

Does the oversight model lead to power relations in terms of empowerment or responsabilization?

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ABSTRACT

In public safety oversight authorities are traditionally assumed responsible of safeguarding operation and promoting safety by defining prescriptions and observing that they are complied with. Regulated entities on their side are assumed responsibility for complying.

While this compliance-based approach has contributed to current levels of safety, it is increasingly debated that it has limitations in yielding further safety achievements, that it represents a “one-size-fits-all” model regardless of diverse performance and needs in companies, and that its focus on standardization and proceduralization has negative side effects. Furthermore, the focus on means applied may seem off-target compared to focusing directly on safety outcomes achieved. Such arguments underlie contemporary developments into rational data-driven approaches introducing quantifiable safety goals, performance measurements, analysis of data and rational decision-making as basis for improvements. This approach aims at responsabilizing industry for safety outcomes, whereas authorities become responsible for monitoring and intervening whenever analysis of recorded outcome data deems so.

A third approach relying on on-site survey interaction focused on concrete observations as offset for dialogue on technical, operational and managerial issues concerning safe operation has been implemented by an Authority in a specific context of passenger ship safety oversight.

Taking offset in a maritime context this thesis examines these three approaches with a view to how they lead to distinct power relations in terms of responsabilization and empowerment. Major consequences for oversight effectiveness have also been touched.

It is argued that although compliance-based and data-driven approaches apply different means, they rest on similar basic presumptions of linearity, predictability and rational decision making. These ideal perspectives may hold in part, but are not capable of grasping complex dynamics inherent in almost any real life operation. A major consequence is responsabilization of either Authorities or regulated entities beyond their reach. Moreover, both approaches tend to create overfocus on formal acceptance criteria, while unintendedly omitting vigilance on other aspects, dynamics and complexities pertinent to safe operation. Such oversight entails “abandonment” of regulated entities rather than contributing to empowerment.

The third approach of on-site dialogue on safe operation seems well suited to yield qualitative insights for understanding local, contextual dynamics influencing promotion or erosion of safety. Due to such insights and exchange of knowledge, the method may serve to empower not only regulated entities, but also authorities.

Finally it is argued that all 3 approaches have merit, and that a merger of the methods carries potential for effective and empowering oversight contributing to companies’ efforts to operate safer.

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1. Introduction

1.1 Motivation for research

A core activity of the organization I work for, the Danish Maritime Authority (DMA) is safety oversight of ships. Until few years ago the DMA applied mainly what might be considered a traditional model of oversight, where periodical surveys of most ship types were carried out by checking compliance with prescriptive regulations, in principle one-by-one by checking actual status of single components against the detailed requirement, popularly speaking by “kicking tires”. Under this model all are inspected equally regardless of differences between enterprises, their contexts and performance in terms of accident and compliance levels.

In recognition that safe operation depend on much more than compliant components, and also that a more flexible approach in oversight is desirable in order to allow adaptation, the DMA has in recent years amended its model of oversight for ships in service by addressing not only compliance of components, but rather safety management and communication as practiced. Such oversight is exercised through more extensive dialogue with offset in technical and operational observations during surveys.

While this new approach is being implemented, further significant amendments to the oversight model are in the pipeline. These concern goal-based approaches relying on rational decision-making based on collection and analysis of measurable performance data. This development is part of a general intention of making public administration, including oversight, more effective and efficient (Rigsrevisionen, “Report on effective inspection regimes”, 2017). Such data-driven, goal-based approaches have been implemented in other public sectors, for instance educational, employment and social systems (Mølgaard et al, 2016), and have been considered also in safety critical sectors including aviation (EASA, ”Report on a Harmonised Approach”, 2014), rail transport (Kelly, 2007), and also within maritime oversight in terms of port State control (Paris Mou, “Memorandum of Understanding”, 2017).

From a theoretical perspective, data-driven approaches are expected to be more effective as they are supposedly based on objective evidence of performance and addresses directly the level of regulatory goal achievement as measured. This contrasts the traditional approach of prescriptive regulations which are concerned with the means deployed rather than the results achieved. Research indicates however that while data-driven methods may provide results as intended in some contexts, realization of the theoretical benefits is not straight forward in many others due to difficulties of defining meaningful, measurable goals and enforcing them in practice (Coglianese, 2015) and unintended side-effects (Mølgaard et al, 2016).

These contemporary developments of public oversight are of my personal and professional interest, as they are tightly connected with present developments dealt with in the DMA.

As Naval Architect I have been working in the maritime and offshore industries, on industry as well as authority side. In my current position I work in the management team of the ship survey and certification division of the DMA. While I worked in industry, it seemed doubtful to me whether statutory surveys provided added value. The initial survey of new build vessels, especially the preparation, seemed to make a significant difference though. No one wanted to end up with a new vessel that not met regulations and hence could not be approved. The intention was evidently to build ships that were able to operate, which implies operating safely, and meeting at least design safety regulations was considered a major cornerstone in this regard. For ships in operation, it seemed however that surveys often concerned compliance checks of banalities and

details, whereas the overall picture in terms of how safety was in fact created was not really addressed; safety management system audits concerned written policies, formal procedures and document control rather than actual ways of operating safely.

Seen from Authority perspective, the picture is different. Companies and ships are different, and do manage differently. Mostly things appear well driven, and there may not be much to add. In a few cases you may find a ship though in a bad state, and need to detain the ship until it is brought to an acceptable state. In such cases it is compelling to discuss findings and ways of working with crew and company and subsequently follow up until things have changed, not only aboard, but also on a more systemic level. In between best and worst examples there are many shades of grey. The main survey focus has until recently been on whether components and safety management systems comply with detailed, prescriptive regulations. Whatever is beyond that in terms of managing safety were only touched sporadically. There is no doubt room for improvements of oversight with a view to better understanding, assessing and supporting safety work undertaken in the companies.

1.2 Maritime safety, regulation and oversight

Maritime activities have long and strong traditions, which reflect shipping as a cornerstone in international trade. They also reflect seafaring as a harsh high-risk working environment (Perrow, 1999; Morel et al, 2008).

Due to the global nature of the industry, regulation needs international agreement. Maritime safety regulations are predominantly agreed through international conventions adopted by the International Maritime Organization (IMO) under the United Nations. Regulations have been developed over the last century, typically in the wake of accidents, starting with the TITANIC disaster back in 1912, which triggered the International Convention on Safety of Life at Sea (SOLAS). These Convention requirements consist of detailed, prescriptive regulations on design, construction, equipment and operational issues. Alternative designs not following standard prescriptive requirements are allowed if an equivalent level of safety is documented through Probabilistic Risk Assessments. Such alternatives are increasingly deployed, but are still the exception rather than the rule¹. New SOLAS regulations are however increasingly facilitating application of standards based on goals, principles and functional requirements, still however providing prescriptive standards (IMO, “Goal Based Standards”, 2016). Concerning operational issues, safety management is explicitly addressed by means of a prescribed “safety management system” covering company ashore and its ships.

According to the international conventions on maritime safety, merchant ships must undergo a complete initial survey by the Flag State, or a “recognized organization” on its behalf at newbuilding before entering into service (SOLAS, Ch. I, Reg. 10). Subsequently, ships must be surveyed periodically to re-confirm all matters (SOLAS, Ch. I, Reg. 12). The requirements prescribe checks of certificates, construction and equipment as well as verification of the company’s mandatory safety management system. Ship construction and equipment on the one hand and the safety management system on the other is normally verified separately at different occasions by different surveyors. Surveys and audits are conducted with regard to regulatory compliance at component level, i.e. by compliance checks of physical components and safety management system documentation such as policies, company organization, responsibilities, operating procedures, emergency preparedness and internal audit reports etc.

¹ Large passenger ships are an exception, as fire safety is often partly based on alternative designs

The Conventions are intended to ensure a well-defined and common level of safety. It is however not always so. As stated on IMO's homepage: "With 167 Governments as Members, IMO has plenty of teeth but some of them don't bite. The result is that serious casualty rates - probably the best way of seeing how effective Governments are at implementing legislation - vary enormously from flag to flag. The worst fleets have casualty rates a hundred times worse than those of the best" (IMO, "Flag State Implementation", 2016).

One reason may be that Flag States have different capacities in terms of development, administration, resources etc. Another that Flags may have different motivations. As a sovereign State each Flag has the prerogative to interpret convention requirements, and differences are likely to emerge. Historically, so called "Flags of convenience" emerged in the 20th century as many Western world ship owners registered their ships in 3rd countries with "Open registers" with a softer approach to tax, regulation and enforcement than the original "National flags" where owners resided (Sehgal, 2010). Today, "Open" or "Quasi-open" registers have more or less become the norm in a heavily globalized industry where ownership, registration and commercial as well as technical management and operation are often undertaken by different companies and subcontractors across borders and continents (Sehgal, 2010). While "Flags of convenience" were perceived "Sub-standard" earlier, they are not necessarily so today, as some "Open registers" demonstrate high levels of compliance with conventions (Rajadurai, 2004); (Sehgal, 2010), while on the other hand sub-standard shipping is found with national flags as well. This indicates that sub-standard shipping relates to the way registers are administered rather than to their status as "open" or "national" (Rajadurai, 2004); Ideally, Flags would be distinguished by their levels of "...responsiveness, pro-activity, quality of service, treatment of seafarers, ratification and implementation of modern regulatory conventions and safety records" (Sehgal, 2010).

The problem of different levels of Flag State implementation has been addressed over the last decades in IMO by introducing Flag State standards and encouraging..." governments to inspect foreign ships that visit their ports to ensure that they meet IMO standards..." (IMO, "Flag State Implementation", 2016). Coastal States in different regions (for instance European States, Russia and Canada forming the Paris MoU, the US and the Pacific region forming the Tokyo MoU) have over the last decades established regional Port State Control regimes to ensure a minimum level of safety and environmental protection of any ship calling at ports in the region while also eliminating "unfair" competition from sub-standard operators.

This means that 3 levels of players are now considered responsible of ensuring safe shipping: Companies and operators are considered basically responsible (Paris MoU, "About Us", 2017), secondly Flag States are considered the 1st line of defense in case companies and operators fail, and finally Port States are considered a 2nd line of defense as the second monitoring and enforcement barrier if the former fails (EU Directive on port State control, 2009/16/EC, Preamble (6)).

Today rather strict requirements of complying with the Conventions is enforced for any ship calling at ports in Europe, US and Pacific port States. These regions represent strong, attractive economic markets of shipping, and compliance with IMO standards must be considered a precondition for operating there.

