less concerned with preventing the accidents that occur most often, namely personal injuries. These results yield support to the notion that operators more frequently perceive risk in connection with disasters and major accidents because they tend to focus on consequences of an accident rather than the probability of it occurring (Rundmo, 1992; Flin et al., 1996; Mearns & Flin, 1995). These findings may suggest that preventing the occurrence of certain *consequences* may be what's more important to the seafarer. This does not necessarily imply that the operators do not know what the most likely occurrences are (i.e., have precise risk assessments), but that they are more concerned with preventing those of greater consequences. We suggest that this may in part be due to the level of uncertainty associated with bigger accidents with greater consequences, and as have been indicated in previous literature – that the perceived control over risk is a central factor (Aalberg et al., 2020). Furthermore, certain cognitive biases may influence such attitudes. One leading theory in this regard is proposed by Kahneman and Tversky (1979), who have suggested that humans disproportionally weight outcomes as more likely to be positive when they themselves are the subject. This is commonly referred to as optimism bias. Hence, we propose that safe work practices may be more adhered to when the uncertainty is higher, whereas higher perceived control may lead to a more freely interpreted safe work practice.

Further evidence of optimism bias can be found when considering personal injuries. Between approximately 60 and 70 percent of incidents found in the incident database were personal injuries, depending on vessel type. The most common personal injury is also the injury that is most likely to occur overall based on reports from the industry – *crush/impact injuries*. For fishing vessels, we found that 35,04% of reported incidents were crush/impact injuries. The responses from the survey to this category made up a 16% share. The same tendency is clear among all three vessel types. Similarly, a large discrepancy was evident for the personal injury category *fall accident on board.* Based on the scoring system developed for this project, we found the average score to be around 40% of the maximum score attainable. We believe the scores, and the responses to each category confirm our first hypothesis based on the discrepancies between the objective risk and subjective assessment and judgments about those risks.

It is a good thing that the operators are enthusiastic about preventing fires and explosions from happening. These types of incidents have the potential to cause massive loss of life if it cannot be contained. Hence, various fire and evacuation drills can occur several times per rotation for Norwegian seafarers. Fire drills is one of the few that is specifically mentioned by law that all ships must conduct regularly (FOR-2014-07-01-1019 Forskrift om redningsredskaper på skip, 2014). We propose that the regularity of such drills and the very imaginable consequences of a fire erupting is what justifies the response share found in the sample. We suggest that this assumption builds on the notion that framework conditions (e.g. those indirectly or directly enforced by the shipping company) may play a significant role in the overall notion of safety in the seafarers work (Aalberg et al., 2020).

In previous literature, maritime operators and others working in industries associated with high risk have been found to have good risk perception when measured against actual risks related to their work (see e.g. Rundmo, 1996; Mearns & Flin, 1995). Following such results, researchers have concluded that risk perception is not something that can be changed in order to reduce accidents (Rundmo, 1996). Instead, it is improvements in underlying factors that predict good or bad risk perception – factors such as training, experience, awareness, working conditions etc. We concur with this. Our findings further suggest why *risk perception* is not the best term to associate with accident reduction. Where risk perception is a term that suggests that risks is something that can be felt and understood almost unconsciously, if interpreted verbatim, we find it hard to directly associate with accident reduction. Having perceived a risk, the operator must then conduct themselves in a suitable manner in relation to that risk. In other words, an assessment is made. From a scientific standpoint it is arguably easier to measure and understand what informs the risk assessment rather than risk perception. Similar proposals have been made by Rundmo (1996) who have suggested that it is underlying factors that need to be understood to change risk behavior. We agree with this way of thinking about risk and believe it to open up a few more conclusive ways of measuring the individuals risk assessment. First, it is possible to subject the individual to hypothetical, relevant events. Second, it is possible to score their assessment based on whether it is in fact likely to occur or not – as was done within the present study – and, finally, it is possible to further research what the subject has based their assessment on. However, we are cognizant that risk perception is something that might be attributed to Situation Awareness (SA) (Endsley, 1995), where perception can be said to make up crucial components. For instance, having good SA is associated with projection of future events, which in turn requires the operator to perceive what these might be. It is still the case, though, that such perceptions and predictions are informed bottom-up rather than top-down. Further, the present results suggest that the respondents have perceived a substantial source of risk, and actively work to make sure it does not happen. Although this may be true, we don't know whether there would have been more fires/explosions if the seafarers had been less concerned with these events, which adds to the complex nature of risk perception as a term often used in relevant research for the present context.

It is also interesting to consider the response shares that adheres most closely with the actual risks. On fishing vessels, 6,88% of reported incidents were cut/puncture wounds. The response share for the same category was 7%. Handling knives or other cutting equipment is par for the course for many operations in this category, so it is likely that the fisherman is well aware of the risks associated with them. Yet, the two results are quite proportionate, which could suggest that they have a reasonable expectation of the potential outcomes related to the risks as well as attributing an appropriate weight to its prevalence. For *collisions with quay/bridge or similar* in the passenger ship category, a similar result can be found. Passenger ships, such as car -and passenger carrying ferries can dock tens of times per day. Crashing into the quay is, quite literally, how they operate. Reports of this nature are therefore reasonable to expect, and most often not associated with substantial damage or injury. Had they been, we could probably have expected the response share to be higher. We consider the same to be the case for *groundings* within the passenger ship category. Operations near land could entail a higher risk of hitting shallows and grounds, yet at slow speed it might not have major consequences.

At the other extreme we find incidents where the response share is disproportionately lower than reported incidents. As mentioned, the clearest example is *impact/crush injuries* across the vessel groups. This is a very large category with many imaginable incidents, but often used in similar surveys to ours. We suggest that this discrepancy might be accountable to beliefs and attitudes about personal risk in the industry. For instance, many seafarers postulate that accidents are an inevitable part of the job, such beliefs have been found to be prevalent amongst Norwegian seafarers. A study comparing UK and Norwegian offshore personnel found that UK respondents believed they had more personal control over the outcome of potentially hazardous situations, than did the Norwegian respondents (Mearns et al., 2004). Interestingly, despite the differences found in "safety attitude" there were no differences in the accident rate between the two sectors. However, our results do not grant much opportunity to examine more closely/say anything conclusive about what beliefs and attitudes about personal risk were prevalent amongst the operators.

We consider the results from the impact/crush injury category to be the clearest indicator of complacency. The discrepancy could in practice entail that seafarers may be more susceptible to engage in unsafe behavior. Previous research has suggested that workers commonly skip or simplify safety procedures put in place to avoid accidents or take other risks that might increase the likelihood of something unwanted occurring (Mullen, 2004). We also know that this can happen regardless of having good risk perception (Mullen, 2004). To us, this suggested that conscious choices are being made to expose either self or others to increased risk. The discrepancy could be interpreted as a judgment made based on an assessment of a cost/benefit analysis where the cost is own health and the benefit could be efficiency, comfort etc. As have been indicated in previous reports about the tendency to reject safety procedures for the sake of "rewards" (Slappendel, 1993), all the while being cognizant of the risks involved (Mullen, 2004). Optimism bias (Kahneman & Tversky, 1979) could play a role here as well.

One final finding that might be inferred from the results can be seen in *fall accident overboard (to sea)* for fishing vessels. Here, the response share is 23%, whereas the number of reported incidents is 2,06%. To us, this suggests that there might be a large amount of underreporting for this category, and that falls to sea might be more common than the incident database tells us.

Overall, we suggest that these results show that there are substantial discrepancies between subjective risk assessment and actual risks, in line with the expectation outlined in H1.

Hypothesis 2 - Individual and systemic factors influence subjective risk assessment

We wanted to get a better a better understanding of the judgments and assessments Norwegian seafarers make, and to understand if any factors could predict these assessments. The second hypothesis regarded factors that might predict the risk score and was based on the assumptions that increased experience should be associated with a higher score because the relevant operators will have had longer time to identify and make judgments about accidents and risks. Another factor analyzed was participation in job safety analysis. This was tested based on the assumption that it would lead to better understanding and awareness of risks and accident potential.

