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One size fits all? Safety management regulation of ship accidents and personal injuries

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Safety management regulation is an important supplement to market forces to establish a sufficient safety level in high-risk industries. The accident statistics in Norwegian maritime passenger transportation display a paradox: personal injuries have decreased while ship accidents have increased in the period during which safety management has been regulated (the International Safety Management Code was effectuated in the late 1990s). We interview regulators, shipping company management, and crewmembers about their practices and opinions regarding safety management regulation and use these data to explore how this *regulation influences safety management practices to prevent different types of accidents*. This study underlines earlier research showing that regulation serves to 'raise the bar' by heightening the industry levels of safety investments and organizational safety awareness. In addition, our results suggest that safety management regulation in maritime transportation is mostly effective for preventing personal injuries in cases in which the personal have sufficient time and resources available, and the procedures are consistent with seafarers' professional values. For ship accidents, such as groundings, other causal factors come into play. We find that the negative consequences of regulation (proceduralization) in particular influence the performance of safety-critical tasks, such as navigation. This may explain why personal injuries have decreased while ship accident frequencies have continued to increase in spite of the regulations aimed at improving safety.

Keywords: regulation; maritime industry; ISM code; seafarers

1. Introduction

Regulation is society's means to make companies run according to its values. Regulation is therefore a counterforce against competitive forces that can lead, for example, to worker exploitation and unsafe working conditions (Bhattacharya 2012). Since the 1990s, the introduction of self-regulation and functional requirements has been a key strategy to improve safety. In maritime transportation, one of the world's oldest, high-risk industries, this is formalized in the International Safety Management code.[1] It was developed by the International Maritime Organization and requires shipowners to make their own safety management systems (SMSs). Hence, maritime international safety regulation is tightly connected to SMSs.

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At the same time, there have been two divergent developments in accident statistics in Norwegian waters. While the frequency of personal injuries has decreased, ship accidents have *increased* (Maritime Authority 2014, 2015). This paradox may have a number of possible explanations, such as increased automation, reduced manning, changes in reporting, and so on, but the differences in the statistical trends are so extensive that these factors could hardly explain all of the variation. The present study links this paradox to the way in which the ISM code is implemented among Norwegian shipowners.

The problem to be addressed is the following: *How does safety management regulation influence safety management practices and the efforts to prevent personal injuries and ship accidents?* The problem is explored through a qualitative study in the maritime industry, involving passenger ship management and crewmembers as well as national regulators. By following the ISM code, all the way from the general regulatory level to the sharp end of ship operations, we are able to see how the operationalization of the code in many ways changes the overall logic and intentions of the regulations.

Our interview data in Norwegian maritime passenger transport elucidate the positive and negative consequences of the ISM code found in earlier research and suggest that this regulation is valuable for reducing individual accidents. In relation to ship accidents, there are some powerful framework conditions in the industry that reduce the significance of the ISM code.

In the next section, we present some background information about Norwegian passenger transportation, safety, and regulation. Our methodological approach is explained in Section 3, while the results and analysis of the data are presented in Section 4. The findings are discussed in Section 5, followed by the conclusions of the study.

2. Norwegian maritime passenger transportation

Norway has a long history as a maritime nation. The lengthy coastline makes the sea important in terms of both employment and transportation. Operating in Norwegian maritime passenger transportation are 402 companies with a turnover of approximately 1.442 billion euros and 9817 employees on ferries, cruise ships, charter boats, high-speed crafts, and so on (Statistics Norway 2015).

In the period from 2000 to 2014, 938 ship accidents and 2704 personal injuries on passenger ships in Norwegian waters were reported (Maritime Authority 2015). The statistics include personal injuries that caused 72 .h or more of sick leave (Maritime Authority 2014). They are often related to clamps, stabs, chemicals, falls, or burning during loading, discharging, cooking, provisioning, mooring, and maintenance. Only 0.55% of the injuries (15 of 2704) happened on the bridge during navigation. Of the 2704 injuries, 281 were related to ship accidents. Ship accidents involve damage to or loss of vessels, most frequently related to groundings, collisions with quays and bridges, and fires. Ship accident investigations mostly establish that the navigation was disrupted before the accident, due to technical error or the navigator being inattentive or asleep.

The statistics show divergent trends since 2000. Personal injuries have decreased considerably at the same time as ship accidents have increased (Maritime Authority 2015, 2014). The last decade's accidents involving Norwegian-registered passenger vessels in Norwegian waters are depicted in Figure 1. Both the total accident

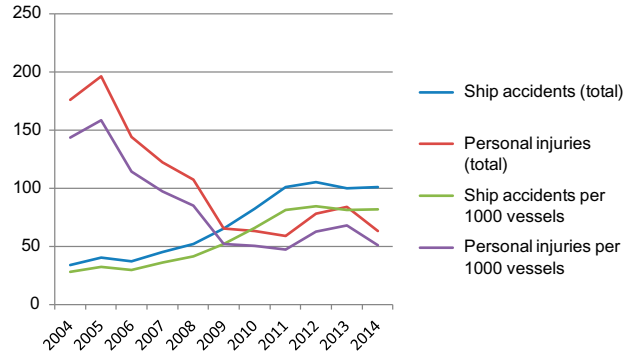

Figure 1. Ship accidents and personal injuries in total and per 1000 passenger vessels on Norwegian passenger vessels in Norwegian waters 2004–2014 (Maritime Authority 2015)

numbers and the frequencies (accidents per 1000 registered vessels in Norway) demonstrate the same contradictory pattern.