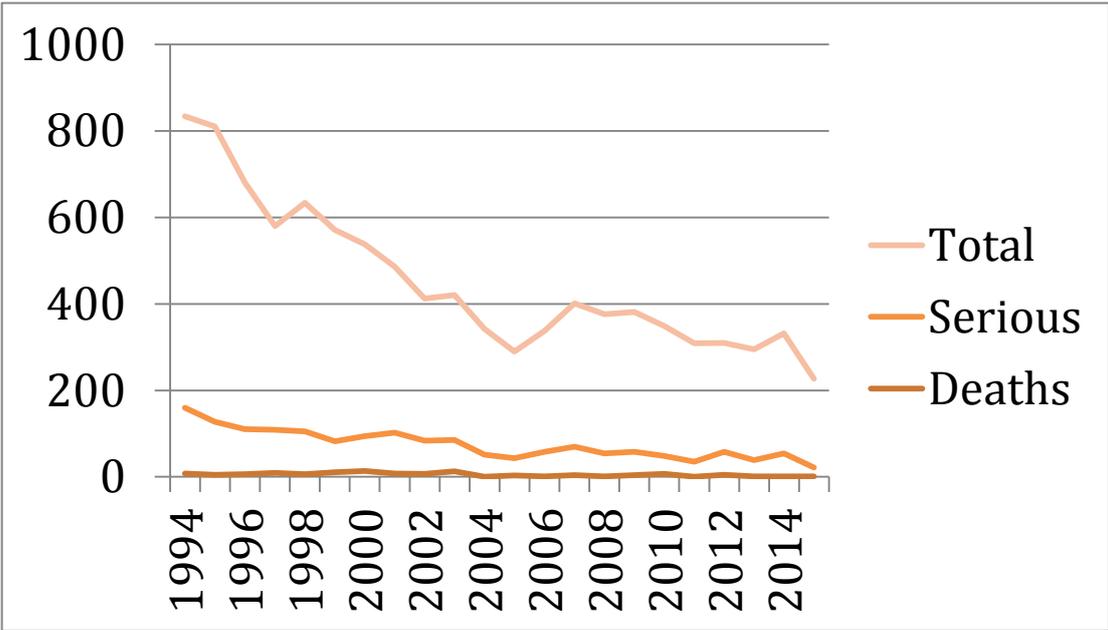
A fully compliant ship and safety management system will however not necessarily imply safe operation. Based on experiences from my own work setting, examples are not rare. In 2009 a coastal tanker lost 2 crews in Greenlandic waters (DMAIB, "Søulykkesrapport fra Opklaringsenheden", 2017) as they capsized in their workboat while carrying a fuel hose from the anchored vessel to a local community ashore. The accident revealed serious safety vulnerabilities

despite clean certificates, a vessel in good condition, and a shining safety management system. Those vulnerabilities were not captured by preceding statutory surveys.

1.3 Compliance is not enough – Quality Shipping 1.0 to 2.0

There is indication that compliance with ever more developed prescriptions over the last decades has been accompanied by a decline of accidents, see figure below showing officially reported injuries and casualties in the Danish merchant fleet since 1994:

Figure 1: Accidents in Danish merchant fleet 1994-2014



Source: Danish Maritime Authority

The numbers include workplace as well as process safety incidents, and the underlying statistics are based on absolute numbers across sectors. Anyway, the figure indicates that (Danish) ships have become a safer workplace over the last 20 years, and further that the declining gradients have diminished and is now approaching zero. This picture corresponds to a common perception within DMA that safety has improved over the preceding decades as a consequence of ever more tightened safety regulations and enforcement, improved education of seafarers and increased focus of industry and organizations on safety and occupational health, but that regulations today constitute a comprehensive complex of provisions that has reached the limit of what can yield further improvements. On the contrary, according to a survey conducted by the DMA in industry and among seafarers concluded that increased controls and documentation requirements are perceived burdensome and counterproductive to safety. Similar findings are more generally noted by Dekker (2014). Another explaining factor may be that increased proceduralization, which inevitably implies less discretionary space, has reached a level where it constrains the systems’ natural adaptability and resilience and hence has become counterproductive (Amalberti, 2013).

In society there seems to be an inevitable and increasing demand for safety (Amalberti, 2013; Leveson, 2011). Taking into account the comments just above, a good question then is how to satisfy this demand further on.

Trends of more compliant and supposedly safer ships are perceived also to have taken place internationally as port State control statistics of decreased detention and deficiency rates (Paris MoU, “Annual Report 2016”, 2017) and increased number of white list flags over the last decades (Owen, P., “All white now”, 2017) indicate that “quality shipping” in terms of compliance with International Conventions has increasingly become the norm. One aspect is that flags, which have earlier “underperformed”, are now performing as quality flags, and have hence increased their commercial competitiveness as to operate on the strong markets of Europe, US and Asian countries with strict Port State inspections. This increased competition has in turn created incentive for “old” quality flags to develop their administrations in order to stay competitive to attract maritime businesses.

“Quality shipping” is an unofficial term. Normally it is used to contrast substandard shipping, and then refers to compliant ships operating with good performance statistics of no accidents, no detentions and good on board living and working conditions. In DMA’s perception the term concerns not only compliant ships, but: “...promoting highest standards of health, safety and environmental protection together with high commercial competitiveness”. This is supplemented by the following: “It is primarily up to the ship owners to ensure and heighten the level of quality” (DMA, “Quality Shipping”, 2016). This means high level standards of safety, living and working conditions, intertwining of safety and economy goals, and finally, in recognition that the ships are operated by the companies and not the Authority, explicit responsabilization of industry to pursue and obtain these goals.

In promotion material to shipowners, the DMA uses the slogan: “*There is more to quality shipping than clean certificates*” (DMA, “Come fly the Danish Flag”, 2016). This contains three substantive messages: First, that clean certificates, i.e. complying with international regulations is a precondition, secondly that this is not enough, and third that “clean certificates” refers to documentation and bureaucracy rather than real operation, which imply a distinction in quality between real operation and bureaucracy. The slogan suggests a “gap” in quality between merely operating with “clean certificates” and operating with “Quality”. This gap, which has neither been defined explicitly nor enforced, constitutes the difference between focusing on compliance only and focusing on safe operation in wide sense comprising proactively working with safety as an integrated part of operation. It is this gap that constitutes the target space for developments.

To define and manage it Flag States pursuing these explicit and intertwined goals of continuously improving safety and commercial competitiveness need to develop their “Quality shipping” concept into a “Quality Shipping version 2.0”.

1.4 Developments in oversight

As entrepreneurs and operators, industry has a major role in driving and realizing such developments of the “Quality shipping” concept, whereas authorities are thought to have a major role in developing and providing the framework conditions. These need to be supportive and generative in meeting commercial needs of industry, while at the same time promoting safe operation to meet societal expectations of ever safer performance.

Developments are intended to consolidate the safety achievements by the traditional compliance based approach, while also introducing a more flexible and differentiated approach by which industry is given greater space for innovation, choice of methods and ways of work as long as safety performance is improving. With such increased autonomy of industry follows increased responsibility within a frame of safe operation defined by the Authority. Further, the Authority is responsible of overseeing that companies actually work within this prescribed frame.

In a traditional perception of oversight, Flags are responsible of acting as a “1st line of defense” by reacting to sub-standard conditions by deploying inspection powers to ensure that deficiencies are rectified. In a “Quality Shipping 2.0” perspective, they will further need to pro-act as supportive, supervising Administrations capable of servicing the industry and adding value through being accessible when required and competent in contributing to problem solving whether technical, legal, diplomatic or other issues whenever authority intervention is needed to help pave the way ahead. Flags will further be responsible of proactively promoting attractive economic framework conditions for the maritime cluster as well as contributing to develop the regulatory framework with a view to promoting safety standards and performance beyond status quo. This will necessitate proactiveness in continuously developing the framework of International Conventions and oversight practices deployed.

To do this, Flag States will need to proactively cooperate with likeminded Flags and maritime industries to initiate and drive developments, the goal being flexible regulation of high standards allowing adaptation and innovation while reducing perceived negative effects due to ever more detailed prescriptions and documentation requirements. Flag States thus need to change the traditional approach of Authority versus entity focused on rule compliance and documentation into a new and more involving, cooperative and dynamic interaction focused on promoting systemic safety as intertwined with commercial soundness. The goals being commercial competitiveness and economic growth side by side, or rather intertwined with continuous safety improvements to meet societal requirements in terms of lesser and lesser societal tolerance of accidents (Amalberti, 2013; Leveson, 2011).

Such “Quality shipping 2.0” oversight model will rely on competent proactiveness from both parties and should be designed to responsabilize both: Industry as proximate actor responsible not only for complying (clean certificates), but for proactively operating safely (efforts beyond clean certificates), whereas Authorities are responsible for effectively constituting a “1st line of defense”, not only by monitoring in a traditional, reactive enforcing way focused on compliance, but also proactively in a responsabilizing, cooperating and empowering way contributing to capacity building and supporting industry in efforts to operate safely, still however with capability of intervening in case industry does not succeed.

1.5 Research question

The previous section outlines maritime oversight at a threshold to change. A new oversight model must contribute to improved safety performance to satisfy public expectations, while at the same time contributing to a generative and supportive framework for commercial operation.

As mentioned initially, 3 oversight models are currently at play:

1. ”Compliance based oversight” as traditionally applied in maritime oversight
2. ”Dialogue based oversight” as developed by the DMA
3. ”Rational data-driven approaches” as introduced in public oversight by “New Public Management”(Mølgaard et al, 2016)

A schematic overview of the 3 models is drawn up in the table below:

Table 1: Schematic overview of oversight models

	Compliance based	Dialogue based	Rational data-driven
Applications	Traditional approach of public oversight, including maritime	DMA Flag State oversight	Public management within many sectors.
Regulation	Prescriptive	Prescriptive	Goal based
Oversight focus	Assessment of compliance with prescriptive regulations	Assessment of conditions, emergency preparedness, communications and company's safety management as practiced	Assessment of goal achievement through analyzing performance data
Activities	Physical surveys on site at fixed intervals	Physical surveys on site	Continuous or periodic data monitoring and analysis
Means deployed	Exhaustive checks of components and documentation on site according to prescriptive regulations ("kicking tires")	Extensive dialogue on site taking offset in observations <ul style="list-style-type: none"> • Comprehensive sample of compliance checks according to prescriptive regulations • Dialogue with crews and company representatives • Practical emergency exercises 	<ul style="list-style-type: none"> • Identification of measurable data and causal relationship to goals • Collecting data • Analyzing data • Evaluation • Rational decision making on basis of analysis
Scope	Any matter explicitly described in prescriptive regulations	Any matter pertaining to safe operation with offset in prescriptions	Any matter explicitly targeted in goals, datasets, analysis and decisions
Adaptation to local context and flexibility in enforcement	Limited – all entities are treated equally regardless of known performance	Allows adaptation depending on observations and developing dialogue.	Allows adaptation and flexibility as long as goals are achieved

The models are explained in more details in chapters 4 and 5.