Statistical analysis was conducted to see whether any predictions could be made in relation to a score developed to represent the operator's adherence to the incident database. This score was tested against two variables; experience, and situation awareness represented by participation in job safety analysis (JSA) procedures. Although we consider the score to be a good indicator of each respondent's subjective risk assessment, we were not able to establish any relationship across these particular variables.

H2A: Increased sailing time (experience) leads to better judgments about risk.

Correspondence analysis and descriptive statistics were conducted to see if any associations could be established between sailing time and the score for risk assessment. For the purposes of these analysis, the sample was divided into quartiles based on the score they achieved. The results were not conclusive for any of the vessel groups. There may be several possible explanations for this. First, there were no strong relations between any of the age groups and the scoring quartiles. Second, the variance followed the original dispersal quite closely, meaning that any shifts in the new tabulation were hard to identify and, to varying degrees not significant. Third, some of the values used in the tabulations were quite small. For fishing vessels, most were below or equal to five, which makes separating out statistical noise particularly hard. Based on previous findings from similar organizations to our sample, we expected to find that increased sailing time would be associated with the higher end of the risk score. Comparisons between experienced and inexperienced personnel have indicated that the former tend to feel safer than inexperienced personnel (Flin et al., 1996). This might still be the case, but we cannot say that it is associated with higher risk scores. One explanation for this could be that we do not know precisely which types of accidents the individual has been exposed to. This has been suggested by Oah et al. (2018) to play a role in shaping attitudes. For the purpose of accident reduction in the Norwegian maritime industry, our results suggest that increased sailing time is not of consequence. Hence, we are not prepared to confirm H2A.

On a more general level, the findings from the three vessel groups suggest that it may be possible to find significant relationships between experience and risk assessment given a larger sample size. Another solution could be to increase the thresholds from quartiles to thirds, with the caveat that it would provide less detail. Had the sample size for the passenger ship group been larger, for example, it is possible to imagine that the points in the correspondence table would be less scattered and more centered around the origin as it is for the passenger ship table. Evidence of this may be found in the initial threshold table (table 9), where the shares of the thresholds seem more evenly distributed than they do when split into multiple contingencies.

H2B: Participation in on-board risk assessments (JSA) leads to better judgments about risks.

A logistic regression analysis was conducted to establish if a relationship could be found between seafarers partaking in JSA before hazardous or uncommon work operations, and risk score. The most important finding in this regard is perhaps found in the initial frequency table (table 13). It was found that compliance with this method of risk assessment was very good across our sample – particularly for the passenger -and cargo ship groups. This level of compliance made it hard to create a predictive model of likelihood that one group (score quartile) would have higher or lower odds of having participated in a JSA or not. Notably, for the cargo ship category, the frequency of conducted JSA's (96,3%, see table 13) makes it hard for the model to predict anything else than "JSA conducted". On the opposite side, the lack of "JSA not conducted"-values might explain why the significance level is not lower ($p = 0.92$). Tests included to explain the strength of the model confirm this, so it should not be relied upon as a generalizable result. However, for this particular sample, the exponential beta, representing the odds ratio – seem to be in line with the values presented in the crosstabs (table 14). It is likely the case that a larger sample size within the fishing vessel category would have resulted in, perhaps, the most interesting findings seeing as it has the most distributed values. Seeing as this isn't the case, it is hard to instill confidence in the results. The negative relationship between the risk assessment score quartiles and JSA is also present here, but the discrepancy in confidence intervals makes it hard to say something definitive about the size of the likelihood or odds.

We postulated that participation with JSA would inform operators risk assessments. Existing literature have suggested that increased knowledge about risks and hazardous elements should lead the operator to make conscious decisions to avoid them from happening. In the Situational Awareness model (Endsley, 1995), for instance, knowledge about a situation is a prerequisite for making appropriate decisions in each context. We suggested that JSA could serve as a predictor variable for the types of context specific awareness raising needed to make better decisions with regard to reducing risks and accidents. This theory is in line with Albrechtsen et al., (2019) who reviewed adherence to JSA's among a cohort of Norwegian construction workers. Similarly, adherence to JSA's in the Norwegian maritime industry was found to be good, yet findings from the present results could not predict whether said adherence increases salience with regard to risk and/or accident reduction. The same was suggested by Albrechtsen et al. (2019). There could be several reasons why reductions or increases in the risk assessment score could not be detected or predicted. First; it is hard to see from the present survey how thorough or how often JSA's are conducted; second, we cannot tell what is included in the assessments, or whether it is formally proceduralized as opposed to operationalized in a more ad hoc manner; third, it is conceivable that many seafarers consider JSA's to be unnecessary or to come in the way of their work operations. Hence, reporting may be inaccurate and could warrant further research. It is likely that organizational size and focus could play a role.

Limitations

We believe we have made a good attempt at comparing objective and subjective risk within the present thesis, however we are cognizant of the debates within the field discussing what is the best way to do this, if it can be done at all. For instance, the way many professionals in the field of risk reduction and understanding measure risk is to not only account for the occurrence of accidents, but also the presumed consequences of them (Goerlandt & Montewka, 2015). A risk score weighted by consequences would have some useful implications, but perhaps more so for organizations rather than individuals. For the maritime industry, for instance, a risk score weighted by possible consequences could indicate which ships and installations that have disproportionately high risk. However, for the sake of understanding individual decisions about risk, we believe it sufficient to account for historical prevalence of incidents. We presume that it can but are not prepared to say that the way it was done herein is the best way forward. For instance, our analysis is based on raw data. It has not been subject to weighting by experts in the field. However, as the survey directly examined the same population that might have submitted some of the incidents, we consider the measures to be comparable for the context of this experiment. Some evidence of this could be seen when comparing certain results with low discrepancies between them.

Another limitation was the sample size for the fishing vessel category. The response rate for this group was substantially lower than the other two, and we reduced it even further when applying our exclusion criteria. The reason for this is that many fishermen do not belong to large organizations and might not have a dependable e-mail address for the survey to reach. Hence, telephone interviews were conducted for a large portion of that particular sample. For the sake of brevity, certain items were excluded, including our own. This is unfortunate, seeing as fishing vessels has the highest risk profile of any vessel category, and that results indicate that they diverge from the other to vessel groups in a positive way based on the risk score.

Significance levels were an issue in several of the analysis. However, the extent to which this is problematic is a matter of interpretation. The results are based on a limited population, and the response rate is quite good for two out of three vessel groups, fishing vessels being the exception, meaning that the samples could be said to be inherently generalizable. For the passenger and cargo ship sample, it might not be of crucial consequence that p-values are somewhat higher than what is normally determined to be good or decent.

We would have liked to be able to compare the outcomes of our risk assessment score to a question regarding risk perception. Currently, we rely on previous findings when we say that maritime operators have good risk perception. This is something that could have been confirmed by, for instance, adding another question to the survey asking the respondents to say which incidents were most likely to occur, or similar. Due to limitations in the development of the survey, one item needed to be prioritized.

One further limitation could be that the objective risk measure is based on twenty years of data. Hence, it does not account for the various trends within the accident database. We do assume there should be some historical context present within the measurements, but perhaps twenty years was too long. Running new experiments for various time frames could provide interesting results.

Implications and suggestions for further research

Hopefully this thesis has added to the knowledge about accident reduction in the maritime industry. First, with regard to objective risk, we employed a simple, yet solid scoring system based on a weighted average. Such a system can probably be expanded and made more precise using different weights, but for the sake of these comparisons we think the simplest option still was best. Second, the survey item asking which incidents the operators deemed most important to avoid, was very useful in understanding the judgments made about risk. The skewness or bias toward certain types of incidents could be explained by several psychological theories. Three categories or inferences can be made from the results with regard to implementation of new safety measures or further research:

1. **Confirming underlying mechanisms for bias toward catastrophic events.**

We theorized that a combination of consequence thinking and reinforcement through regular exercises could explain why there was such a large discrepancy between the occurrence of fires/explosions and judgments about preventing them from occurring. A longitudinal study could be suggested as a way of measuring developments for this category and others. If our assumption is correct, it might be possible to see effects of other incidents on the results. A high-profile incident resulting in loss of life and/or causing major damage might afflict the results for that year. Media coverage and surveillance of other relevant platforms in the industry could be examined to get an understanding of common topics of discussion over time.