2.1. Competitive tendering

Passenger vessels operating Norwegian coastal routes are privately owned but contracted by the Norwegian counties. The counties apply *competitive tendering* to acquire passenger transport services. Norwegian competition law demands that the cheapest vendor is to be chosen if other aspects are equal (Lovdata 2006). Usually, the counties add technical criteria for the vessels and otherwise expect the shipowners to satisfy the regulations (Gullestad 2013). This implies a strong motivation for cost reductions and efficiency improvements to stay in business: the cheapest tenderer is not likely to include extra safety measures. It is more likely to fulfill the minimum requirements in the law. In addition, most counties fine shipowners each time their vessels do not adhere to their schedule. This shows that competitive tendering and competition legislation constitute a powerful framework condition that pushes toward the minimum safety level (Gullestad 2013).

3. Safety regulation

The term ‘regulation’ usually refers to a form of control exerted by a public agency over an activity that is seen as important to a community (Selznick 1985). A core mission for regulators is to influence the behavior of actors in ‘their’ industry (Baldwin, Cave, and Lodge 2011). Related to risk, regulation is about the protection of employees, customers, and society (Grote and Weichbrodt 2013). Recently several authors have pointed to the role of environmental factors in influencing the safety management practices of organizations (e.g. Rosness et al. 2012). Regulations can be regarded as one such environmental factor by constituting important framework conditions for companies’ safety management.

Most stately regulation follows a trend of deregulation: instead of creating and controlling detailed prescriptive rules about certain subjects, the regulator establishes goals or functions with which the companies must comply (Walters et al. 2011; Lindøe, Baram, and Renn 2013). Since the companies are responsible and the

regulator controls them, this is called co-regulation (Baram and Lindøe 2013, 22). For co-regulation to be legitimate, there must be a close relationship between the regulator and the companies in the regulated industry as the regulator has to trust the companies to implement systems that lead to the described goals and the companies must trust that the regulator is competent to evaluate them.

3.1. Maritime safety regulation

Seafaring has been an international activity for centuries. The increasingly global nature of the maritime industry limits the influence that single states can exert, making international agreements important to regulate maritime transportation.[2] The international regulation of maritime safety started after the Titanic sinking in 1912, with the *International Convention for the Safety of Life at Sea* (SOLAS). It was traditionally about technical standards, such as ship construction and lifesaving appliances for the vessels (IMO 2015).

However, deregulation trends from the 1960s resulted in changes that forced safety management regulation forward (see Bhattacharya 2012 for a thorough overview). Deregulation made the shipowners opt for cheaper and easier regulatory regimes, leading to global competition and weaker rights for the seafarers. A growing number of maritime accidents called for safety management regulations. The catastrophic capsizing of the *Herald of Free Enterprise* in 1987 and the *Estonia* in 1994, of which managerial errors were identified as important causal factors, accelerated the IMO's work with a code to regulate workplace safety and pollution.

'ISM code' is short for the *International Management Code for the Safe Operation of Ships and for Pollution Prevention*, which was established by the IMO in 1993 and made mandatory from 1998. It is designed to 'ensure safety at sea, prevention of human injury or loss of life, and avoidance of damage to the environment (…)' (ISM code, Section 1.2.1). According to the ISM code, a SMS should include, for instance, (1) a safety and environmental protection policy, (2) procedures to ensure the safe operation of ships, and (3) defined lines of communication between shore and shipboard personnel (IMO 2014). The philosophy underpinning the code is total quality management, highlighting continuous improvement through management commitment and personnel empowerment (Lappalainen 2008). Deming's circle ('plan–do–check–act') can be traced in the way in which the code is formulated. This is also evident in secondary laws in Norway, regulating working life in general (e.g. in the concept of 'internal control for HSE') (Saksvik, Torvatn, and Nytrø 2003). A leaflet from the International Shipping Federation (ISF no date) stressed that 'the underlying purpose of the ISM Code is to move shipping away from a culture of "unthinking" compliance with external rules, towards a culture of "thinking", self-regulation of safety'.

The Norwegian ratification of the ISM code on passenger vessels was effectuated in 1995 (Lovdata 2014). Now the code is included in the *Norwegian Ship Safety Act* (Lovdata 2007), which consists of functional requirements and states that companies are responsible for safety on their ships.

3.2. Earlier research on regulation and safety

Within the safety literature, scholars have considered the relationship between regulation, SMSs, and safety to be a key part of the foundation of safety science

(e.g. Rasmussen 1997; Hale and Swuste 1998; Hopkins and Hale 2002). Rasmussen is one of few authors to combine a micro-perspective on safe operation with a more macro-oriented perspective in which regulation is taken into the equation. This is illustrated in his famous model of the socio-technical system involved in risk management (Figure 2).