The models target different aspects of safe operation and entail different means deployed, which likely influence how companies and Authority interact. It is not immediately clear what the implications are or how the models fit with promoting responsabilization and empowerment of industry as intended by for instance the "Quality shipping 2.0" sketch. I therefore find it desirable to make a deeper examination of these oversight models for the purpose of assessing implications on empowerment and responsabilization.

To do this it will in the first place be desirable to clarify the models' underlying perspectives of "safety" and its creation. Secondly, general perspectives on regulation and oversight are relevant to provide a frame of reference. Thirdly, since the 3 models differ with a view to what they monitor, the means to do it, and the level of industry involvement and interaction, they have different implications also with a view to what industry is responsabilized for, the level of empowerment induced, oversight powers and the way they are deployed and responded to. Finally, the models will most probably entail implications also with a view to effectiveness of oversight.

Oversight presumes exercise of powers, and it appears obvious that the way and the extent to which this is done in each model are somehow influencing relations of power between companies and Authority, especially this concerns power relations in terms of empowerment and responsabilization.

This forms the basis for the research question:

Does the oversight model lead to power relations in terms of empowerment or responsabilization?

In addition I intend also to consider major advantages or disadvantages of the models as may be found with a view to their effectiveness in identifying and promoting safe operation.

2. PREVIOUS RESEARCH AND THEORETICAL FRAMEWORK

Literature within following areas has been reviewed to establish a theoretical framework:

- Perspectives on safety
- Perspectives on safety regulation and oversight
- Perspectives of authority, power and power relations.
- Perspectives on responsabilization and empowerment

2.1 Perspectives on safety

Perrow (1999) argues that accidents are inevitable in interactively complex, tightly coupled systems. He addresses specifically the maritime industry as predominantly characterized by tight couplings and more linear than complex interactions. This is a generalization, which may cover deviations in different segments (p. 172-176). Passenger ships are becoming ever larger and of increasingly complex design. Combined with ever larger crews and passenger numbers, complexity and tight coupling are likely increasing.

Perrow argues that even more important than the complexity-coupling consideration, the maritime industry constitutes an “error-inducing system” characterized by “fragmentation” and “self-defeating mechanisms” as a result of social organization (traditions and power structure), production pressures, the industry structure and insurance and difficulties of regulation (p. 172-176).

In the context of passenger ship safety, it can be argued that countervailing mechanisms affect the maritime system in regional contexts. In the US and EU passenger ship safety has high political priority, and additional safety requirements are imposed along with strict port State control. Companies and authorities are held accountable by the political system and the public, which seems to turn the global shipping perspective into a local, more homogeneous sub-system, which counterbalances fragmentation, self-defeating and error-inducing mechanisms referred to by Perrow (1999).

Safety regulations of international conventions are continuously developed by governments in cooperation with industry and seafarer organizations. Developments typically reflect learning in the wake of accidents, and the means are protective barriers through detailed prescriptions on construction, equipment, manning, training, operational procedures etc. The conventions prescribe initial and periodic surveys by complete inspections. The underlying safety model corresponds to a “Swiss-cheese, defense-in-depth” model (Reason, 1990) concerned with safety as a state to be obtained continuously through proceduralization and controls ensuring compliant, reliable components, work and management processes. Safety perceived to be created this way, either externally by regulators or internally by self-regulation in companies, is referred to as “controlled safety” by Amalberti (2013). The original “Quality Shipping” concept sketched in the introduction is resting on a belief in controlled safety. Underlying perceptions essentially reflect a Newtonian perspective of linearity, cause-effect symmetry and predictability. Hollnagel (2014) refers to such perspective, which is reactive and focused on specific safety add-ons in order to avoid known and predictable paths to losses, as Safety-I.

Leveson (2011) argues however that safety and reliability are different properties that should not be confused, and further that safety in complex systems is an emergent system property rather than a resultant effect of reliable components and procedures. From this view, and to the extent

that the maritime systems concerned are complex, the linear perspective of Safety-I will not be sufficient to understand safety and manage it. Further, in assuming that the Safety-I perspective has brought about its maximum yield in safety performance, but at ever higher costs in terms of increasing administrative burdens and regulatory complexity, which have now significant, counterproductive and even detrimental effects (Dekker, 2014), a main idea of “Quality Shipping 2.0” is to consolidate what have been achieved so far, but also that adjusting the regime is paramount if further improvements shall be obtained. Other perspectives on creation of safety will be needed to achieve this, and the concept aims at introducing a more holistic perspective focusing on safe operation by acknowledging production and safety as intertwined goals that cannot be created by focusing on distinct, detailed safety prescriptions and component compliance alone.

Amalberti (2013) refers to the total safety of a system as the sum of “Controlled safety” and “Managed safety” (p. 77). The second term refers to “...*safety supported by operators’ adaptive intelligence...*” (p. 77), which means any agency to manage what is not covered by “Controlled safety”. “Managed safety” constitutes an important contribution in handling unforeseen demands to ensure that things go right (Amalberti, 2013). Distinction between “Controlled” and “Managed” safety is not necessarily clear in practice, as work as imagined is always different from work as done (Bieder & Bourrier, 2013). What is perceived “Controlled” may actually turn out to be non-implemented or even non-implementable and hence must be handled by “Managed safety”. Hollnagel (2014), Bieder & Bourrier (2013) and Grote & Weichbrodt,(2013) argues along similar lines that total safety emerges by a combination of providing structure in terms of controlled safety while also providing discretionary space and flexibility through promoting the capability to adapt performance continuously as varying needs arise during operation. Hollnagel (2014) introduces the term Safety II, which in contrast to traditional reactive perspectives and efforts as of the Safety-I perspective concerns a forward looking perspective focused on offensively and proactively seeking to make things go right. This should be seen as supplementing means to the traditional approach of defensively avoiding that they go wrong (2014). Along similar lines Bieder & Bourrier (2013) argues that safety ultimately concerns the ability to manage uncertainty.

Amalberti (2013) proposes that safety in industrial systems can meaningfully be described by 3 basic models: The “Resilient model”, the “HRO² model” and the “Ultra-safe systems model” applied in “skilled trades”, “industrial systems” and “high-risk industries” respectively. In mentioned order these models represent increasing levels of system governance, organization and degree of controlled safety, which effect increasing levels of safety performance of magnitudes 10^{-3} , 10^{-6} and 10^{-9} respectively. The actual model is dictated by and intertwined with its underlying economic, business model. For this reason transition to a safer model presumes changing also the economic model. Within each model it is however possible to improve safety performance by a magnitude of 10 through self-improvement and optimizing existing resources and means (p. 87-88). Presuming these safety models as basic frames of reference, Amalberti (2013) draws up “golden rules” for successful intervention in system safety comprising amongst others (p. 126-129):

- safety is never the only goal, relative priorities and trade-offs are inevitable and at the core of navigating safety
- safety goals must be realistic and not go beyond the actual safety model’s potential
- the approach must be systemic and cover system, enterprise and workplace levels

² HRO: High Reliability Organization

- the strategy of economy, safety and trade-offs must be communicated to all levels.
- interventions must concern
 - existing resources before applying means of more advanced safety models
 - doing well what can be done as well as explicitly stating what cannot be done
 - not only prevention, but also recovery
- a fair degree of autonomy of operators must be allowed to support adaptive capacity

Amalberti (2013) considers merchant shipping as governed by the HRO-model. This is well described in literature (Weick & Sutcliffe, 2007; Dekker & Woods, 2006; Kringen, 2013). This categorization of passenger ship transport in a safety context appears meaningful as frame of reference, as the practical approach to organization of safety work on merchant ships is often based on principles similar to those of HRO's, even though the degree of adherence to ideal principles can be varying and far from realized. As Gunningham (2015) notes, the many efforts and attitudes ideally needed require an immense piece of social engineering which is hardly realizable in practice. In high reliability theory, "safety culture" is considered the magic tool in keeping accidents away (Henriqson et al., 2014). This is however a hardly definable concept (Antonsen, 2009; Grote & Weichbrodt, 2013), which may have more character of a label than of a specific, identifiable characteristic, and it is an open question whether and how it is possible at all to purposefully build, implement and enforce a specific culture (Dekker, 2015). Antonsen (2009) demonstrated that it is difficult if not impossible through surveys to establish whether a good safety culture, whatever this means, is present in an organization and effective in "keeping accidents away". Amalberti (2013) notes that "...culture...[may be]...linked to the safety model, but is rarely a concept that permits direct, primary action to improve safety" (p. 99). Perrow (1999) is outright skeptical to the concept of safety culture and "...doubts its utility..." (Antonsen, 2012, p. 183-184).

Based on such considerations Grote & Weichbrodt (2013) argue that "...regulators should stay away from safety culture and stick to rules instead", meaning that regulators should look for concrete safety measures rather than some hardly graspable and even more difficult-to-modify culture. This seemingly leads back to the traditional oversight model of checking compliance with detailed prescriptive regulations – which can only at its best reach "Controlled safety", but not "Managed safety".

A basic question then remains: What should an authority look for when carrying out statutory surveys? "Controlled safety" is an obvious target, but is not sufficient as capabilities with regard to "Managed safety" are essential and highly valuable sources of resilience in safe operation (Morel et al, 2008).

Amalberti (2013) concludes that while an [abstract] toolbox is available, it provides "...no recipe for navigating safety", and that the level of control possible depends on the ability to continuously and vigilantly (re)consider priorities and trade-offs in balancing safety with other goals and needs (p. 129). Normally, this balancing will however not tend to prioritize safe solutions as these typically imply short term economic costs for long term potential safety benefits (p. 121). Best drivers in pushing the balance towards safety solutions will be known risks due to occurred accidents, and safety requirements imposed by regulators. The latter, will however encourage senior managements to expect nothing beyond compliance (p. 121), and as regulation is typically induced by looking on accidents in the rear-view mirror (p. 97), both drivers tend to promote a defensive, reactive perspective on safety relying on regulation only. Inevitably this will be on the expense of a more offensive, proactive and self-guided perspective within companies. Such is called for by for instance the Safety-II perspective (Hollnagel, 2014).