2. **Confirming non-discrepant results.**

Some results were more conforming to the incident database. These could serve as an indicator of good risk assessment, if confirmed. We think these results are found in the intersection between incidents with a relatively high chance of occurring and a realistic expectation of the risks. Collision with quay for passenger vessels was used as an example.

3. **Confirming underlying mechanisms for bias toward personal injury.**

The discrepancy between categories representing personal injuries, such as crush/impact, and assessment and judgments about the importance of preventing these, was quite large. We suspect that more accidents within this category can be avoided if the operators are less inclined to put themselves at risk, which we think these results indicate. Decision making processes regarding such events should be further examined. Prospect theory could be used as a framework for experiments in affecting decisions.

Further research. Assuming that the risk score used for the present study is useful in understanding risk assessments, further analysis can be done using other variables. We chose to look at sailing time as a measure of experience and Job Safety Analysis as a measure of awareness of work-related risks. These can be understood as components of Situational Awareness. Other components that might be compared with the risk assessment score include, but are not limited to, communication, physical and mental strain, organizational and/or leadership related factors, and working conditions. Apart from using the risk assessment score to better understand the abovementioned factors, we would also like to suggest an increased focus on understanding which authorities and role-models seafarers adhere to and follow. A top-down focus from regulators and ship-owners will go a long way in establishing a good safety culture, but it is likely that there are cohorts among the sample who do not adhere to safe working practices as close as is desired. For one, they might be intrinsically opposed to being told what to do and how to do it by bureaucrats, furthermore, some might take for granted that risk and accidents are to be expected in their line of work. Fundamentally, it is about confronting biases and changing often deeply held believes. It is likely that measures implemented across the sector or across vessel groups will have a limited effect in reaching the population of people that are likely to accept higher risk. They may follow other authorities and be informed by decisions made by role models and other influential people near to them. Knowing more about who serve as such influences and having them be part of a proactive effort to influence others could lead to higher trust in, understanding of, and adherence to the safety management system.

Concluding remarks

Norway, with its long seagoing history, takes pride in providing safe working conditions for the many who are employed in the industry. Similarly, ship owning companies often use safety as a competitive advantage, citing working conditions and environmental focus as competitive advantages to customers and potential employees. For 2021 the Norwegian Maritime Authority have established safety culture and risk understanding as a focus area. This entails revised procedures when conducting inspections on ships, for instance. Risk understanding is a suitable topic for psychologists to research. The present thesis has attempted to further risk understanding by investigating how Norwegian seafarers assess risks associated with their work. This was done by giving the subjects a score based on historical prevalence of incidents in the industry. The resulting score was also compared with components of Situational Awareness (SA) (Endsley, 1995) known to affect safety in a positive or negative way. Overall, seafarers across the three vessel types tested were found to be more concerned with preventing incidents with a historically low chance of occurring. We believe this to be both an interesting finding for the industry, in particular with regard to accident reduction. We also hope that it serves as a good jumping-off point for discussions about what might inform these beliefs. The findings are supported by existing, related research from other industries where safety is of the highest concern. Hence, we believe that our findings and methods are applicable outside of the maritime industry.

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Appendix A

Det tar omtrent 15-20 minutter å gjennomføre, og det er mulig å svare frem til 10. februar 2021.

I undersøkelsen ber vi om at du tar utgangspunkt i fartøyet du vanligvis jobber på.

PS: Hvis du har mottatt undersøkelsen på to forskjellige e-poster, så beklager vi dette, og ber om at du besvarer kun én av invitasjonene.

Safetec Nordic står for den praktiske gjennomføringen av kartleggingen. Sjøfartsdirektoratet er ansvarlig for prosjektet. Har du spørsmål til undersøkelsen, så kan du ta kontakt med prosjektleder Sverre Flatebø (sfl@sdir.no).

Med vennlig hilsen

Leif Inge K. Sørskår, Prosjektleder for Safetec Nordic

Sverre Flatebø, Prosjektleder for Sjøfartsdirektoratet.

Sjøfartsdirektoratet
Norwegian Maritime Authority

FISKERIDIREKTORATET

NORSK SJØMANNSFORBUND

DNMF

NSOF
1995
NORSK SJØOFFISERSFORBUND

KYSTVERKET

1. Innledende spørsmål
Først trenger vi å vite om spørreundersøkelsen er relevant for deg eller ikke.
Har du seilt/arbeidet på et fartøy de siste to årene (eller vært los)? *Trykk nederst i høyre hjørne for å komme videre i spørreundersøkelsen.*

- ☐ Ja
- ☐ Nei

Mannskapstype

- ☐ LOS

2. Fartøygruppe
De spørsmålene du nå skal ta stilling til handler om fartøyet du arbeider på.
Hvilket fartøy jobber du vanligvis på? Hvis du er los, velg fartøytypen du oftest jobber på. *Trykk nederst i høyre hjørne for å komme videre i spørreundersøkelsen.*

- ☐ Lasteskip (*f.eks. nærskipsfart, oversjøisk fart, offshore-skip, flyttbar innretning, havbruksfartøy*)
- ☐ Passasjerskip
- ☐ Fiskefartøy
- ☐ Militært fartøy
- ☐ Annet

3. Fartøygruppe, del 2

Spesifiser type fartøy du jobber på.

____
____
____
____
____

Velg type lasteskip

- ☐ Nærskipsfart
- ☐ Oversjøisk fart
- ☐ Offshore-skip
- ☐ Flyttbar innretning (MOU/FPSO/FSO etc.)
- ☐ Havbruksfartøy

Velg type passasjerskip

- ☐ Innenriks ferge
- ☐ Innenriks hurtigbåt
- ☐ Passasjerskip (verken innenriks ferge eller hurtigbåt)

Hvor mange passasjerer kan fartøyet føre?

- ☐ 1-12
- ☐ 13-99
- ☐ 100-499
- ☐ 500-2000
- ☐ Over 2000

Velg type fiskefartøy

- ☐ Fiskefartøy - 15 meter største lengde
- ☐ Fiskefartøy - over 15 meter, bruttonasje (GT) < 500
- ☐ Fiskefartøy - over 15 meter, bruttonasje (GT) > 500

4. Fartøygruppe, del 3

Hva er fartøyets lengde (LOA)?

- ☐ Over 24 m
- ☐ Under 24 m

Hvilken type passasjerskip arbeider du på?

- ☐ Store (over 1500 bruttotonn, f.eks. cruise)
- ☐ Mindre (f.eks. små skyssfartøy)

5. Fartøygruppe, del 4

I hvilket register er ditt fartøy registrert?

- ☐ NOR
- ☐ NIS
- ☐ Uregistrert
- ☐ Annet (*også annen flaggstat*), vennligst spesifiser: ________________________________

Arbeider du alene om bord på fartøyet?

- ☐ Nei, vi er flere om bord
- ☐ Ja

6. Fartøygruppe, del 5

For at vi kan unngå å måtte stille en rekke spørsmål om fartøyet ber vi deg om å oppgi IMO, kallesignal, eller navn på fartøyet du nå jobber. Da kan vi hente inn informasjonen automatisk. Velg aller helst IMO/kallesignal dersom du kjenner til dette. Vi minner om at din besvarelse behandles konfidensielt selv om du oppgir dette. *Dersom du likevel ikke vil oppgi dette, vennligst velg siste alternativ.*

- ☐ IMO
- ☐ Kallesignal
- ☐ Navn på fartøyet
- ☐ Ønsker ikke å oppgi

7. Fartøygruppe, del 6

IMO-koden på fartøyet:

____
____
____
____
____

Kallesignalet på fartøyet:

____
____
____
____
____

Navnet på fartøyet:

____
____
____
____
____

8. Bakgrunn om deg selv

De spørsmålene du nå skal ta stilling til handler om deg selv.

Hva er din alder?

- ☐ Yngre enn 26 år
- ☐ 26–35 år
- ☐ 36–45 år
- ☐ 46–55 år
- ☐ Eldre enn 56 år
- ☐ Ønsker ikke å oppgi

Kjønn

- ☐ Mann
- ☐ Kvinne
- ☐ Ønsker ikke å oppgi

Hvordan er din jobbsituasjon per i dag?