This is not to be interpreted as a command-and-control model. On the contrary, the actors on each level of the chain have considerable degrees of freedom in their follow-up of other actors, so this is as much a model of self-organization as it is a governance chain (Le Coze and Wiig 2013). This means that regulatory intervention and other measures that involve different levels can be largely unpredictable. The relevance of Rasmussen's work to our study lies in this unpredictability and the way in which regulatory interventions in general are translated into various safety measures as they pass through different levels of the socio-technical model with different environmental influences. We will follow the ISM code down the chain to shed light on its effects, both intended and unintended, on practices and different types of accidents in Norwegian maritime passenger transportation.

Studies show that the ISM code's main objective has been achieved: safety management has improved. In an evaluation of the research literature on the effects of the ISM code, Lappalainen, Kuronen, and Tapaninen (2014, 24) find that the maritime activities 'are more environmentally friendly and more safety-oriented than in

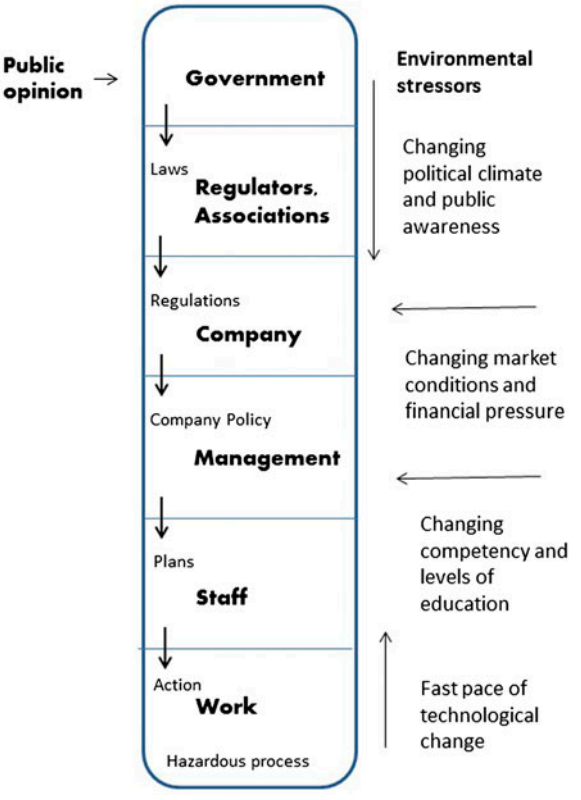

Figure 2. Risk management in socio-technical systems (from Rasmussen 1997).

the 1990s'. The ISM code has heightened seafarers' safety awareness, as they have internalized the principles of safety management over recent years. It should not be forgotten that the companies' responsibility for safety has enhanced their safety investments and communication.

However, contrary to the IMO's ambition to improve maritime safety by formalizing safety management, research also points to several unintended negative consequences. Many are connected to the trend of self-regulation, which results in an enlarged administrative burden on the companies. This burden goes under names such as 'the audit society' (Power 1999), proceduralization (Bieder and Bourrier 2013), or bureaucratization (Dekker 2014; Lappalainen, Kuronen, and Tapaninen 2014; Vandeskog 2015). Heavy administration is mainly a problem because the companies have limited personnel resources and other tasks that are also important for safety (see e.g. Walters et al. 2011; Almklov, Rosness, and Størkersen 2014). This also implies too many or too complicated procedures that hamper compliance: some procedures might conflict with operations or other procedures or might not be known by the operative personnel (see Reason 2013, 1990; Størkersen and Johansen 2014, etc.). As Vandeskog (2015, 105) puts it: 'It is difficult to have faith in a "toolbox" so full that you do not know what tools it contains and cannot find the tool you need when you need it.' Almklov, Rosness, and Størkersen (2014) suggest that these drawbacks may not be due to the ISM code per se, as it could be implemented in a simple and practical manner. Instead, the rules are complicated because of the framework conditions, such as liability law, general SMSs not being adapted to the organization, and so on [also found by Anderson (2003)]. A result of this may be decoupling of the management and operative levels of organizations, with a formal management system as the only proxy. On the other hand, procedures can be reformed through employee participation, which could also improve the employment conditions and the understanding between seafarers and management (Anderson 2003; Bhattacharya 2012; Walters and Bailey 2013).

The professional culture might also work against compliance of the SMSs. Research suggests a weak link between the formal SMSs and the seafarers' informal ideals of work (Bye and Lamvik 2007; Antonsen 2009; Knudsen 2009; Bhattacharya 2012; Kongsvik, Antonsen, and Størkersen 2014; Lappalainen, Kuronen, and Tapaninen 2014; Vandeskog 2015). The ideals of *good seamanship* entail 'a blend of professional knowledge, professional pride, and experienced-based common sense' (Knudsen 2009, 295). Thus, the introduction of formal systems might not be directly compatible with existing cultural features among crewmembers and can marginalize practical, system-specific knowledge (Almklov, Rosness, and Størkersen 2014).