2.2 Public/regulatory oversight

The International Conventions on maritime safety rigorously prescribe frequency and contents of surveys of passenger ships. This regulatory oversight model is developed centrally by Flag State experts in the IMO context and is focused on standardization, bureaucratic administration and external control by each Flag State performing its “1st line of defence in monitoring”. This may be seen as an example of “Authoritarian high modernism” (Dekker, 2014).

This approach is designed to enhance safety through “Controlled safety”, and represents in this context a reactive perspective as of Safety I, but does not address adaptive capacity and “Managed safety” (Amalberti, 2013), whereby an important contribution to what makes safety emerge is not taken into account. In fact it may not necessarily promote “Controlled safety”, but rather the formal bureaucracy designed to manage it (Dekker, 2014). A bi-product of the bureaucratic, rational-legal approach then is structural secrecy (Vaughan, 1996). According to Dekker (2014) the bureaucratic approach and its focus on compliance, documentation, hierarchical organization and decision making implies bureaucratic accountability-up, meaning that reports, numbers and statistics are analyzed and laid up the hierarchy for further decision upon actions (p. 352). Dekker notes that bureaucratization is believed to yield results in terms of improving safety, but also that it has secondary, counterproductive effects, which have now become salient and provides a detrimental contribution to safety (Dekker, 2014).

In search for a different approach, Bieder & Bourrier (2013) asks: “Would it be possible to assess the social construction of safety through a deep understanding of the conditions under which people work daily, which does not rely on paperwork audits?” (p. 5).

Hale & Borys (2013) underpins the question by Bieder & Bourrier (2013) in their description of two widespread and basic models of safety governance and oversight: One is centralized, top-down, where operators need to comply with centrally formulated rules, whereas the other is bottom-up, representing a constructivist view where rules emerge from best practices among experts. The former consider adaptations and deviances as violations, the latter not only leaves space for such, but see them as fundamental to safety as experts’ ability to handle inevitable arising needs is fundamental due to uncertainty in a complex, dynamic environment. This questions the regulatory model of detailed prescriptive requirements, which is overwhelmingly dominant within maritime safety. Hale & Borys (2013) and Gunningham (2015) refer to the importance of designing and applying appropriate rules that are adapted to the regulated area in question. They argue for striking the right balance between different types of rules combined in a complementary way: “Prescriptive rules”, “action rules”, or “means standards” which in details prescribe the means of how to achieve the purpose of regulation, “Process-rules” which prescribe necessary processes, but not the exact contents, “Principles” which refer to general duties, and finally “Performance goals”, which refer to overall requirements with regard to the desired outcomes of function and performance, but leaves it up to the enterprise how to achieve this (Coglianese, 2012).

Bardach & Kagan (1982) made a thorough examination of prescriptive regulatory regimes predominant in protective regulation. They discuss the growth of protective legislation in the US during the 1960’s and 70’s and argue that notwithstanding legitimate political intentions of protecting workers, consumers or environment against hazards, the method of enforcing protective legislation through strict oversight of compliance has been counterproductive. The authors consider regulation to be a blunt instrument that can hardly grasp the multifaceted reality in a wide range of regulated enterprises. By legal principle all are treated equal, despite local contexts, which will inevitably imply unreasonable and non-meaningful requirements. Industry’s

answer has often been reluctance, resistance and at best minimum compliance with written rules, not necessarily with intentions behind.

The authors call instead for flexible enforcement relying on reciprocity through responsiveness to views from industry, forbearance in achieving meaningful compliance and supplying information to regulated enterprise when needed (p. 130-131). They call for professional accountability by the surveying agency and its inspectors, not only in terms of skills in their specific trade, but also of their capacities as inspectors being capable of enforcing not necessarily the rules as written, but rather as intended.

Enforcing rules as written is the easy option, as rules prescribe rigorously how to comply. It gets difficult when rules cannot easily be complied with meaningfully or at costs that are unjustifiable compared to the expected safety gains. In such cases, inspectors shall be capable of going beyond written rules, and through a deep understanding of intentions behind, apply rules adaptively to obtain an equivalent level of safety by alternative means. However, the inspector shall also be capable of insisting on compliance when that is the viable solution. In either case, the inspector must be able to make sound professional judgments by using professional skills and knowledge while balancing differing views and needs while staying within limits set out by law. The inspector will face situations where strong interests from operator side will act against necessary decisions. Conflict is thus an inherent part of the job as surveyor (Bardach & Kagan, 1982).

Bardach & Kagan argues that inspectors need "...the wisdom of Solomon, the craftiness of Ulysses, and the fortitude of Winston Churchill..." (p. 150). Or in other words they need extremely high competencies that no single person actually possesses. Strong competencies will thus be a prerequisite for exercising power as necessary for enforcing rules, not only formally as they are written, but as they are intended.

Bardach & Kagan emphasizes that ideas of flexible enforcement may apply meaningfully in most cases, as people are generally well-intended, wish to protect against hazards and comply with law. In some cases however, enterprises are not necessarily well-intended in these terms, but may prioritize differently. In these cases, authorities will need to apply rigorous, strict enforcement and possibly sanctions to ensure compliance.

Gunningham (2015) advocates that effective management of health and safety rely on 4 essential pillars that are relatively easy to identify but difficult to achieve in practice:

1. Appropriately designed regulation balanced between needs of prescriptive regulations, process rules and performance goals;
2. effective implementation and enforcement;
3. competent and motivated enterprises/facility operators; and
4. genuine worker representation and participation (p. 757).

Finally, a central distinction concerns whether the operation in question is considered sufficiently safe or not and by whom. The envelope of safe operation may be defined and assessed differently by industry and authorities depending on their respective knowledge and interests (Dekker & Nyce, 2012). Dekker (2011) points out that in an increasingly complex world with ever more complex socio-technical systems, it gets increasingly difficult for authorities to actually fulfil its authoritative, protective role in the classic Hobbesian sense. Instead, a more consultative and co-operative role will be necessary to assess, influence and participate in governing high-risk, complex systems (p. 182-185).

2.3 Authority, power and power relations

Oversight concerns enforcement of law for the purpose of safety. The maritime authority as Flag State is intended to do this by acting as a barrier, or “line of defense” to catch up with vulnerabilities not sufficiently safeguarded by enterprises. This is ideally done through assessing activities and effecting changes whenever necessary. Behind this idea lies a conception of the State as protector, which may be traced back to classic political philosophy formulated by Hobbes in the 17th century (Peter, 2014)). In this view, the State is constituted and exercises its powers legitimately to protect its citizens. Max Weber termed such legitimate power as “authority”, which should be distinguished from “power as coercion” (Best, 2008).

Weber further argued that in a modern society, “legitimate rule” of a political order will be based on “Rational legal authority” (Best, 2002) which refers to a decision-making structure being legitimate through reference to a legal code as law. This will inevitably entail administration by bureaucracy (Best, p.7), which is characterized by hierarchical organization, specialization of the workforce and division of work, rational governing by abstract, formalized rules and rationalized decision-making at distance from front-line work (Best, 2008; Dekker, 2014). Weber argued that bureaucracy is the most effective form of administration in modern societies, but warned that it is impersonal, machine-like, alienating and further has an inherent tendency to “exceed its function and become a separate force within society” (Best, p. 10). Dekker (2014) refers to this as “Bureaucratic entrepreneurship”. Another side-effect of bureaucracy’s rational-legal character, division of work and hierarchical organization is structural secrecy (Vaughan, 1996).

Exercise of power is inherent in oversight processes concerning “assessing activities and effecting changes as necessary”. Max Weber defined “Power” in terms, which may be interpreted roughly as the ability of a person to get his/her will through despite resistance of others (Heiskala, 2001). This conception refers to an ability within a social context to dominate others to some extent with a view to effect outcomes as intended. Or as Dahl (1957) puts it: “A has power over B to the extent that he can get B to do something that B would not otherwise do” (p. 202). Dahl was concerned with issues of open conflict. Bachrach & Baratz (1962) added that exercise of power is not limited to open conflicts, but also flourish in keeping issues out of the agenda at all. They therefore extended Dahl’s definition to also cover covert conflict, where A gets his/her will through by avoiding open discussion of the issue whereby keeping B out of influence. Lukes (2005) referred to the former as power’s 1st dimension (Dahl) and the latter as its 2nd dimension (Bachrach & Baratz, 1962). Further, he introduced a 3rd dimension of power concerning manipulation by which A obtains power over B through making B believe and hence comply with the interests of A, even though this may be against B’s true interests (Lukes, 2005).

These definitions concern domination, where the powerful part A dominates the powerless part B. They all presuppose that actors A and B are well defined entities, persons or groups, acting in a social relation. Power then becomes a distributive game where more power with one part means less with another (Heiskala, 2001). Further the definitions concerned, at least originally³, exercise of power, i.e power as some sort of conscious, willful agency.

In contrast to this relational conception of power, “power-over”, exercised between actors, Morriss (2002) considers power as a disposition or capacity of persons or groups concerning their ability to effect outcomes. This concerns power in the notion of an agents’ potential or capability to do and make something happen. This is termed “power-to”. Whether the actors will actually

³ Lukes in his later version of his book “Power, a radical view” (2005) changed his view from seeing power as something exercised in favor of power as a capacity

be able to effect the outcomes that they are in principle capable of will depend on actual circumstances, for which reason Morriss (2002) speaks of “power as ableness”, i.e. power as an ableness of an actor to effect a specific outcome. Morriss argues that as power is essentially a dispositional concept, it can never be observed directly.

In contrast to the above perspectives, structuralist views concern power as something inherent in social or societal structures. One of the most influential proponents of such perspective was Foucault (Gutting, 2005); (Kusch, 1991). His arguments are complex and can impossibly be captured in few words (Gutting, 2005). Suffice it to say here that he was concerned with power not necessarily as willful agency of individual agents, but with power as structural, omnipresent and continuously exercised within social interactions throughout society between agents in their specific contexts of prevalent conditions and influences of any kind. Seen this way, power works “capillary” at micro-level in society’s network of social relations. Such micro-powers, or forces, may exclude or reinforce each other and will in some way sum up to power on superior levels (Kusch, 1991). This conception concerned power exercised in “internal relations of interaction”, in which power works through mechanisms that can be of multiple sorts, simple or complex, institutionalized or subtle and may work capillary or between different levels of society.