- ☐ Ansatt i et rederi
- ☐ Ansatt i et bemanningsselskap
- ☐ Ansatt i et privat selskap (ikke rederi)
- ☐ Ansatt i offentlig sektor (Forsvaret, Kystverket, annen statlig organisasjon)
- ☐ Midlertidig ansatt (selvstendig/på kontrakt/vikar)
- ☐ Arbeidsledig
- ☐ Pensjonert
- ☐ Ansatt, men jobber ikke på fartøy
- ☐ Ønsker ikke å oppgi
- ☐ Annet, spesifiser: ________________________________

Hvilket land kommer du fra?

- ☐ Norge
- ☐ Andorra
- ☐ Angola
- ☐ Antigua and Barbuda
- ☐ Argentina
- ☐ Armenia
- ☐ Australia
- ☐ Austria
- ☐ Azerbaijan
- ☐ The Bahamas
- ☐ Bahrain
- ☐ Bangladesh
- ☐ Barbados
- ☐ Belarus
- ☐ Belgium
- ☐ Belize
- ☐ Benin
- ☐ Bhutan
- ☐ Bolivia
- ☐ Bosnia and Herzegovina
- ☐ Botswana
- ☐ Brazil
- ☐ Brunei
- ☐ Bulgaria
- ☐ Burkina Faso
- ☐ Burundi
- ☐ Cabo Verde
- ☐ Cambodia
- ☐ Cameroon
- ☐ Canada
- ☐ Central African Republic
- ☐ Chad
- ☐ Chile
- ☐ China
- ☐ Colombia
- ☐ Comoros
- ☐ Congo, Democratic Republic of the
- ☐ Congo, Republic of the
- ☐ Costa Rica
- ☐ Côte d'Ivoire
- ☐ Croatia
- ☐ Cuba
- ☐ Cyprus
- ☐ Czech Republic
- ☐ Denmark
- ☐ Djibouti
- ☐ Dominica
- ☐ Dominican Republic
- ☐ East Timor (Timor-Leste)
- ☐ Ecuador

- [ ] Egypt
- [ ] El Salvador
- [ ] Equatorial Guinea
- [ ] Eritrea
- [ ] Estonia
- [ ] Ethiopia
- [ ] Fiji
- [ ] Finland
- [ ] France
- [ ] Gabon
- [ ] The Gambia
- [ ] Georgia
- [ ] Germany
- [ ] Ghana
- [ ] Greece
- [ ] Grenada
- [ ] Guatemala
- [ ] Guinea
- [ ] Guinea-Bissau
- [ ] Guyana
- [ ] Haiti
- [ ] Honduras
- [ ] Hungary
- [ ] Iceland
- [ ] India
- [ ] Indonesia
- [ ] Iran
- [ ] Iraq
- [ ] Ireland
- [ ] Israel
- [ ] Italy
- [ ] Jamaica
- [ ] Japan
- [ ] Jordan
- [ ] Kazakhstan
- [ ] Kenya
- [ ] Kiribati
- [ ] Korea, North
- [ ] Korea, South
- [ ] Kosovo
- [ ] Kuwait
- [ ] Kyrgyzstan
- [ ] Laos
- [ ] Latvia
- [ ] Lebanon
- [ ] Lesotho
- [ ] Liberia
- [ ] Libya
- [ ] Liechtenstein
- [ ] Lithuania
- [ ] Luxembourg
- [ ] Macedonia
- [ ] Madagascar
- [ ] Malawi
- [ ] Malaysia
- [ ] Maldives
- [ ] Mali
- [ ] Malta
- [ ] Marshall Islands
- [ ] Mauritania
- [ ] Mauritius
- [ ] Mexico
- [ ] Micronesia, Federated States of
- [ ] Moldova

- ☐ Monaco
- ☐ Mongolia
- ☐ Montenegro
- ☐ Morocco
- ☐ Mozambique
- ☐ Myanmar (Burma)
- ☐ Namibia
- ☐ Nauru
- ☐ Nepal
- ☐ Netherlands
- ☐ New Zealand
- ☐ Nicaragua
- ☐ Niger
- ☐ Nigeria
- ☐ Oman
- ☐ Pakistan
- ☐ Palau
- ☐ Panama
- ☐ Papua New Guinea
- ☐ Paraguay
- ☐ Peru
- ☐ Philippines
- ☐ Poland
- ☐ Portugal
- ☐ Qatar
- ☐ Romania
- ☐ Russia
- ☐ Rwanda
- ☐ Saint Kitts and Nevis
- ☐ Saint Lucia
- ☐ Saint Vincent and the Grenadines
- ☐ Samoa
- ☐ San Marino
- ☐ Sao Tome and Principe
- ☐ Saudi Arabia
- ☐ Senegal
- ☐ Serbia
- ☐ Seychelles
- ☐ Sierra Leone
- ☐ Singapore
- ☐ Slovakia
- ☐ Slovenia
- ☐ Solomon Islands
- ☐ Somalia
- ☐ South Africa
- ☐ Spain
- ☐ Sri Lanka
- ☐ Sudan
- ☐ Sudan, South
- ☐ Suriname
- ☐ Swaziland
- ☐ Sweden
- ☐ Switzerland
- ☐ Syria
- ☐ Taiwan
- ☐ Tajikistan
- ☐ Tanzania
- ☐ Thailand
- ☐ Togo
- ☐ Tonga
- ☐ Trinidad and Tobago
- ☐ Tunisia
- ☐ Turkey

- Turkmenistan
- Tuvalu
- Uganda
- Ukraine
- United Arab Emirates
- United Kingdom
- United States
- Uruguay
- Uzbekistan
- Vanuatu
- Vatican City
- Venezuela
- Vietnam
- Yemen
- Zambia
- Zimbabwe
- Færøyene

På fartøyet jeg arbeider ombord arbeider det personer med ulike nasjonaliteter

- Ja
- Nei

Under hvilket arbeidsområde passer din stilling best?

- Dekk
- Bro
- Maskin
- Forpleining/catering
- Jobber på land

9.

Dersom du nå ikke arbeider på et fartøy, men har arbeidet på fartøy innenfor de to siste årene kan du svare på resten av undersøkelsen med basis i fartøyet du sist arbeidet på, eller velge å avslutte undersøkelsen.

- Jeg vil fortsette undersøkelsen
- Jeg vil avslutte undersøkelsen

10. Bakgrunn om deg selv del 2

Hva er din stilling om bord? *Velg det alternativet som ligger nærmest din stilling.*

- Kaptein
- Dekksoffiser/Styrmann *(ikke kaptein eller los)*
- Los
- Dekksmannskap/Dekkspersonell *(Matros, Båtsmann, Tømmermann, Jungmann etc.)*
- Maskinsjef
- Maskinoffiser/Maskinist *(ikke maskinsjef)*
- Maskinmannskap *(Mekaniker, Motormann, Pumpemann, Smører etc.)*
- Lærling/kadett
- Innenfor forpleining (*Catering, Kokk, Renhold, Sykepleier og andre støttefunksjoner*)
- Elektriker
- Annet, spesifiser: ________________________________

11. Arbeidsvilkår

De spørsmålene du nå skal ta stilling til handler om arbeidsvilkår på fartøyet du arbeider om bord.

I løpet av et døgn til sjøs, hvor mange timer jobber du i gjennomsnitt?

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7
- ☐ 8
- ☐ 9
- ☐ 10
- ☐ 11
- ☐ 12
- ☐ 13
- ☐ 14
- ☐ 15
- ☐ 16
- ☐ 17
- ☐ 18
- ☐ 19
- ☐ 20

Overnatter du vanligvis om bord på fartøyet i jobbperioden?

- ☐ Ja
- ☐ Nei

Hvor mange timer varer vanligvis en tokt/tur? ***(skriv inn antall timer, eller skriv f.eks. 4 dager)***

____
____
____
____
____

Har du fast rotasjon?

- ☐ Ja
- ☐ Ikke relevant
- ☐ Annen ordning, vennligst spesifiser ________________________________

12. Arbeidsvilkår, del 2

Angi hvor lenge de ulike seilings-og friperiodene dine vanligvis/omtrentlig varer.