Even though the ISM code was implemented as a counterforce to a global competitive market, cost efficiency is still important for the survival of every shipping company. Therefore, profit and market conditions are used as decision criteria more than safety by shipowners, politicians, and regulators (DeSombre 2008; Bhattacharya 2012; Gullestad 2013; Walters and Bailey 2013; Johnson 2014; Størkersen 2015). Rasmussen (1997, 184) hints at the same mechanisms: 'At the top, society seeks to control safety through the legal system: safety has a high priority, but so has employment and trade.' To cope, shipping companies are found only to implement safety measures required by regulation, 'maintaining the minimum safety level, ensuring that the ISM audits were passed …' (Lappalainen, Kuronen, and Tapaninen 2014, 28).

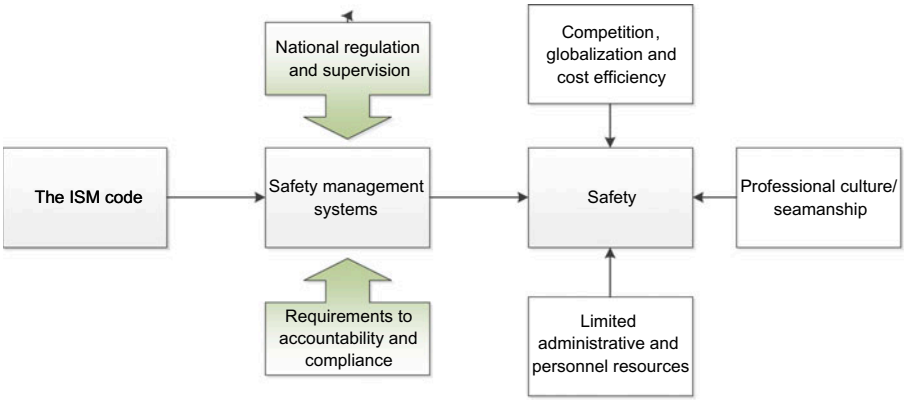

Figure 3. Forces that affect the regulation before the regulation can affect safety management.

Figure 3 illustrates the intention to use the ISM code and SMSs to improve safety and other forces that influence safety, such as global competition, limited resources, and professional culture.

However, neither the ISM code rationality nor earlier research highlights the kind of accidents that the regulation prevents (or does not prevent). When the ISM code has both advantages and disadvantages, and the personal and ship accident statistics point in opposite directions, it is not clear how the SMSs work and whether they work more for some accident types than others. This is the issue discussed in this paper.

4. Method

The empirical foundation for this study is qualitative interviews with 47 representatives from the Norwegian Maritime Authority, the Norwegian Coastal Administration, and several high-speed craft companies. An overview of the number of persons interviewed is provided in Table 1.

Those interviewed from the Norwegian Maritime Authority work with safety, law, international affairs, inspection, and the working and living environment, while the representatives from the Norwegian Coastal Administration have responsibilities within administration and safety. In the high-speed craft companies, we interviewed 12 persons from the shipowner's offices, who are managing directors, quality and

Table 1. Empirical foundation for the study.

Organization	Persons interviewed
The Norwegian Maritime Authority	15
The Norwegian Coastal Administration	4
High-speed craft companies	28
• Shipowner's office	12
• Crew	16
Total	47

safety managers, operating managers, and transport coordinators. The remaining 16 interviewees are captains, engineers, and seafarers on the high-speed passenger vessels.

The interviews took place at the interviewed persons' workplaces, including offices and vessels in different Norwegian regions. One to three researchers conducted systematic conversations lasting for half an hour to two hours with one or more participants (semi-structured group and single interviews). We used a digital recorder, and the interviews were later transcribed verbatim. The transcriptions are the source of the quotations in Section 4. In the interviews, we asked the representatives to describe how regulators, the ISM code, management, and other factors influence their work and ability to perform safe operations. They were not asked to reflect on the different accident types, so we undertake this task ourselves in Section 5.

The analysis of the interview data is performed by dividing the data into three subgroups based on the levels from Rasmussen's (1997) risk management chain depicted in Figure 2: regulators, management, and crewmembers. In the next section, we analyze each of these groups, looking for the themes and topics highlighted by most or all of the informants within the group. This allows us to compare the viewpoints of each group to see how the link between regulation and safety changes as we move from the blunt to the sharp end. The knowledge acquired from Section 4 enables us to discuss the regulations' influence on personal injuries and ship accidents in Section 5.

5. Results and analysis

In our interviews, selected regulators, ship office management, and crewmembers explain their views of the ISM code in relation to safety and safety management, practices, and values. How the regulation prevents personal injuries or ship accidents is implicit here but will be discussed directly in Section 6.

5.1. Regulators

This section addresses how the regulator representatives describe (1) the ISM code's implications for their own practice and what they see as its (2) positive, and (3) negative consequences for safety management in the shipping companies.

5.1.1. Consequences for regulatory practice – mostly positively valued

When a regulator performs audits to verify whether a company's SMS complies with the ISM code, he or she is required not to consider the quality of the system but to oversee that a system is in place and is followed. Most regulators are ambivalent regarding this (see more in Section 5.1.3).

> If they have a system that works for them and that satisfies the code, then we have nothing to add. But, if they have a system that no one uses, then it's another matter.

More positive experiences are related to the fact that the ISM code has revealed a new *advisory* role for regulators. They value their ability to make recommendations and provide guidance in ISM audits. This gives the regulator the possibility to suggest simplifications of SMSs.