Hayward (1998) provides another structuralist view in which she considers power as a network of social boundaries that enable or constrain actors (defines fields of action) (p. 12). She notes that power relations may vary between extremes of “domination” as one endpoint and a “fluid” relation respectively at the other. By “Fluid” power relation she means an “equal”, dynamic power relation defined “...by social boundaries that are understood by all participants and that allow the maximum possible space, not only for action within, but also for effective action upon the boundaries themselves” (p. 21).

Despite the notions of “domination” and “power-over”, which may appear oppressive only, Foucault and Hayward consider that power can also be productive, depending on the power mechanism involved; some mechanisms may work oppressive, while others are enabling and productive (Kusch, 1991; Hayward, 1998). For this reason, Hayward “...resists drawing a firm distinction between "empowering" actions and actions that "exercise power over" for example, methods of teaching that enable and those that constrain students' freedom” (p. 19.)

Being able to effect outcomes implies moral responsibility (Morriss, 2002; Lukes, 2005). Morriss (2002) further argues that the link between power and responsibility is “essentially negative” (p.38), which means that lack of power to effect a certain outcome, means lack of moral responsibility for that. Lukes (2005) finds this insufficient, as being able to effect a certain ethically desirable outcome also implies being morally responsible for doing so (p. 68).

2.4 Responsibilization, empowerment or abandonment

A main factor in arguing for changes in public oversight is an expected benefit for industry and citizens of flexible regulation (Coglianese, 2012). This does not concern regulatory goals, but the means of how to reach them. In practice this will typically be pursued through reducing detailed prescriptions and hence Authority domination (its “power-over”), while at the same time increasing space for regulated entities to exercise their capabilities (their “power-to”).

Responsibilities of regulated entities then shift from a responsibility to comply with prescriptions to a responsibility to achieve overall safety goals. According to Morriss’ perception of a negative connection between power and responsibility (2002), such change is not meaningful unless the regulated entity possesses necessary powers in terms of capacities and abilities to manage these new responsibilities.

A precondition for this to work is that regulated entities are capable, motivated and aware of their responsibilities and what they are accountable for (Gunningham, 2015), or in Clarke's terms (2005), that they are "independent, activated and self-sustaining individuals" possessing authority to act. In addition to being capable, this presumes that they are empowered in terms of having "voice" and "choice" (Clarke, 2005); the former refers to the ability "speak up" and "being heard" such as to influence one's own conditions through mutual dialogue with authorities; the latter concerns having capacities and possibilities to choose between alternatives, which is a self-evident precondition for possessing power (Morriss, 2002).

In terms of power relations, empowerment and responsabilization concerns distribution of power from the powerful to the powerless. In the oversight context, it then entails less dominance by the Authority by transferring power and responsibility in terms of authority to act. This entails a more fluid relation of power between Authority and regulated entities, where one-way dominance by the Authority is softened up towards mutuality and shifts in influence. In such context oversight will tend to turn into monitoring and information exchange between equal professionals, which corresponds to cooperation rather than exercise of enforcement powers.

The said empowerment is however conditional as society's overall safety goals remain unchanged and hence must continuously be met. In line with Lukes' view of a positive connection between power and responsibility (Lukes, 2005), moral responsibility for managing in accordance with interests of society then is a precondition for the said empowerment and responsabilization (Clarke, 2005).

This view of empowering and responsabilizing capable and activated individuals by transferring powers and responsibilities from the State reflects essentially neo-liberal political theory (Clarke, 2005; Gray, 2009). It focuses exclusively on decentralized agency and does not pay attention to underlying structural, contextual features and mechanisms however influential they may be (Gray, 2009).

Clarke (2005), Gray (2009), Liebenberg et al (2013) and Gunningham (2015) points out however that populations are not homogenous, but diverse; not all agents can be characterized as authoritative, "independent, activated, self-sustaining individuals". Enterprises are not alike: Some are capable as they are motivated, competent and proactive, whereas others may rather be characterized as the opposite (Gunningham, 2015, p. 746). If such agents are responsabilized they will be unable to fulfil their role as self-sustaining individuals as they are powerless. In that case, assigning responsibility to them will be oxymoronic (Morriss, 2002), and rather than being "empowered" they will be "abandoned" if no further intervention is made (Clarke, 2005).

This questions then how society should manage its diverse population (Clarke, 2005; Gunningham, 2015). Companies are different and should be approached differently through targeted strategies depending on what is supposed to work in each case. In safety oversight, Gunningham (2015) suggests differentiation in regulation and enforcement based on capacity and motivation of companies as well as on the level of risks involved in their operation. Capable and motivated companies should be supported by systemic, flexible and risk-based regulation through dialogue based approaches. In contrast, prescriptive regulations and stricter, rigid enforcement will be necessary whenever companies are neither capable nor motivated, and enforcement is about imposing improvements. In the latter case, the power relation turns back into a more dominant relation. This should not be understood in an oppressive sense only, but also in terms of empowering actions (Hayward, 1998).

A difficult part for the regulator is to make correct distinctions between capable and incapable entities (Clarke, 2005; Gunningham, 2015). One approach of making such distinction may be through rational data-driven oversight where statistics on measurable, quantitative performance indicators are used as basis for an overall distinction (Mølgaard et al, 2016). This is dealt with in more details in a separate literature study in sections 4.3 and 5.3.

3. DESIGN OF RESEARCH - METHODOLOGY AND METHODS

3.1 Methodology

The research question concerns power relations between operators and Authority in terms of responsabilization and empowerment, inherent in different models of oversight as – or to be - applied in the maritime sector. These three models are

1. the traditional compliance based oversight as typically applied in oversight of International Conventions on maritime safety,
2. the new dialogue based oversight scheme introduced by the DMA, and
3. rational data-driven approaches.

Major advantages and disadvantages inherent in these with a view to their effectiveness in contributing to safe operation were considered.

The research question encompasses complex relations, interactions and mechanisms which are assumed to be hardly quantifiable, which calls for an interpretivist, qualitative approach (Blaxter et al, 2010; Creswell, 2013) based on observations of oversight as exercised under the different models. A pragmatic approach (Creswell, 2013) was chosen, by which the inquiry was organized and information was gathered by any readily available, practically feasible and ethically justifiable method, which effectively informed the study. The previous research referred to in chapter 2 provided the theoretical lens for analysis. Against this it would have been possible to formulate a hypothesis and carry out a hypothetico-deductive analysis. In order to provide a more open, examining study of generative character, it was chosen to apply an inductive and naturalistic approach (Blaxter et al., 2010).

As an insider, I had obvious possibilities of gathering data through direct observations during survey planning and surveys, scrutiny of documentation in procedures and files of the DMA and furthermore by drawing in professional experiences and insights of my own. At the same time, being an insider employed in the Authority under study also means inherent biases and a possibility of severe ethical issues. In the first place this may be due to asymmetrical relations to those operators and Authority employees under study. Secondly authority employees are by law subject to confidentiality concerning specific knowledge and cases which may be sensitive to individual companies or operators involved. This imposes substantial limitations on research methods and data sources. Obviously, interviews with operators and employees of the DMA would be problematic, and in case of using records of specific cases, this would be possible only if anonymity is respected.

Further limitations in availability of data follows from the fact that experiences with dialogue based oversight, and especially with data driven oversight within the maritime domain are few. The traditional compliance based model of oversight is historically rooted and may be said to

form part of the DNA of maritime safety and oversight. Examples are numerous and readily available. The ongoing transitions to dialogue based oversight are observable too, as the DMA begun implementation during 2015. When it comes to rational data-driven oversight it becomes more difficult to find readily available examples in the maritime context of Flag State oversight.

3.2 Method

The three models of oversight were examined separately in consecutive order reflecting the chronological development. In the Danish context, traditional compliance based oversight has recently been relieved by the dialogue based approach, which may in the nearer future be adjusted or ultimately replaced by data-driven approaches. Within this chronological order, a case study approach was applied for the compliance and dialogue based models respectively, whereas a literature study was used for examining the data-driven model.

To study the compliance based model it was chosen to gather data mainly within a special segment concerning smaller passenger ships trading exclusively within Danish ports. Data was drawn from relevant regulations, survey procedures and report forms applied by the DMA, and further from an accident report and conclusions from a court case in the wake of an accident with a sightseeing tour boat. In all cases I have only used publicly available information. These data, which all were in written form, were further supplemented by data gathered during participant observations during surveys conducted by the dialogue based survey model.

The newly introduced dialogue based oversight model applied by the DMA was examined by studying two specific survey cases. “Dialogue-based oversight” refers to the new survey model of the DMA as outlined in the introduction. The two survey cases concerned annual renewal surveys of two larger Danish passenger ships in scheduled service, both carrying a magnitude of $1.000\pm$ passengers, and having relatively large crews including catering personnel. The study was conducted by scrutinizing documentation relevant to the surveys such as regulations, correspondence, survey plans, procedures and reports.

The main bulk of observations were gathered through participant observations during the two surveys. During these I participated in principle as a “fly on the wall”, and made observations during formal and informal survey meetings as well as during survey interactions on-site in the different operational contexts and situations on board. For ethical reasons, I had prior to the surveys fully disclosed my position and purpose of participating to the companies concerned who agreed by written consent. Further, at each survey I fully disclosed my position and purpose of participating to the crew members concerned during the survey opening meetings and subsequently when participating in survey interactions whenever they involved crew members who had for some reason not participated in the survey opening meeting.

Observations made during survey interactions between surveyors and operators were mostly visual and silent. For ethical reasons due to asymmetrical power relations, I abstained from recording conversations and making interviews as such. However, as each survey took place over 2-3 workdays on board, informal conversations with surveyors and crew members came naturally and it is notable that people from both groups were seemingly curious on my research and raised questions and disclosed information on own initiative. I took note of such verbal information by taking scribbles and field notes with a view to capturing essential meanings, but did not record exact quotes. While I consider information gathered this way to be highly valuable as data, it is worthwhile to keep in mind also that it may be as biased as my own perceptions.

As the dialogue based approach was applied for the first time on the ships concerned during the two participant observation surveys, crew members on especially the one ship referred

extensively to the former compliance based approach. Even though the context here was not the same as for the sightseeing boats I used this information to inform also the study on the compliance based approach.

With regard to the study of data-driven approaches, they have not yet been applied in the context of Flag State oversight to any significant extent, and it has therefore not been possible to draw in specific cases as such. Instead data-driven risk- or performance based oversight was dealt with by drawing on a study of relevant literature on experiences from other industries.