	1 uke	2 uker	3 uker	4 uker	5-9 uker	10-14 uker	15-19 uker	20 eller flere uker	Ingen alternativ passer
Seilingsperiode	☐	☐	☐	☐	☐	☐	☐	☐	☐
Friperiode	☐	☐	☐	☐	☐	☐	☐	☐	☐

Jeg får betalt for friperiodene mine

- ☐ Ja
- ☐ Nei

Hvilken type vaktordning har du normalt i seilingsperioden?

- ☐ 6 timer på - 6 timer av, 6 timer på - 6 timer av
- ☐ 8 timer på - 8 timer av, 4 timer på - 4 timer av
- ☐ 10 timer på - 14 timer av
- ☐ 12 timer på - 12 timer av
- ☐ Dagvaktsordning *(8 timer på - 16 timer av)*
- ☐ Skiftordning *(som ikke er dekket av alternativene over)*
- ☐ Ingen fast ordning
- ☐ Annen fast ordning, spesifiser: ________________________________

Hvilket avlønningssystem har du?

- ☐ Fast lønn
- ☐ Akkordlønn
- ☐ Lott
- ☐ Timebetaling
- ☐ Provisjon
- ☐ Fast lønn + bonus/akkord/lott etc.
- ☐ Grunnhyre + eventuelle tillegg
- ☐ Annet, spesifiser: ________________________________

Følgende påstand handler om arbeidsvilkårene om bord på fartøyet. Hvor enig eller uenig er du i følgende påstand?

	1 - Helt uenig	2 - Noe uenig	3 - Verken enig eller uenig	4 - Noe enig	5 - Helt enig	Vet ikke	Ikke relevant
Jeg anser skift-/vaktordningen som belastende.	☐	☐	☐	☐	☐	☐	☐

13. Arbeidsvilkår, del 3

Hvis ingen av alternativene for seilingsperiode og friperiode passet, vennligst skriv inn din rotasjon/kontrakt under.

____
____
____
____
____

14. COVID-19

De påstandene du nå skal ta stilling til handler om COVID-19 - problematikk på fartøyet du arbeider om bord. Hvor enig eller uenig er du i følgende påstander?

	1 - Helt uenig	2 - Noe uenig	3 - Verken enig eller uenig	4 - Noe enig	5 - Helt enig	Vet ikke	Ikke relevant
Jeg føler meg sikker på at smittevern blant ansatte er godt nok ivaretatt på fartøyet jeg jobber om bord.	☐	☐	☐	☐	☐	☐	☐
Jeg føler meg sikker på at smittevern for passasjerer er godt nok ivaretatt på fartøyet jeg jobber om bord.	☐	☐	☐	☐	☐	☐	☐
Det hender at hensyn til smittevern må vike for å få jobben gjort.	☐	☐	☐	☐	☐	☐	☐
Vi har fått tilstrekkelig informasjon vedrørende COVID-19 på fartøyet jeg jobber om bord.	☐	☐	☐	☐	☐	☐	☐
På fartøyet jeg jobber om bord er det rom for å melde fra om symptomer på COVID-19.	☐	☐	☐	☐	☐	☐	☐
Rederiets COVID-19 tiltak handler også om å hindre smittespredning utenfor fartøyet jeg jobber på *(f.eks. transportrestriksjoner, krav om testing og karantene)*.	☐	☐	☐	☐	☐	☐	☐
En stor andel av mine arbeidstimer blir brukt til smittevern i stedet for mine normale arbeidsoppgaver.	☐	☐	☐	☐	☐	☐	☐
Det hender at smitteverntiltak hindrer sikkerhetskritisk vedlikehold.	☐	☐	☐	☐	☐	☐	☐
Covid-19-tiltak kan føre til dårligere kvalitet på arbeidet jeg utfører.	☐	☐	☐	☐	☐	☐	☐
Min trivsel om bord er negativt påvirket av COVID-19-tiltak.	☐	☐	☐	☐	☐	☐	☐
Mitt rederi tilbyr velferdstiltak grunnet COVID-19.	☐	☐	☐	☐	☐	☐	☐
Å komme seg fra mitt bosted til og fra fartøyet har blitt mer krevende (*tid, transport, testing, karantene, etc.***) som følge av COVID-19.**	☐	☐	☐	☐	☐	☐	☐

Er du eller har du vært permittert som følge av COVID-19?

- ☐ Er permittert
- ☐ Har vært permittert
- ☐ Nei

Hvor stor andel av dine rotasjoner har du måttet stå lenger i grunnet COVID-19?

- ☐ 1-30%
- ☐ 30-70%
- ☐ 70-100%
- ☐ Har ikke stått lenger i rotasjon

15. COVID-19, del 2

Hvor mye lenger har du i gjennomsnitt stått i rotasjon grunnet COVID-19?

- ☐ 1 uke eller mindre
- ☐ 2 uker
- ☐ 3 uker
- ☐ 4 uker eller mer

16. Kommersielt press

De påstandene du nå skal ta stilling til handler om kommersielt press. Hvor enig eller uenig er du i følgende påstander?

	1 - Helt uenig	2 - Noe uenig	3 - Verken enig eller uenig	4 - Noe enig	5 - Helt enig	Vet ikke	Ikke relevant
Rederiets avlønningssystem kan gå utover sikkerheten på fartøyet.	☐	☐	☐	☐	☐	☐	☐
Manglende vedlikehold har noen ganger ført til dårligere sikkerhet.	☐	☐	☐	☐	☐	☐	☐

17. Samarbeid og kommunikasjon

De påstandene du nå skal ta stilling til handler om samarbeid og kommunikasjon om bord på fartøyet. Hvor enig eller uenig er du i følgende påstander?

	1 - Helt uenig	2 - Noe uenig	3 - Verken enig eller uenig	4 - Noe enig	5 - Helt enig	Vet ikke	Ikke relevant
At ikke alle snakker samme språk kan resultere i farlige situasjoner.	☐	☐	☐	☐	☐	☐	☐
Det hender at sammensetningen av nasjonaliteter om bord fører til dårligere samarbeid.	☐	☐	☐	☐	☐	☐	☐
Samarbeidet mellom mannskapet om bord på vårt fartøy er godt.	☐	☐	☐	☐	☐	☐	☐
Jeg har mulighet til å få hjelp og støtte fra mine kolleger når jeg trenger det *(eller andre fartøy om du arbeider alene om bord)***.**	☐	☐	☐	☐	☐	☐	☐
Samarbeidet med eksterne parter *(e.g. taubåt, VTS, los, havn/kai, andre fartøy)* **gjør det vanskeligere å håndtere farlige situasjoner.**	☐	☐	☐	☐	☐	☐	☐

Hvilket arbeidsspråk benyttes primært om bord på fartøyet du arbeider?

☐ Norsk
☐ Engelsk
☐ Svensk
☐ Dansk
☐ Annet, spesifiser: ________________________________

18. Erfaring, kompetanse og arbeidsfordeling

De påstandene du nå skal ta stilling til handler om kompetanse og arbeidsfordeling. Hvor enig eller uenig er du i følgende påstander?

	1 - Helt uenig	2 - Noe uenig	3 - Verken enig eller uenig	4 - Noe enig	5 - Helt enig	Vet ikke	Ikke relevant
På mitt fartøy er oppgaver og ansvar klart fordelt.	☐	☐	☐	☐	☐	☐	☐
Vi har tilstrekkelig tid til opplæring/familiarisering av ansatte.	☐	☐	☐	☐	☐	☐	☐
Alle mine kolleger har tilstrekkelig kompetanse til å utføre arbeidsoppgavene sine på en sikker måte.	☐	☐	☐	☐	☐	☐	☐
Vi får alltid gjennomført de beredskapsøvelsene vi skal/er pålagt.	☐	☐	☐	☐	☐	☐	☐

Hvor mange års erfaring har du fra å jobbe på sjøen totalt *(inkluderer evt. losing). Velg fra nedtrekksmenyen.*

- ☐ Mindre enn ett år
- ☐ 1-5 år
- ☐ 6-10 år
- ☐ 11-15 år
- ☐ 16-20 år
- ☐ 21-25 år
- ☐ 26 eller flere år

Hvor mange år har du arbeidet med denne fartøystypen du er på nå? For los, hvor lenge har du arbeidet som los? *Velg fra nedtrekksmenyen.*

- ☐ Mindre enn ett år
- ☐ 1-5 år
- ☐ 6-10 år
- ☐ 11-15 år
- ☐ 16-20 år
- ☐ 21-25 år
- ☐ 26 eller flere år

Hvor ofte deltar du på kurs i BRM *(Bridge Resource Management)*/ERM *(Engine room Resource Mangement)*?