> I don't think that it's a goal to come back with a lot of nonconformities after an ISM revision, not at all. […] I think it's important to make them aware of parts of the system that they don't need and should omit.

5.1.2. Positive consequences of the ISM code for the shipping companies

Overall, the regulators perceive that the ISM code, with the resultant SMSs, has led to safety improvements in the industry. It has pushed forward the development of much-needed SMSs among the shipowners, as they earlier had variable and sometimes lacking SMSs. Today's systems are mostly in accordance with the regulations, even though they vary in size and practical use.

> ISM's a very useful tool, and the ISM code isn't extensive, it's very limited and general. In a way, it's up to the ship owners to align it with their activities.

5.1.3. Negative consequences of the ISM code for the shipping companies

Most of the interviewed regulators reflect upon the increased administrative burden associated with the SMSs. Importantly, but not surprisingly, they are concerned that the SMSs can be too extensive with too many procedures to handle. They fear that this can lead the crews to lose respect for the system or disregard important parts of it.

> Safety management systems can be too large, too many procedures to take into account, procedures for the simplest of operations. The more dangerous things can be overlooked. Maybe we should've omitted some and kept the important ones.

The regulators admit that the paperwork demands considerable attention from officers on board and worry that it can challenge what are regarded as core tasks.

> The captain has to be released to go below to do the paperwork, then up again to navigate the vessel, and then down again … The system can be too demanding for a ferry crossing a fjord with four crewmembers on board.

Practically, all vessels use computer software to register and document the information that is required by the ISM code. Although this eases some of the workload, regulators also note that the use of IT tools can foster a kind of 'ritualization' of safety work and a sense of false security. For example, risk appraisals can be produced in a 'copy–paste' manner, in which no actual risk considerations are made. Regulators call this 'window dressing', which has little actual effect on safety.

> Then we got the computer-based way of doing risk appraisals. One could just push the button. It looks very impressive. But there's a danger that you just push 'print' the next time you need it. […] If it isn't reconsidered regularly, this might lead to complacency.

Furthermore, the regulators express concern about a negative effect of functional requirements in general. Safety-relevant issues can be ignored if no concrete requirements address a certain hazard.

> When I started, there was a problem with fishermen falling into the sea [without being able to climb back on board]. And I wondered, couldn't they just install ladders? The answer was that there was no requirement for ladders, and hence, they were not acquired.

The regulators wonder why collisions and groundings have increased in recent years.

> We have too many vessels colliding with quays. Why does this happen? We have functioning systems, as well as audits from the authorities that show few deviations, but still they collide.

In sum, the regulators' general impression is that the ISM code has led to the implementation of SMSs on a broad basis and that this has brought about positive changes related to safety. Still, some see non-intended consequences that could also compromise safety, for example, SMSs can increase the administrative workload and the 'ritualization' of safety.

5.2. The shipowner's office

Management representatives are mostly positive towards the ISM code and the SMSs that they have created, as (1) they make the company invest in safety and (2) they formalize and systematize the safety work. Nevertheless, they also see negative aspects with the low safety resources, without connecting them to either personal or ship accidents.

5.2.1. More safety investments

The transport companies included in the study express that they have limited room for extra expenses. Due to the tendering processes that they have undergone, all costs have been thoroughly reviewed and minimized (confer the brief introduction to competitive tendering in Section 2.1). The departments of safety and quality at the shipowner's office are often responsible for the SMSs. These departments usually consist of one employee and a tight budget.

> Just now, an operations manager came to my office wondering why we needed money for safety work. Then you have to sort of defend why you need to spend money on it.

Some safety managers state that the ISM code can serve as a form of empowerment to defend the need for safety expenditures in their company. Still, some voice frustration about not gaining acceptance to raise the bar above what regulators consider the minimum level of safety. Most interviewed managers hope that the ISM code will make the counties include mandatory safety measures in future tenders. Managers confirm that companies cannot win contracts if they plan to spend more on safety measures than just what is legally required.

> The tenders usually refer to regulations – as long as it's within regulation, it's approved. But, to me, that's a reactive approach to safety. You do nothing more than you have to.

5.2.2. Formalization of safety

At the same time, the company representatives express that the ISM code has led to a strong formalization of safety work.

> There is too much office-related work. We have become executive officers, all we get is a computer in front of us, and we deal with the case from A to Z. I see that as a very poor solution.

This formalization is also viewed as positive by the managers because it involves a more systematic approach to safety management and the seafarers have (albeit slowly) grown accustomed to a larger amount of paperwork. Nevertheless, there seems to be considerable friction between the formal and the informal aspects of work. One of our informants, with a background as both a captain and an administrator, reflects on the challenges he saw at the time when formal routines were implemented, although autonomy was the ideal:

> If you go back in time, the ISM code involves going into something new, like with the quality assurance system: you have to document what you do. And that's a clash between an old and a new culture. My experience after all these years is that a captain like me would say, 'ISM – what the hell is this? I've done this all my life, and now I have to do my job according to the writing on a piece of paper?' There was a lot of resistance, and some even quit sailing because of the ISM code.