For each model of oversight illuminated through data as described above, an analysis was made through applying a lens of Gunninghams' 4 pillars of effective governance of safety, i.e. by considering for each model the actual characteristics;

1. appropriate regulation,
2. effective implementation and enforcement,
3. motivated and competent companies/operators and
4. the level of genuine worker participation,

and through this to illuminate inherent distributions of responsibilities, perspectives on safety, main relations of power, and finally the possible implications with a view to effectiveness and efficiency. This is used to identify differences in these areas when going from the traditional compliance based oversight to either dialogue based oversight or possibly data-driven oversight.

The analysis then forms the basis for a discussion on overall effectiveness and efficiency of the three different models of oversight with a view to governing safety.

4 DATA AND OBSERVATIONS

4.1 Compliance based oversight

The case segment – Small passenger ships operating within port areas

Sightseeing tour boats operating exclusively within ports and similar protected waters constitute a special passenger ship segment. Due to the special operation in protected waters, special regulations are in place. In the Danish context, the ships are relatively small, less than 24 m length, of simple arrangement and carry normally up to 100-150 passengers. The company involved in the accident operates a number of identical vessels year round and carries a total of approximately 400.000 passengers a year.

Regulations

The safety regulations in place consisted mainly of

- Danish Act on Safety at Sea (No. 72 of 17th January 2017)
- Danish Order on passenger vessels exclusively engaged on voyages in port areas or on lakes, etc
- Danish Order on Safe Manning

The Act on Safety at Sea constituted the basic legal framework. Central passages in relation to governing safety are:

“...Section 2. Every ship shall be constructed, equipped and operated in such a way as to adequately protect human life at sea and in such a way that it is fit for the nature of the service for which it is intended at any time...

...

Section 3. The Minister for Business and Growth may lay down rules on the construction, equipment and operation of ships...

...

Section 17. ...

Subsection 2. The Danish Maritime Authority shall undertake the administration of this act...and its duty is

- 1) to ensure that the act and the rules, enforcement notices and prohibitions issued pursuant hereto are complied with,
- 2) to approve the use of ships...and... to issue the necessary certificates ...
- 3) to keep itself informed of the technical and social development within the framework of the act and to contribute to improving ships and their equipment and operation as regards health, safety and the environment.”

The *Order on passenger vessels exclusively engaged on voyages in port areas or on lakes, etc.* consists of the order itself with provisions on scope, definitions and sanctions followed by an annex with detailed prescriptions on surveys, certification, construction, equipment and safety management, structured like the International Convention requirements for larger ships, but with much simpler provisions. Operational issues are dealt with through a requirement of a safety management system according to the international ISM-Code⁴ originally developed for larger ships and companies under the scope of International Conventions. The *Order on Safe Manning* determines the number of crew members and required qualifications in terms of education and seagoing experience.

Making the Act and Orders follows a democratic process involving the public and stakeholders, especially ship owner and seafarer organizations, through extensive hearing processes during development.

Survey approach, procedures and practice

Until 2015 surveys were made by checking condition of construction and equipment through a checklist reflecting detailed prescriptions. The assessments concerned the boat and components with a view to condition, type approvals, numbers according to requirements, expiry dates etc. as prescribed and whether required documentation of maintenance, safety meetings, drills etc. was in place. The general requirements of the *Act on Safety at Sea* were not incorporated in survey procedures and checklists, and were not used for practical purposes.

According to practice the survey checklist was sent to the company in advance to facilitate preparation. Further, to carry out surveys efficiently and interfering as little as possible with commercial operation, a number of identical boats were surveyed simultaneously in a non-operative environment out of service with no passengers or crew aboard.

The safety management system verifications were carried out separately from periodic surveys on construction and equipment on different occasions by different surveyors. They were carried out by assessing system compliance with formal requirements, i.e. the process-rules, of the ISM

⁴ International Safety Management Code applicable to passenger and cargo ships under the scope of the SOLAS Convention

Code. Substantial matters on operational issues would not be touched, as the verification was intended to be a check of the system mechanisms, not of operational substance. The reasoning behind carrying out verifications independently from periodic surveys was to perform independent system control.

Periodic surveys and safety management verification reports contained a list of non-compliances to be rectified within a given period depending on the seriousness.

In the specific case, the company would willingly comply with requirements if explicitly imposed by the Authority with clear reference to prescriptive regulations. According to the Authority, the company's attitude could be characterized by the sentence: *"We wish to operate safely, tell us what to do, and we will do it"*.

The accident case

In short, a child passenger who was sitting aft close to the starboard bulwark had her arm severely injured between boat and pier during berthing operation. According to the accident investigation, the specific maneuver was not unusual and represented an everyday work situation (DMAIB, p. 4). The boat had been surveyed, approved and certified for operation annually, and, the company's safety management system had been verified and certified by the Authority annually (DMAIB, p. 7).

According to the accident report, the perception of safety among operators was based on belief in low risk operation due to sheltered waters with readily available assistance, ships considered unsinkable due to built-in buoyancy and a history with no major accidents. Likely influenced by this, safety was based on theoretical considerations and precautions rather than concrete safety assessments, practical considerations and exercises. Thus, the boats and their safety equipment were formally compliant, and the safety management system contained general instructions and precautions concerning scenarios as man-over-board, fire, collision, loss of maneuvering, evacuation etc. They were however of general character, based on theoretical assumptions rather than specifically tailored and practically feasible considerations and had not been trained and developed by realistic exercises. This may be illustrated by the approved stability information which assumed passengers to remain seated evenly distributed in case of a flooded vessel (p. 20). Further, structural barriers like bars or screens for protecting passengers when approaching piers, low bridges to be passed etc. were not present, symbolic barriers of relevant warning signs were not posted on board, and operational barriers such as safety instructions to passengers were limited. In consequence the sightseeing boats would not be self-sustaining in an emergency, but entirely dependent on effective alarming and quick external assistance (DMAIB, p. 20). The actual alarming procedure required the crew to contact the company instead of external assistance directly which significantly delayed assistance.

The accident was followed by a court case, in which main opposing arguments were (Court of Copenhagen, case SS 2-25388/2015)

- Company: We complied with all regulations and have been surveyed and approved for years by the Authority without any significant remarks. We have always reacted positively and implemented any requirements imposed by the Authority. We carried abt 400.000 passengers a year without accidents until this occurrence – it was an unforeseeable accident and we could have done nothing to prevent it (p. 2-3).
- Authority: The Company is responsible for operating its boats safely, which entails responsibilities beyond merely complying with prescriptive regulations. Surveys and approvals ensure that a certain minimum level of safety is present at the time of survey, which

constitutes a basis of the permit to operate. From Authority side, we check construction, equipment, crew certificates and that a compliant safety management system is in place as an infrastructure for safety management. It is a responsibility of the operator to work proactively to identify and mitigate risks. (p. 5).

4.2 Dialogue based oversight

Each survey was carried out over 2 days by 3 inspectors with backgrounds as ship master, marine engineer and naval architect. In both surveys company representatives were present. In both cases, the new survey form was applied for the first time on the actual ship. For comparison, compliance based surveys were carried out according to a 24-page checklist, and would require in total 5 surveyors over 2-3 days.

Regulations

The main underlying safety regulations were:

- *Consolidated Act on Safety at Sea*
- *Notice B from the DMA*
- *Order on [Safe manning]*

Relevant parts of the *Act on Safety at Sea* are identical with the previous example of sightseeing boats. “*Notice B from the DMA*” consist of a consolidated text of the requirements in main International Conventions on safety⁵ and living and working conditions of seafarers⁶. Regulations contain comprehensive prescriptions on surveys, certification, construction, equipment and navigation. Operational issues are managed through a safety management system in accordance with the ISM Code which is mandatory according to the Convention on Safety of Life at Sea.

The oversight model was implemented without changes of these underlying prescriptive regulations.

Surveys

According to the DMA instruction to surveyors, the purpose of the new surveys is:

“...to contribute to a high level of safety on board Danish passenger ships. The surveys shall verify that the ships are constructed, equipped and maintained in accordance with regulations and the intentions behind them, and that safety work and safety culture is manifested in daily work with the effect of safe and sound living and working conditions and such that the crew is able to operate the ship safely and to act effectively in case of an emergency”.

It is stated that surveys should verify that companies take on responsibilities in this respect.

Survey activities are:

- Preparation by informing the company of expected survey activities. The company is requested to submit time plan, and that safety representatives are present.
- Opening meeting in which crew, surveyors, safety representatives and company representative go through the survey plan. Surveyors explain the purpose to explore how

⁵ The Conventions on Safety of Life at Sea (SOLAS) and The International Convention on Load Lines (ILLC)

⁶ Maritime Labour Convention (MLC)

safety considerations and work is managed and incorporated in operation, and how it may be further developed. It shall explicitly be communicated that the purpose is not to examine crews or search for non-conformities. Further it shall be communicated that the DMA considers the company and crews as the experts in operating their own system.

- Evaluation 1: Dialogue on emergency response - each survey must comprise mandatory emergency exercises and additional emergency exercises of free choice within a theme chosen by the DMA. The exercises shall be conducted by crews with surveyors observing only and talking with crewmembers to facilitate reflections on responsibilities and possible interventions as the exercise unfolds.
- Evaluation 2: Dialogue on safety management and occupational health - Surveyors must talk to crewmembers, at least 2 persons of each category, during work in their own setting. Questions must take offset in a specific theme chosen by the DMA, but need not be limited to this.
- Evaluation 3A: Dialogue on operation and maintenance – The crews explain how they plan and carry out maintenance such that safety essential systems are maintained, tested and kept in good condition in accordance with prescriptions. Surveyors make spot-checks of procedures and components to cross-check and discuss observations.
- Assessment 3B: Risk based control of construction and equipment – Comprehensive spot checks of components are carried out. Depending on observations and dialogue they may extend to full checks.
- Certificate control – check of certificates
- Evaluation and report – based on dialogues, exercises and physical observations a final, holistic evaluation of safety work, -communication and -management is made. Survey instruction requires explicit focus on what seem to work well then followed by areas with identified potential of improvement. Holistic evaluation and main observations supporting it are documented in a report. Specific non-conformities and imposed requirements must be noted in appendix
- Closing meeting - surveyors provide feedback to company representative, ship management and safety representatives. Each evaluation 1-3B is explained and discussed. Surveyors are instructed to keep focus on the overall picture of the company's and crews' ability to operate the ship safely, whereas emphasis on specific non-conformities should be avoided. Surveyors should not prescribe specific solutions, but leave discretion for operators.

Finally, it is stated that annual verification of the company's safety management system covering all ships must be based on survey reports from each of the company's ships within the preceding 12 months.