- ☐ Flere ganger årlig
- ☐ Årlig
- ☐ Annethvert år
- ☐ Hvert femte år
- ☐ Sjeldnere
- ☐ Aldri deltatt
- ☐ Ikke relevant

19. Bemanning

De påstandene du nå skal ta stilling til handler om bemanningen på fartøyet du arbeider om bord. For los, generelt for fartøyene du jobber på. Hvor enig eller uenig er du i følgende påstander?

	1 - Helt uenig	2 - Noe uenig	3 - Verken enig eller uenig	4 - Noe enig	5 - Helt enig	Vet ikke	Ikke relevant
Bemanningen om bord er tilstrekkelig til at sikkerheten ivaretas.	☐	☐	☐	☐	☐	☐	☐
Det er til vanlig flere i besetningen enn det som er fastsatt som sikkerhetsbemanning for fartøyet.	☐	☐	☐	☐	☐	☐	☐
Rederiet benytter seg i stor grad av midlertidig ansatte på fartøyet jeg jobber ombord.	☐	☐	☐	☐	☐	☐	☐
Rederiet gir mulighet for tilleggsbemanning ved behov.	☐	☐	☐	☐	☐	☐	☐
Jeg tar med meg ekstra mannskap ved behov.	☐	☐	☐	☐	☐	☐	☐
Tid og ressurser til vedlikehold og kontroll av fartøy og utstyr er tilstrekkelig.	☐	☐	☐	☐	☐	☐	☐

Hvor stor er vanligvis besetningen om bord? (Trekk i "slideren" mot høyre)

- ☐ 0 (Vet ikke)
- ☐ 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
- ☐ 29
- ☐ 30 (eller mer)

20. Sikkerhetsstyringssystem: Sikkerhetsprosedyrer på bro

Nå ønsker vi å vite litt om sikkerhetsstyringssystemet (SMS) og sikkerhetsprosedyrer på ditt fartøy.

Sikkerhetsprosedyrer er rutiner og retningslinjer for sikker arbeidspraksis som inngår i sikkerhetsstyringssystemet.

Eksempel på sikkerhetsprosedyre for deg som arbeider på bro er:
Rutiner for utkikk
Ankomstprosedyre
Manøverprosedyre
21. Sikkerhetsstyringssystem: Sikkerhetsprosedyrer (maskin)

Nå ønsker vi å vite litt om sikkerhetsstyringssystemet (SMS) og sikkerhetsprosedyrer på ditt fartøy.

Sikkerhetsprosedyrer er rutiner og retningslinjer for sikker arbeidspraksis som inngår i sikkerhetsstyringssystemet.

Eksempler på sikkerhetsprosedyrer for deg som arbeider i maskin er:
Rutiner for tørking av oljesøl i henhold til det som er beskrevet
Rutiner for å holde maskinromsområde rent og ryddig (housekeeping)
Rutiner for at reservedeler og verktøy er på sine faste plasser
22. Sikkerhetsstyringssystem: Sikkerhetsprosedyrer på dekk

Nå ønsker vi å vite litt om sikkerhetsstyringssystemet (SMS) og sikkerhetsprosedyrer på ditt fartøy.

Sikkerhetsprosedyrer er rutiner og retningslinjer for sikker arbeidspraksis som inngår i sikkerhetsstyringssystemet.

Eksempel på sikkerhetsprosedyre for deg som arbeider på dekk er:
Rutiner for orden og ryddighet
Rutiner for sikring av last
Rutiner for å sjekke åpne luker til lasterom

Rutiner for sikker lasting og lossing
Rutiner for sjøklarering
23. Sikkerhetsstyringssystem: Sikkerhetsprosedyrer på fiskefartøy

Nå ønsker vi å vite litt om sikkerhetsstyringssystemet (SMS) og prosedyrer på ditt fartøy.

Prosedyrer er rutiner og retningslinjer for sikker arbeidspraksis som inngår i sikkerhetsstyringssystemet.

Eksempler på prosedyre for deg som arbeider på fiskefartøy er:
Rutiner for bruk av sikkerhetsline
Rutiner for å åpne/lukke luker i sidekledning (drage-/setteluke)
Rutiner for sikring av last og fiskeredskaper
24. Sikkerhetsstyringssystem

De påstandene du nå skal ta stilling til handler om sikkerhetsstyringssystemet om bord på fartøyet. Hvor enig eller uenig er du i følgende påstander?

	1 - Helt uenig	2 - Noe uenig	3 - Verken enig eller uenig	4 - Noe enig	5 - Helt enig	Vet ikke	Ikke relevant
Sikkerhetsprosedyrene er dekkende for å ivareta sikkerhet ved utføring av mine arbeidsoppgaver.	☐	☐	☐	☐	☐	☐	☐
Jeg har enkel tilgang til sikkerhetsprosedyrer som gjelder mitt arbeid.	☐	☐	☐	☐	☐	☐	☐
Jeg bryter noen ganger sikkerhetsprosedyrene for å få jobben gjort.	☐	☐	☐	☐	☐	☐	☐
På mitt fartøy blir arbeidsoppgaver som kan medføre risiko ikke alltid utført i henhold til sikkerhetsprosedyrene.	☐	☐	☐	☐	☐	☐	☐
Rederiets krav til effektivitet gjør at vi noen ganger må bryte sikkerhetsprosedyrene.	☐	☐	☐	☐	☐	☐	☐

25. Fartsområde

De påstandene du nå skal ta stilling til handler om fartsområdet ditt og hva som kjennetegner operasjonen der. Hvor enig eller uenig er du i følgende påstander?

	1 - Helt uenig	2 - Noe uenig	3 - Verken enig eller uenig	4 - Noe enig	5 - Helt enig	Vet ikke	Ikke relevant
Antall fartøy gjør det vanskelig å navigere i farvannene vi vanligvis seiler.	☐	☐	☐	☐	☐	☐	☐
Det er ofte utfordrende værforhold i farvann vi vanligvis seiler.	☐	☐	☐	☐	☐	☐	☐

Er fartøyet du jobber på pliktig til å bruke los?
- ☐ Ikke lospliktig
- ☐ Lospliktig - bruker los
- ☐ Lospliktig - bruker kun farledsbevis
- ☐ Lospliktig - bruker en kombinasjon av los og farledsbevis
- ☐ Vet ikke

26. Los-operasjoner
De spørsmålene/påstandene du nå skal ta stilling til handler om los-operasjoner på fartøyet du oftest arbeider om

bord. Med los-operasjoner mener vi operasjoner hvor los har vært involvert.

Har du vært involvert i los-operasjoner de siste to årene?

- ☐ Ja
- ☐ Nei

27. Los-operasjoner, del 2

De påstandene du nå skal ta stilling til handler om los-operasjoner om bord på fartøyet. Hvor enig eller uenig er du i følgende påstander?