The interviews with crewmembers show that this friction is still very present among seafarers, as the next section elaborates.

5.3. Crews

Many crewmembers on the vessels express strong opinions about the ISM code and their SMSs. Most of our operative informants are quite negative towards the effects of the ISM code, feeling that it may actually have worsened safety. Others are more neutral in the sense that they believe the ISM code has had little effect. A third category of viewpoints consists of those that see positive safety effects of the ISM code.

5.3.1. Neutral views of the ISM code's consequences

Every crewmember interviewed feels that the SMSs have become too extensive and that it is difficult to keep track of the various rules and procedures. Yet, many crewmembers do not see a link between SMSs and work practice at all. Although SMSs have been implemented, the work performance has continued unchanged.

> You know what's in the procedures and the [SMS], but anyway you do things in your own way in the daily business.

However, the neutral (as the negative) view of the ISM code also involves violating procedures on a regular basis and shows a form of indifference toward SMSs:

> When so much is about 'safety' you don't give a damn. [Laughing] It's clearly not seafarers who've made these systems.

5.3.2. Negative consequences of the ISM code

Others, especially navigators, highlight a more negative view. During an interview, one navigator turns the pages of the SMS and finds irony in the fact that he cannot comply with the procedures with which he really agrees. The company's SMS says the navigator must have the navigation in absolute focus. He is to monitor the sailing, he is to not use the phone if the water is not clear, no irrelevant persons should be on the bridge, and the communication on the bridge should only be about navigation. However, all navigators say that they always receive calls, from customers, the next crew, maintenance operators, the company office, and so on. The navigator in

charge has to find stand-ins for crewmembers who call in sick, answer emails, write in the logs, and fill in documents. Most navigators are frustrated by all the documentation that they have to do '… for the managers to cover their backs'.

> … The office is supposed to be there for us, but it is rather the opposite. We're here for the office.

Some point out that SMSs makes them 'dumber', because they have to comply with instructions instead of thinking or using their competence. They are concerned that many procedures lead seafarers to become less dedicated and act only upon the hazards that have already been defined.

> Our [SMS] says how to mark out the course for each of the company's schedules. But it doesn't consider stream or weather. And, experienced navigators want to – and do – choose a course according to wind and stream. But that's not complying with the [SMS].

This is directly linked to the notion of seamanship and the seafarers' perceptions of their own competence. They see that the SMSs and electronic equipment demand a new type of competence that is disconnected from the old practices and is causing the ideals of 'good seamanship' to lose significance:

> Before, you had to be able to find your way – one criterion was that you were familiar with [your region]. Now you have to know about papers and computers and all this.

> It's over. There's nothing called seamanship anymore. Everything … the seamanship is between two loose-leaf binders.

5.3.3. Positive consequences of the ISM code

There are also positive perspectives of how SMSs affect work practices. The seafarers are generally satisfied with procedures that make their everyday work easier and safer – such as electronic maintenance systems and mandatory resting periods, risk analysis, personal protective equipment, HSE meetings, and routines for emergency training.

> I've worked here in seventeen years now, so I've felt the difference. When I was a boy we didn't have any [emergency] training.

Many of the informants also report a change in attitudes and perceptions after they 'started with all these loose-leaf binders'. They point out that the paper systems have made them think more systematically about safety and understand more of the safety consequences of their practices. Therefore, they act in a safer manner. Although many perceive that they perform their work in the same way as always, some also think that they and their colleagues are more focused on safety:

> I feel that safety is much better taken care of now than before. It was more at random before, even though it was ok back then, too.

When asked if this has led to a safer work environment, one ship captain says:

> I sometimes reflect upon that. We've got the papers in order, but is it really better? Do we only produce paper? […] The Maritime Authorities statistics are as bad as before, we run on shore just as much as we did before.

Seafarers, trying to explain the many ship accidents happening despite improved safety management, underline the negative aspects of regulation in addition to the reduced staffing and resources on the vessels due to competitive tendering. The interviewed crewmembers are especially irritated by the tight time schedules set by the counties and the incorporated fines, resulting in seafarers becoming occupied with financial rather than safety priorities.

> Our schedule is a stress factor. They plan for it to be a stress factor. Everything is on the spot, you have no margins.

All the crewmembers express that the passenger vessels are run safely – some say *because of* and others *in spite* of the SMSs. In general, they describe the safety systems as a 'necessary evil', which improves safety in some ways but at the expense of good seamanship and practical attention and, therefore, might decrease safety in other ways.

6. Discussion

In this paper, we explore safety management regulation's impact on safety management to prevent individual and ship accidents. The last section described the ISM code's practical consequences through the views of Norwegian regulators, shipowner management, and crewmembers on passenger vessels. Consequently, we have gained insights into how the international regulation is translated into safety measures by the actors on different levels of the socio-technical system (Figure 2, Rasmussen 1997). Now we will discuss how the ISM code influences safety management (1) positively and (2) negatively, to come closer to revealing (3) the consequences for personal and ship accident prevention.

6.1. Fighting economy: safety regulations raise safety levels

SMSs are generally perceived to increase safety awareness – in this study as well as in earlier research (Lappalainen, Kuronen, and Tapaninen 2014). Other positive effects reported in our interviews – on all levels – are valuable routines, regular emergency training, a systematic approach to qualifications, and more features meant to stimulate safe and competent work practices.