Observations:

Both surveys were generally conducted as outlined above, however not as clearly structured, as the different assessments became more or less intertwined as surveys developed. The two surveys differed as one was conducted by experienced surveyors, whereas the other was conducted by surveyors with shorter experience. The team with least experience conducted the survey with closest adherence to the structure and contents outlined, whereas the experienced team carried out the survey according to acquired routines with significant emphasis on component checks, however with a strong focus on close dialogue with crew members on what they observed.

Main observations were as described below:

Generally, dialogue between company representatives, crew members on all levels and surveyors was extensive. In some cases it evolved during interviews, but mostly during survey interactions

when observing normal work and exercises, and in subsequent follow-up. The atmosphere appeared constructive and open, and crews and surveyors entered into dialogue, both generally and when discussing specific issues. Surveyors' approach was listening and acknowledging to operators' expertise as well as the company's efforts in management.

Immediate observations on condition of ship and equipment, working patterns and heuristics, effectiveness of operational procedures, emergency response etc. served not only as ends in themselves, but rather as a platform for dialogue providing insight for surveyors and an opportunity to discuss issues on technical systems and organization of work. This way, topics on organization and safety management were discussed beyond what explicitly followed from prescriptive regulations.

The dialogue seemed effective for getting insight in company's and crews' knowledge and handling of systems, working patterns, perceptions of safe operation and safety management. At a specific occasion, an emergency exercise did not develop as intended according to the procedure set up, but crews succeeded to cope with the unexpected variation and successfully completed the exercise. The ability to cope anyway was explicitly acknowledged by surveyors in the aftermath discussion rather than considering the observation as a deviation. In another specific operational situation, a surveyor engaged in dialogue on use of hard hats, but without concluding or imposing any requirements. The officer in charge returned at the end of survey indicating that it was right to take up the subject and that it needed internal discussion on board after survey.

Emergency exercises and tests illuminated on board ways of working and uncovered issues that likely had gone untouched if only the documentation had been checked as in a traditional compliance based survey. In these cases, observations were dealt with directly by crewmembers that initiated solutions.

In two instances, observations concerned malfunctions of essential safety systems, which needed immediate repair. This caused substantial delay with abt 500 passengers on board. The proximate, technical issues were solved by crews with little intervention from surveyors, who merely informed the master that the ship would not be allowed to depart (a "soft" informal detention), where after they withdrew to let crews do their work. The malfunctioning systems were discussed afterwards in a constructive dialogue on proximate technical issues as well as more systemic perspectives. These systemic issues were however not brought up as intended during the subsequent annual safety management verification at the company's head office.

Conflicting views were discussed on spot and if not solved directly, taken up subsequently with ship management or company representatives. In some cases, surveyors' immediate views were followed, in others not depending on arguments and discussion. In a few instances, issues of conflict, or potential conflict, were not discussed openly or left untouched, apparently because the case was not sufficiently clear, deemed out of survey scope, considered counterproductive or because surveyors judged it might have had too big consequences for the company to insist on a requirement compared with the safety risk at hand. There may well have been issues where operators have kept things out of surveyors' sight or knowledge, but for obvious reasons this was not observed directly. Some operators mentioned however examples of how – in theory – they might get around with such.

Surveys were reported with emphasis on holistic assessments based on observations during interviews, exercises, walk-around-the-ship and random spot-checks of compliance. The assessment concerned condition of the ship, management of operation and maintenance during

normal operation, crews' ability to handle an unforeseen situation, management and communication on safety. Non-conformities to be rectified were reported in an appendix to the report. The ships' certificates were renewed on this basis

Crews and company representatives expressed

- Generally a positive attitude towards oversight; most expressed need for competent oversight and found surveys desirable for providing an external perspective, and requested surveys to add value. In one survey crews acknowledged explicitly the new dialogue based surveys as less adversarial, more cooperative and effective in assessing operation due to dialogue on operation, maintenance and exercises rather than documentation, and this way having a stronger potential for identifying areas of improvement. They welcomed the acknowledging and holistic approach, and several crew members expressed relief that the former approach, which they found adversarial, rigid and fault-seeking, was gone. They referred explicitly to examples during former compliance based surveys of formal requirements which they perceived meaningless in the actual context, but which were enforced rigorously anyway.
- Also critical views concerning oversight in general and the dialogue surveys in particular. With regard to the former, one operator expressed that surveys should be concentrated on companies and ships with known problems, whereas it was superfluous on well operated companies and ships. Other operators expressed a critical view on the lack of structure of the dialogue based surveys and also about the reduction of compliance checks.
- A mainly positive, but also critical view was expressed that the new surveys were “much better”, less control-like, more open to views from operator and company side, and in that way in line with the way they wanted to work within the company itself. It was acknowledged that the new surveys had identified and caught up operational issues that a traditional survey would not have, and further that surveys were held in a better atmosphere and that crews apparently liked the new surveys better, and that they simply were less afraid of them. One mentioned this as a reason why they now had experienced fewer problems with sick-leaves prior to surveys. On the drawback side one made reference to the less comprehensive component checks and further that surveys could benefit from a more clear structure. He expected it to be easier for operators to talk around and get away with things if not captured during spot-checks.
- A company representative stated that they “honestly speaking” did not experience any big difference between old [compliance based] and new surveys [dialogue based].

Surveyors expressed:

- Mainly belief in the new way of working. One found that this way of conducting surveys was much better: “We ask questions, they answer, which leads to our next question that they respond to and so it evolves. This way we get a good understanding of how they work. We try to meet them as equal professionals to discuss their work and operation. By doing so we recognize their competencies and their work. I have only met willingness to explain their work. When they trust us, they don't hide things so much anymore. Since we started this, they have begun to contact us in between surveys to discuss and get advice. They didn't do that previously. We have a better relation now”. Another surveyor expressed that the former surveys were just a matter of going through a check-list, which he didn't find motivating as it did not take it beyond the plain rule. He found that it was not useful for crews either, as they just had to do what was in the checklist. To his perception, the new way is more meaningful and capable of getting an idea of how things are managed.

- Also critical views concerning that the dialogue based surveys can be difficult to structure and that there is a risk that dialogue gets superficial and turns into “small talk” rather than substantial issues.
- Further, some experienced surveyors were positive to the new surveys of dialogue, but did not find the approach that “new” as they argued to have always talked to crews and applied a flexible approach based on their “Fingerspitzgefühl” and interpretation of regulations.

Especially with a view to power to effect changes in the companies, the following was stated:

- “We have power to change smaller issues. We can require smaller issues and require changes if prescriptions clearly backup. Otherwise it may get difficult, unless it is a serious, obviously safety related issue. We can also detain a ship for a shorter while, if we have clear grounds backed up by regulations. But when it comes to safety management and how they actually operate and prioritize it gets very difficult to stop operation as long as the ships formally comply – no matter how clear it is to us that the actual safety management is poor.
- “We may face strong forces from up the hierarchy against our requirements if the company does not like them. It may involve top managements, organizations and ultimately even players in the political system.

4.3 Rational data driven approaches

Regulation is about ensuring that outcomes within acceptable limits (Bardach & Kagan, 1982). Traditional compliance based regulation tries to accomplish this through prescribing specific means. In contrast data driven approaches focuses not on means deployed, but rather on results achieved, which in turn presumes measurement. The latter is coined in the slogan: “You can’t manage what you don’t measure” (Kravchuk & Schack, 1996)), the point being that effective management depends on measurement of performance data as a precondition for providing knowledge about actual levels of goal achievement.

In this context, the term “Rational data-driven approaches” refers to goal-based approaches relying on collection and analysis of measurable performance data for the purpose of rational decision-making. Such methods have been introduced in public administrations in many countries under the umbrella of “New Public Management” (Mølgaard et al, 2016).

Common to such approaches are four basic steps (Mølgaard et al, 2016):

1. Defining measurable safety goals
2. Deploying efforts (activities, means and resources) assumed effective in contributing to reach the goals
3. Monitoring effects (outcomes) and assess the level of goal achievement
4. Decision making based on gathered knowledge

With this general description the term accommodates specific applications such as “result-based management”, “performance based management”, “risk-based management” or the like. Risk-based oversight can be considered a special form of performance based, as it is similar in the basic approach, but differs by being focused on directing efforts towards entities that are considered to pose highest risk (EASA, 2014). This concerns so called “under-performers” with risk profiles and performance data below what is considered acceptable.

As acceptable outcomes are in principle the essential target of any regulation and oversight, data driven approaches may be perceived as focusing directly on goal achievement, which are the purpose of regulation while leaving the means for regulated entities to decide. This way data driven approaches provides, at least in theory effective and efficient efforts, while providing, flexibility and possibilities for local adaptation and innovation in industry.

This is a main argument behind a common perception, for instance in US governments (Coglianese, 2012), of data driven, performance based approaches as desirable and superior to traditional, prescriptive oversight. Evidently, such will be on the expense of standardization and consistency, and in terms of accountability, they move bureaucratic accountability of adhering to prescriptive regulations to accountability for results (May, 2003).

Central to the concept is definition of quantitative goals, acceptance criteria, measurements, monitoring and assessment of safety performance (Mølgaard et al, 2016). This is however not as straight forward as it may appear. Safety for instance is a concept that is notoriously not easily defined, and to measure it poses significant challenges. As put by May (2003): "...For many instances it is not possible to undertake direct assessment of outcomes. The systems may be too complex or the outcomes to be prevented are unobservable. The safety of a nuclear power plant cannot be directly observed, nor can the safety of a building with respect to earthquakes, fire or other potential harms..." (p. 386).

To attempt practical measurement, monitoring and assessment of goals that are not easily defined and quantifiable, "indicators" are commonly introduced. This term means observable measures that provide insights into a concept – in this case safety – that is difficult to measure directly (Swuste, 2016). Extensive research on safety performance indicators and assessment of their efficacy has been undertaken by many, Hopkins (2009), Hale (2009), Grote (2009), Dyreborg (2009), Wreathall (2009), Reiman & Pietikäinen (2012) and Swuste et al (2016) to name a few.

Typically certain types of outcomes are used as indicators, for instance numbers or rates of accidents, incidents, injuries or fatalities. They concern past outcomes, and are then considered "lagging", and may be used reactively in safety management (Hopkins, 2009). Safety performance is however not only reflected by outcomes, but also by "presence of certain activities to manage risk" (Sarter et al, 2010; Hollnagel, 2014). The existence (or lack of same) of such activities may then from a foresight perspective be perceived as precursors, i.e. "leading indicators". These may concern activities assumed to promote safety management, or observations of system states made during such activities (Hopkins, 2009; Reiman & Pietikäinen, 2012). The assumption is that such indicators carry information on performance. It is notable though that quantitative indicators do not necessarily carry qualitative information. For instance certain activities or observations assumed to be lead safety indicators may well turn out to indicate the opposite. Examples of could be "Number of safety or risk assessments performed per year" or "Number of internal safety audits per year" (Banda et al, 2015), where high numbers are assumed to indicate an effective safety management system. The number in itself does however not tell about the quality or effectiveness of such assessments or audits. High numbers may as well reflect wasteful, unproductive systems generating numerous low-quality audits and assessments undertaken for purely formal or even ulterior purposes.