	1 - Helt uenig	2 - Noe uenig	3 - Verken enig eller uenig	4 - Noe enig	5 - Helt enig	Vet ikke	Ikke relevant
Los får korrekt informasjonen om los-oppdraget før ombordstigning.	☐	☐	☐	☐	☐	☐	☐
Det er utfordrende å kommunisere med fartøyets mannskap på grunn av språkbarrierer.	☐	☐	☐	☐	☐	☐	☐
Det er utfordrende å kommunisere med los på grunn av språkbarrierer.	☐	☐	☐	☐	☐	☐	☐
Los og mannskapet er tydelige seg imellom på hvilke roller brobesetningen skal ha under seilasen, inkludert kaitillegget *(hvem gir kursordre, hvem står med spakene, etc.)*.	☐	☐	☐	☐	☐	☐	☐
Bromannskapet (inkludert losen) er tydelig informert om retningslinjer fra kai/havn i god tid før fartøyet skal legge til.	☐	☐	☐	☐	☐	☐	☐
Jeg er trygg på at losens farvannskunnskap er god nok.	☐	☐	☐	☐	☐	☐	☐
Losen stopper seilasen dersom han/hun mener videre seilas ikke er forsvarlig *(mht. vind, sikt, fartøyets tekniske stand, besetningens tilstand, etc.)*.	☐	☐	☐	☐	☐	☐	☐
Los-operasjoner brukes av fartøyets mannskap til å hente inn nødvendig hviletid eller utestående oppgaver som f.eks. nødvendig logging/rapporteringsarbeid.	☐	☐	☐	☐	☐	☐	☐
Bro-teamet (inkluderer los) er underbemannet under los-operasjoner.	☐	☐	☐	☐	☐	☐	☐
Transport av los til og fra fartøyet under seilas gjennomføres trygt.	☐	☐	☐	☐	☐	☐	☐
Broen presenteres for losen på en måte som bidrar til å sikre los-operasjoner *(e.g. ryddig, lett å finne frem til losplugg, navigasjonsutstyr, etc)*.	☐	☐	☐	☐	☐	☐	☐
Los blir ofte stående for manøvreringen (direkte styrer thruster/rorkontroll) av fartøyet under seilas og/eller kaitillegg.	☐	☐	☐	☐	☐	☐	☐

28. Navigasjon

De påstandene du nå skal ta stilling til handler om navigasjonspraksis på bro på fartøyet du arbeider om bord. Hvor enig eller uenig er du i følgende påstander?

	1 - Helt uenig	2 - Noe uenig	3 - Verken enig eller uenig	4 - Noe enig	5 - Helt enig	Vet ikke	Ikke relevant
Jeg bruker som regel seilasplaner som ligger ferdig lagret i kartplotteren.	☐	☐	☐	☐	☐	☐	☐
Når jeg utfører tilleggsoppgaver (*f.eks. kommunikasjon med eksterne aktører, logging, etc.***) samtidig som jeg navigerer fartøyet, går det på bekostning av sikker navigasjon.**	☐	☐	☐	☐	☐	☐	☐
Seilasplanen gjennomgås sammen med alle navigatører om bord i forkant av en ny seilas.	☐	☐	☐	☐	☐	☐	☐

Hvor ofte er det mulig, ut fra typisk bemanning om bord, å ha to navigatører på bro under seilas?

☐ Kontinuerlig
☐ I en kortere periode (under 4 timer)
☐ Aldri uten å bryte hviletidsbestemmelser
☐ Aldri. Vi har kun én navigatør om bord
☐ Vet ikke

Når har dere dedikert utkikk på broa under seilas? For los, generelt i los-operasjoner. ***Flere kryss mulig. Trykk nederst i høyre hjørne for å gå videre i spørreundersøkelsen.***

☐ Ved åpen sjø/normal seilas
☐ Ved mye trafikk
☐ Når det er mørkt
☐ Under vanskelige værforhold (ikke tåke)
☐ Ved nedsatt sikt/tåke
☐ Ved mye skjær i sjøen/grunt
☐ I ukjent farvann
☐ Når vi legger til/tar løs ved kai
☐ Under taubåtoperasjoner
☐ Ved losing
☐ Sjeldent
☐ Annet, spesifiser: ________________________________

29. Navigasjon, del 2

Hva inneholder seilasplanene du vanligvis bruker om bord? ***Flere kryss mulig. Trykk nederst i høyre hjørne for å gå videre i spørreundersøkelsen.***

☐ Planlagt kurser og distanser satt ut i kart *(papir/elektronisk)*
☐ Rutiner for å avvike fra plan
☐ Planlagte endringer i sammensetning av broteam
☐ Notiser og annen informasjon relevant for reisen *(f.eks. rapporteringspunkt, farlig område)*

30. Arbeidsmiljø

Følgende påstand, som vi ønsker at du tar stilling til handler om arbeidspress om bord på fartøyet. Hvor enig eller uenig er du i følgende påstand?

	1 - Helt uenig	2 - Noe uenig	3 - Verken enig eller uenig	4 - Noe enig	5 - Helt enig	Vet ikke	Ikke relevant
Det hender at jeg føler meg presset til å fortsette operasjonen/arbeidet, selv om sikkerheten for meg selv eller fartøyet er truet.	☐	☐	☐	☐	☐	☐	☐

De påstandene du nå skal ta stilling til handler om arbeidsmiljøet om bord på fartøyet. Hvor enig eller uenig er du i følgende påstander?

	1 - Helt uenig	2 - Noe uenig	3 - Verken enig eller uenig	4 - Noe enig	5 - Helt enig	Vet ikke	Ikke relevant
Jeg får ikke gjort jobben min slik jeg skal fordi jeg har for mye å gjøre.	☐	☐	☐	☐	☐	☐	☐
Jeg kjeder meg på jobb fordi jeg har for lite å gjøre.	☐	☐	☐	☐	☐	☐	☐
Rederiet tilbyr gode velferdstiltak. *Velferd defineres her som velvære og trivsel gjennom tiltak som underholdning, fritidstilbud o.l. i sjøfolks fritid om bord.*	☐	☐	☐	☐	☐	☐	☐
Det er god nok hastighet på internett for bruk i fritiden på mitt fartøy.	☐	☐	☐	☐	☐	☐	☐

Er internett for bruk om bord i fritiden gratis?

- ☐ Ja, fri bruk
- ☐ Ja, men jeg må betale for mer hastighet
- ☐ Nei
- ☐ Har ikke internett tilgjengelig i fritiden.

31. Rusmidler (inkludert alkohol)

De påstandene du nå skal ta stilling til handler om rusmidler (inkludert alkohol) på fartøyet du arbeider om bord. Hvor enig eller uenig er du i følgende påstander?

	1 - Helt uenig	2 - Noe uenig	3 - Verken enig eller uenig	4 - Noe enig	5 - Helt enig	Vet ikke	Ikke relevant
Bruk av rusmidler (inkludert alkohol) er et problem på fartøyet jeg jobber.	☐	☐	☐	☐	☐	☐	☐
Det hender at kolleger på fartøyet jeg arbeider ombord er ruspåvirket/i bakrus i jobbsammenheng.	☐	☐	☐	☐	☐	☐	☐
Jeg bruker rusmidler (inkludert alkohol) for å holde meg opplagt/beroliget på jobb.	☐	☐	☐	☐	☐	☐	☐
Rederiet har tydelig kommunisert en nulltoleranse for bruk av rusmidler (inkludert alkohol) på jobb.	☐	☐	☐	☐	☐	☐	☐

32. Hvile og restitusjon

De påstandene du nå skal ta stilling til handler om hvile og restitusjon på fartøyet du arbeider om bord. Hvor enig eller uenig er du i følgende påstander?

	1 - Helt uenig	2 - Noe uenig	3 - Verken enig eller uenig	4 - Noe enig	5 - Helt enig	Vet ikke	Ikke relevant
Jeg får tilstrekkelig søvn og hvile om bord.	☐	☐	☐	☐	☐	☐	☐
Jeg får ikke nok hvile fordi jeg må jobbe når jeg skulle hatt fri.	☐	☐	☐	☐	☐	☐	☐

	Daglig	Ukentlig	Månedlig	Hvert kvartal	Årlig	Vet ikke	Ikke relevant
Hvor ofte blir vaktskiftet ditt utsatt på grunn av arbeidsoperasjoner, eksempelvis havneanløp?	☐	☐	☐	☐	☐	☐	☐
Hvor ofte arbeider du mer enn 14 timer i løpet av et døgn?	☐	☐	☐	☐	☐	☐	☐
Hvor ofte blir frivakten din avbrutt for å jobbe?	☐	☐	☐	☐	☐	☐	☐

	Daglig	Ukentlig	Månedlig	Hvert kvartal	Årlig	Vet ikke	Ikke relevant
Hvor ofte blir vaktskiftet ditt utsatt på grunn av forsinkede los-operasjoner?	☐	☐	☐	☐	☐	☐	☐
Hvor ofte arbeider du mer enn 14 timer i løpet av et døgn?	☐	☐	☐	☐	☐	☐	☐
Hvor ofte blir frivakten din avbrutt for å jobbe som følge av innkommende hasteoppdrag?	☐	☐	☐	☐	☐	☐	☐

33. Arbeidspraksis

De påstandene du nå skal ta stilling til handler om arbeidspraksis på fartøyet du arbeider om bord. Hvor enig eller uenig er du i følgende påstander?