A positive aspect emphasized in most interviews is that the ISM code makes shipowners raise their safety level. This does not prove a *high* safety level, as the general state in sea transportation still favors cost-efficiency [discussed for example by Størkersen (2015); Bhattacharya (2012); Lappalainen, Kuronen, and Tapaninen (2014); DeSombre (2008)]. In Norway, county authorities give contracts to the cheapest tender for passenger transport, making the tenderers reduce their costs and increase their efficiency. Production priorities tend to trump protection – as Reason (1997) would say – but safety regulations have made shipping companies prioritize protection where it is mandatory [also reported by Lappalainen, Kuronen, and Tapaninen (2014); Bhattacharya (2012); Knapp and Franses (2009)]. The companies report openly that they cannot afford to implement safety measures that are not directly related to government requirements.

In addition to the measures that the companies implement due to regulations, the company boards might be persuaded by the personnel to make safety investments. Crewmembers and safety management point to the ISM code as a source of power

in arguing for the importance of safety measures. This illustrates that the regulation serves to heighten the minimum safety level to which the companies adhere.

However, the logic of raising the minimum level and compliance stands in contrast to the ISM code's intentions for companies to be 'self-regulated' and 'self-thinking'. Many interviewees want the regulators to demand higher safety levels from the companies, but when the ISM code requests 'procedures to ensure safe operation of ships', the *companies* are expected to decide what is safe enough. Still, most of the initiatives in practice lie with the *regulator*. The regulators know of measures to pursue the safety priority but cannot act on them due to a lack of support from trade-focused government and interest organizations (Størkersen 2015). Our study indicates that the move from regulator responsibility to companies taking total safety responsibility has not yet been fully achieved in maritime transportation. This is discussed further in the next section about the bureaucratization of safety management.

The consequences of the ISM code discussed in this section seem to contribute positively to safety; at least, is it hard to see that these aspects should increase the risk of any accidents.

6.2. Unintended negative consequences of the safety management regulation

Regulators, managers, and indeed crewmembers describe most companies as having SMSs that are too complex, leading to extended formal work and a culture clash.

A comprehensive management system demands much administration and formalization. The interviewed managers experience being forced to be computer clerks. On the vessels, our study, like others (Bhattacharya 2012; Lappalainen, Kuronen, and Tapaninen 2014), demonstrates that the increase in administrative work is a source of frustration for the crewmembers, since much of it is viewed as unimportant tasks that take away time from safety-critical 'core tasks'. The paperwork load is especially heavy for navigators, who consequently have few opportunities to practice direct safety guidance and navigation. In addition, earlier research (Power 1999; Dekker 2014) emphasizes that attention to paperwork can turn resources and attention away from the actual operations.

Further, this formalization causes a clash between compliance and traditional professional culture. As we have seen, the SMSs are implemented as detailed rules, commonly described as overly static compared with the situational variation (e.g. weather conditions). The ISM code can be argued to have contributed to a *bureaucratic culture*, using the typology of Westrum (2004). In a bureaucratic culture, compliance with external requirements is likely to be the goal of safety management. This means that the commitment to safety is driven more by extrinsic than by intrinsic motivation. Crewmembers experience that the SMSs displace the common sense incorporated into *good seamanship*. The SMSs formalize safety, involving a strong presence of safety professionals with a 'model monopoly' that can marginalize practical knowledge (Almklov, Rosness, and Størkersen 2014). The crewmembers point to an antagonistic relationship between traditional seafarer values – to make independent decisions according to the weather and context – and formalities – to perform work according to the rules. In practice, neither the management nor the crewmembers are urged to be 'self-thinking', even though that was a goal for the ISM code. Studies find that the ISM code has contributed to better communication in the Finnish maritime industry (Lappalainen, Kuronen, and Tapaninen 2014)

but has created a large gap between managers and crewmembers on tankers (Bhattacharya 2012). Our results suggest a gap between administrative- and practical-focused personnel on all levels. Bureaucratic safety discourses disempower the practitioners and their local knowledge. Overall, the traditional ideals of what it means to be a good seaman seem to be at odds with the formal SMSs.

These negative aspects of the ISM code can influence accident prevention differently. The administrative burden is easily associated with less concentration on navigation, which can lead to ship accidents. The absence of seamanship and the experienced pressure for 'unthinking' compliance can lead to both kinds of accidents as sailors lose their professional competence, but perhaps compliance can also prevent individual accidents, assuming that it empowers crewmembers' planning.

6.3. How the ISM code affects the risk of personal injuries and ship accidents

The discussion so far shows that earlier research results are also valid for Norwegian passenger transportation: the ISM code can exert a positive influence by increasing safety investments and safety awareness, but it also has negative effects that cause crewmembers to fight against paperwork, limited concentration, limited manning, and many tasks. How this is connected to accident prevention is unclear, so now we want to consider the ISM code's relation to the ship accident increase and personal injury decrease in Norwegian waters (Maritime Authority 2014).

Personal injuries or individual accidents happen to crewmembers during work or other activity on the vessel. According to Reason (1997), personal injuries are often related to slips and lapses. Our data from companies and regulators show that even though the maritime SMSs are complex (producing less rule overview and more paperwork), the crewmembers largely benefit from improved safety awareness and better-structured routines. Even though most crewmembers underline the importance of seamanship and their own considerations, their statements also suggest compliance with thought-through procedures for maintenance, resting periods, personal protective equipment, safe job analysis, and emergency training. Such routines unite the rationality of seamanship and the SMSs, the new and the traditional way of working at sea, and might prevent hazardous operations that earlier led to broken bones, clamped fingers, and suchlike. These operations are on-board operations that are unequal to navigation. They are mostly related to personal accidents and can more easily be regulated by simple procedures. Consequently, the ISM code might have contributed to a decrease in slips and lapses on Norwegian passenger vessels.

Navigation, on the other hand, can result in ship accidents if it fails. Ship accidents are more likely to be organizational accidents (in the terminology of Reason (1997)]). *Navigation* is often the mediator between unfavorable organizational conditions and the accident, meaning that a navigation error is often a cause of ship accidents. Our studied companies' SMSs have formal procedures for safe navigation, for instance to prepare each sailing as if it were the first, use a crewmember as a watchman, keep all focus on the navigation, and so on. However, our interviewees explain that these procedures are seldom complied with, as competing market-related procedures are prioritized. According to the procedures, the navigator is to answer emails from managers and calls from customers (about keeping to the schedule), to organize extra manning, and to fill in logs – and all this has to be carried out under navigation to leave time for sleep after the watch duty. It is hard for a navigator to concentrate on navigation under such disturbing conditions. It seems that the

Table 2. ISM code intentions and industry responses.

Regulatory intention	Industry response
Self-regulation	Compliance-driven
Continuous improvement	Minimum standards for safety
Safety culture	Administrative structures (procedures)

negative sides of the ISM code – extensive proceduralization – disrupt navigation more than they disrupt other activities. Following navigation procedures and at the same time focusing on navigation might be possible if the navigators' tasks are reduced or reorganized. Additional manning could partly solve the problem, but the companies cannot grant this.

Our results therefore indicate that the ISM code contributes to safety in some activities on the vessels, as intended. SMSs are useful for preventing individual accidents. When it comes to ship accidents and navigation, on the other hand, the negative effects from SMSs and economic competition have more influence, so the possible positive effects of the ISM code are not apparent.

Summing up, there seems to be a mismatch between the regulator's intention for the ISM code and the industry's adaptation to these regulations. This mismatch is described in Table 2.

Somewhere along the risk management chain of Rasmussen (1997), the regulatory signals from the ISM code seem to change into practices that are based on a rather different philosophy of safety. Due to this 'mutation' of the ISM code's intentions, it influences the risk of personal injuries and ship accidents in different ways. Safety management practices directed at personal injuries often take the form of work procedures. Such measures are 'cheap' in the sense that they require little or no economic investment from the company. The risk of ship accidents are to a greater extent influenced by technical measures and the level of manning. These are measures that require either investment in design and equipment or increases in operating costs. In a context of heavy competition, shipowners' efforts are therefore likely to be aimed at the procedural (personal injury) level.

7. Conclusion

In this paper, we have explored how safety management regulations influence safety management practices and their prevention of personal injuries and ship accidents, exemplified by the ISM code's consequences for Norwegian maritime passenger transportation. We find that the ISM code has positive and negative implications; it has led to greater safety awareness and a higher safety level in the industry but also more administrative work and frustration related to professional competence and compliance. This is in line with earlier research [by for instance Bhattacharya (2012); Lappalainen, Kuronen, and Tapaninen (2014); Bieder and Bourrier (2013); Almklov, Rosness, and Størkersen (2014)], but Norwegian maritime passenger transportation seems to be particularly suitable as a case to show how employers prioritize economy instead of innovative safety measures. In addition, Norwegian maritime transportation has increasing rates of ship accidents but improving rates of personal injuries, and our results propose an explanation for this paradox: the safety management regulations appear to work when they contain knowledge and routines

that seem rational to the personnel, provided that the personnel have the resources to comply with the procedures. However, during watch-keeping on the bridge, the ISM code and market aspects give navigators too many disturbances to follow the safety procedures and concentrate fully on the navigation. Thus, at least in this industry, the SMSs might prevent individual accidents, such as personal injuries, but not ship accidents, such as ship groundings.

Possible approaches for companies to avoid ship accidents could be to simplify the procedures and minimize the disturbances for the navigators, for example by allocating more of the administrative tasks to the onshore organization. Regulators could actively address the external conditions. For example, tendering processes could include stronger safety criteria. These would reduce the pressure to make cost reductions and, at the same time, ensure equal competition between the bidders. Regulators could actively pursue the concretization of safety criteria in cooperation with other public bodies.

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Notes

1. The full name of the ISM code now is the *International Management Code for the Safe Operation of Ships and for Pollution Prevention*.
2. Several organizations, associations, and conventions are important for international maritime law, such as the International Maritime Organization, the International Labour Organization, and Paris MoU, but this paper will not provide an overview of these.

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