	1 - Helt uenig	2 - Noe uenig	3 - Verken enig eller uenig	4 - Noe enig	5 - Helt enig	Vet ikke	Ikke relevant
Risikofylte arbeidsoperasjoner blir alltid nøye gjennomgått før de påbegynnes.	☐	☐	☐	☐	☐	☐	☐
Mine kolleger og jeg benytter alltid påkrevd personlig verneutstyr.	☐	☐	☐	☐	☐	☐	☐
Utstyret jeg trenger for å arbeide sikkert er lett tilgjengelig.	☐	☐	☐	☐	☐	☐	☐
Mine kolleger og jeg rapporterer alle uønskede hendelser.	☐	☐	☐	☐	☐	☐	☐
Jeg stopper mitt arbeid dersom jeg mener at det kan være farlig for meg eller andre å fortsette.	☐	☐	☐	☐	☐	☐	☐
Mine kolleger stopper meg dersom jeg arbeider på en farlig måte.	☐	☐	☐	☐	☐	☐	☐
Jeg gir beskjed dersom jeg ser farlige situasjoner.	☐	☐	☐	☐	☐	☐	☐

Utføres det risikovurderinger (f.eks. SJA; sikker jobb analyse) i forkant av risikofylte arbeidsoperasjoner?

- ☐ Ja
- ☐ Nei

34. Arbeidspraksis, del 2

Hvem deltar i risikovurderinger av arbeidsoperasjoner på ditt fartøy? ***(flere kryss mulig)***

- ☐ De som skal utføre jobben
- ☐ Skipsledelsen
- ☐ Landorganisasjonen
- ☐ Andre
- ☐ Vet ikke
- ☐ Ikke relevant

35. Ledelse rederi

De påstandene du nå skal ta stilling til handler om ledelsen i rederiet du arbeider for. Hvor enig eller uenig er du i følgende påstander?

	1 - Helt uenig	2 - Noe uenig	3 - Verken enig eller uenig	4 - Noe enig	5 - Helt enig	Vet ikke	Ikke relevant
Rederiet responderer (*forbedringstiltak, informasjon, etc.*) på forhold vi rapporterer.	☐	☐	☐	☐	☐	☐	☐
Jeg mener at rederiets reaksjoner på regel og prosedyrebrudd er rettferdige.	☐	☐	☐	☐	☐	☐	☐
Vi får tilbakemeldinger om forbedringstiltak som blir igangsatt basert på rapporterte uønskede hendelser.	☐	☐	☐	☐	☐	☐	☐
Det å følge sikkerhetsrutinene blir ikke verdsatt i det rederiet jeg jobber for.	☐	☐	☐	☐	☐	☐	☐
Så lenge arbeidet blir gjort, bryr ikke rederiet seg noe med hvordan vi gjør arbeidet.	☐	☐	☐	☐	☐	☐	☐

36. Skipsledelse

De påstandene du nå skal ta stilling til handler om skipsledelse på fartøyet du arbeider om bord. Hvor enig eller uenig er du i følgende påstander?

	1 - Helt uenig	2 - Noe uenig	3 - Verken enig eller uenig	4 - Noe enig	5 - Helt enig	Vet ikke	Ikke relevant
Skipsledelsen går foran med et godt eksempel når det gjelder å ivareta egen og andres sikkerhet.	☐	☐	☐	☐	☐	☐	☐
Jeg er trygg på å få støtte fra skipsledelsen dersom jeg prioriterer sikkerhet i alle situasjoner.	☐	☐	☐	☐	☐	☐	☐

37. Vedlikehold og teknisk utstyr
De spørsmålene/påstandene du nå skal ta stilling til handler om vedlikehold og teknisk utstyr på fartøyet du arbeider om bord.
Vennligst bedøm den tekniske tilstanden til utvalgt utstyr om bord på fartøyet.

	1 - Svært dårlig	2 - Dårlig	3 - Verken dårlig eller god	4 - God	5 - Svært god	Vet ikke	Ikke relevant
Brannslukkeutstyr *(slanger, koblinger, pumper, manuelt slokkeutstyr, sprinkler etc.)*	☐	☐	☐	☐	☐	☐	☐
Elektrisk anlegg	☐	☐	☐	☐	☐	☐	☐
Brannvegger/-dører og isolasjon	☐	☐	☐	☐	☐	☐	☐
Utstyr for lastsikring	☐	☐	☐	☐	☐	☐	☐
Utstyr som opprettholder stabilitet som følge av vanninntrenging	☐	☐	☐	☐	☐	☐	☐
Personlig verneutstyr (*hjelmer, masker, etc.*)	☐	☐	☐	☐	☐	☐	☐

Den følgende påstanden, som vi ønsker at du tar stilling til handler om vedlikehold om bord på fartøyet. Hvor enig eller uenig er du i følgende påstand?

	1 - Helt uenig	2 - Noe uenig	3 - Verken enig eller uenig	4 - Noe enig	5 - Helt enig	Vet ikke	Ikke relevant
Det brukes alltid originale deler i forbindelse med vedlikehold/modifikasjoner på fartøyet jeg arbeider.	☐	☐	☐	☐	☐	☐	☐

38. Hendelser
Straks ferdig!

De spørsmålene/påstandene du nå skal ta stilling til handler om ulykker/hendelser på fartøyet du arbeider om bord. For los, fartøyene du generelt sett arbeider på.

Vennligst avgi et ja/nei-svar på følgende spørsmål

	Ja	Nei
Har du i løpet av de siste 12 månedene opplevd at kritisk teknisk utstyr har feilet om bord på fartøyet du arbeider ombord? *(f.eks. tap av motor/drivkraft, navigasjonssystem, styring)*	☐	☐
Har du i løpet av de siste 12 månedene vært involvert i en eller flere situasjoner som kunne ha utviklet seg til en alvorlig ulykke, men ikke gjorde det?	☐	☐
Har du i løpet av de siste 12 månedene vært involvert i en eller flere situasjoner som utviklet seg til alvorlig ulykke?	☐	☐

39. Hendelser, del 2

Meldte du/andre fra til Sjøfartsdirektoratet om ulykken?

- ☐ Ja, jeg meldte inn selv
- ☐ Ja, andre meldte inn
- ☐ Nei
- ☐ Vet ikke
- ☐ Ikke relevant

Alt i alt, hvordan vil du vurdere sikkerheten i din arbeidssituasjon? (Trekk "slideren" mot høyre")

- ☐ 1 (svært dårlig)
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7
- ☐ 8
- ☐ 9
- ☐ 10 (svært bra)

Hvilke hendelser er viktigst å jobbe preventivt mot? Velg minst en (1) og maks tre (3) av de hendelsene i listen under du mener er viktigst å jobbe for å unngå.

- ☐ Brann/eksplosjon
- ☐ Fall om bord på fartøyet
- ☐ Fall overbord (*fall til sjø*)
- ☐ Grunnstøting
- ☐ Kollisjon med andre fartøy
- ☐ Kollisjon med kaier/broer e.l. (*kontaktskade*)
- ☐ Kantring
- ☐ Miljøulykke (*miljøskade/forurensing*)
- ☐ Stikk/kuttskade
- ☐ Støt/klemskade
- ☐ Andre personskader, vennligst spesifiser: ________________________________

40. Avslutning - frivillige kommentarfelt

Skriv inntil tre (3) velferdstiltak som du mener er viktige at dere har om bord på fartøyet du jobber på. *Velferd defineres her som velvære og trivsel gjennom tiltak som underholdning, fritidstilbud o.l. i sjøfolks fritid om bord*.

____
____
____
____
____

Hvilke uønskede hendelser skjer oftest på fartøyet du arbeider?

____
____
____
____
____

Har du andre kommentarer relatert til spørsmålene i spørreundersøkelsen?

____
____
____
____
____