Further, the distinction between lagging and leading indicators is extensively discussed (Hopkins, 2009; Dyreborg, 2009). Leading indicators may be understood as lagging as they reflect something that has occurred, and lagging indicators within a larger population may identify trends as leading indicators. The perception as lag or lead of an indicator depends on where in time and on which level they are considered (Dyreborg, 2009).

Based on the ideas of an “incubation period” (Turner, 1978), the “normalization of deviance” (Vaughan, 1996) or “practical drift” (Snook, 2000) which point to developing slides of practices towards the safety boundary, Leveson (2011) argues that precursors or “leading indicators” likely exist, and to the extent they are identifiable and practically observable, they carry potential for prediction of accidents and incidents. According to Dyreborg (2009) such identification and observation of precursors will be necessary for proactivity in safety management. However, as stated by Grote (2009): “The very difficult issue is to establish good precursors that have sufficient predictive validity”. This implies that a causal relation between leading indicators (modifiable conditions influencing safety) and lagging indicators (outcomes) need to be established, either through sound knowledge (Grote, 2009) or practical or scientific evidence (Dyreborg, 2009).

Such establishment of unambiguous cause-effect relationships between precursors and outcomes is far from simple. It may be possible only to the extent that the systems concerned are understandable and manageable, but in case of complexities, which are per definition intellectually unmanageable (Leveson, 2011), it will be difficult, if not impossible. As mentioned by Swuste et al (2016) “Gradually it becomes clear that...safety indicators are a complicated topic. Failing management factors and...barriers are scenario-dependent and scenarios appearing in the bowtie metaphor [probabilistic risk analysis] as straight lines can in reality develop rather capriciously”. Serious accidents are never the result of one assignable error or malfunction, but of a pattern of events which have their roots in the technology, the organizational and management domain. It is questionable whether such a pattern can be caught by one or a limited number of indicators” (p. 166). Hale (2000) notes: “The indicators need to be kept comprehensible and transparent. The more there are, the more likely it will be that they show apparently contradictory measurements or trends. They must be linked to a very clear set of models or frameworks about how the safety management system works, so that all concerned can see at a glance what aspect the indicators are measuring. This is not easy in complex systems...” (p. 11).

Adding to the above, Swuste (2016) notes that grand theories of safety science, such as path dependency, normal accident theory, high reliability theory and resilience engineering all seem to suggest different aspects as relevant for prediction and hence for identification of meaningful leading indicators.

Identification of meaningful indicators in dynamic, complex systems is thus a complicated unresolved topic (Kongsvik et al, 2010; Swuste, 2016). Wreathall (2009) refers to practical attempts this way: “This author has seen enough organizations where indicators are “used”, but only in terms of the data gathered being entered in a spreadsheet and colored graphs plotted and put on display boards or just presented in management briefings. These do not represent any meaningful use of indicators”.

Adding to these difficulties, performance based approaches imply unintended negative side effects (Møller et al, 2016). One is manipulation with results, or “number-gaming”, or as put by Hopkins (2009): “...the moment there are consequences attached to performance with respect to an indicator there is an incentive to manage the indicator itself rather than the phenomenon of which it is supposed to provide an indication”. Such leads to significant misinformation on actual performance driving true information underground (Dekker, 2014). Another is the “Teaching-to-the-test” phenomenon concerning that tests directs teaching to focus on students’ test-performance rather than on genuine education. According to Coglianese (2015): “...[it is] worrisome...[if] such educational testing actually worsens the quality of instruction, as students are taught strategies to score better on tests rather than working to develop deeper academic

knowledge and cognitive skills”. Another salient example of this mechanism at work was Volkswagen’s installation of software ensuring compliant measurements of emission levels of car motors in tests only, but not in real life use, whereby the purpose of regulation was bypassed (Coglianese, 2015).

Referring to the New Zealand “Leaky Buildings” case concerning thousands of homes in urgent need of reconstruction due to unenforceable goals in a performance based regime, May (2003) refers to enforcement as the “Achilles heel” of performance based regulation (p. 384). Coglianese (2012) notes that a main purpose, flexibility for regulated entities, is often an illusion as technology and other limitations dictates specific means as the only practical solutions despite theoretical flexibility offered by goal standards. Hopkins (2009) argues that presence of a significant statistical population is necessary for providing information, which is often not the case, for instance when considering mishaps in already safe systems. A further issue concerning measurements is that it is not always practicable to measure what is important, but only what is possible to measure.

Coglianese (2016) summarizes that performance based regulation is “...clearly not a cure-all. [Its] success ultimately depends on a regulator’s ability to specify performance and then to measure and monitor it accurately, conditions that will not always be met”. As defining meaningful goals, and monitoring that they are adhered to is often difficult in practice he notes that “...the unbridled enthusiasm for performance-based regulation needs a reality check”,

Referring to limitations of quantitative indicators when applied to address dynamic, complex causal relationships concerning organizational and systemic qualities, which are often considered “root causes” of large scale accidents, Kongsvik et al (2010) propose that quantitative approaches need supplement from qualitative approaches, for instance by using “action research” methods involving all levels to reveal significant knowledge of system specific organizational hazards that are unquantifiable or hitherto unknown. Such knowledge may be used proactively to “construct tailored and local quantitative organizational safety indicators that address specific safety issues” (p. 1409). They thus argue that qualitative and quantitative approaches are desirable to support each other mutually.

5. ANALYSIS

5.1 Compliance based oversight

The following analysis is based on data from the sightseeing boat case and observations made during passenger ship surveys, as during the latter both surveyors and operators referred extensively to the former compliance based surveys.

Pillar 1: Appropriate regulation

The already quoted sections of the *Act on Safety at Sea* constitute central parts of the regulatory framework concerning responsibilities on maritime safety and oversight.

Section 2 of the *Act on Safety at Sea* stipulates overall principles: “*Every ship shall be constructed, equipped and operated in such a way as to adequately protect human life at sea...*”. It specifies no concrete means in terms of prescriptions or performance goals, but responsabilizes shipping companies and operators, to operate “adequately” safety. It constitutes an example of “*Principle-based regulation*”, which provides a “moral compass” but need complementary regulations of other types to operationalize it (Gunningham, 2015). Such are introduced by Section 3 *Act on Safety at Sea*,

which responsabilizes the State to lay down specific rules on construction, equipment and operation of ships, i.e means that operators must comply with to create “adequate” safety. With this legal basis, the practical means are prescribed in the Orders containing detailed provisions on survey, certification, construction, equipment and manning etc. and bureaucratic processes of managing safety. Section 17 of the Act requires the State to oversee that rules laid down are complied with, and further that the State “...*keep itself informed of the technical and social development ... and... contribute to improving ships and their equipment and operation as regards health, safety and the environment.*”

The linkage between overall principles of section 2 and detailed prescriptions of section 3 and underlying Orders is described neither in the Act nor in Orders. It is not clear whether compliance with the Orders should be considered “adequate” to fulfil the principles of section 2, or whether they should rather be seen as a basic platform for safe operation. This ambiguity is at the core of conflicting arguments of both parties drawn up in the court case in the aftermath of the sightseeing boat accident:

- The company argued it had complied with detailed prescriptions for years since its ships and safety management system had been approved annually, and therefore considered its legal obligations fulfilled, including overall principles of section 2, and was then free of legal responsibility. This view seems to be well in line with the general tendency as pinpointed by Amalberti (2013) of companies’ reluctance to go beyond compliance. It assumes rules and regulations as set by the Authority to define an “envelope of safe operation” through controlled safety (Amalberti, 2013) and proceduralization (Bourrier, 2014) to keep performance variability within safe limits. This corresponds to the Safety I perspective (Hollnagel, 2014). Further, the company’s view presumes that the Authority in a Hobbesian sense is responsible and capable of prescribing and enforcing rules that will exhaustively ensure safe operation. Such Authority intervention would directly govern operators’ choices and would presume full predictability and manageability of safety, which presumes a Newtonian perspective.
- The Authority considered compliance only as the necessary basis for safe operation, which would need additional local proactive safety management by the company to operate safely in accordance with the overall principles of section 2. The Authority considered that the company as proximate agent would be closest to identify risks and act accordingly. This view is concerned with safety as not fully predictable, but rather as an emergent property of complex systems where managed safety and local capacity to adapt is required to manage performance variability and uncertainty. This view goes beyond reactive safety management and proceduralization only, and contains a focus on proactiveness as of the Safety II perspective.

Pillar 2: Effective implementation and enforcement

Survey procedures, checklists and report forms show that practice did not explicitly refer to the principles of the Act on operators’ responsibility to operate “adequately” safe. Instead, checklists consisting of numerous pages of tick-boxes for the renewal survey, and many pages also for the safety management audit, reflected prescriptive regulations in an abbreviated way. Each check was then simple to perform, and constituted an “end” in itself to be incorporated directly in the report. A filled-out checklist documenting compliance of all components would constitute basis for approval and certification for operation. This rule-based, standardized process is essentially reductionist and bureaucratic.

Surveys of construction and equipment on the one hand and safety management system assessments on the other were carried out during separate audits by different surveyors. Observations made during technical survey were then not taken into consideration during safety management audit, thereby not facilitating assessment of whether the safety management system actually served to effect desired ways of work, and interactions between technical components, operational procedures, maintenance and management. Instead safety management verifications concerned bureaucratic mechanisms only, while surveys concerned compliance of single components. This reflects a bottom-up exercise without directing attention to systemic issues. Surveys then concerned reliability on component level only, but not safety on enterprise, not to say system level (Leveson, 2011). This is most saliently reflected by surveys carried out alongside in a non-operational context with no crew members on board, whereby operational aspects and interactions would not at all become visible to surveyors. This practice left little to no space for emergency exercises and discussions with crews about safety strategies. The survey practices were seemingly satisfying bureaucratic needs and goals rather than the substance in terms of practical arrangements and work-as-done on board and in the company as a whole. The oversight practices do not seem effective when seen in the light of Amalberti's golden rules of intervention concerning inter alia system, enterprise and workplace levels, while focusing on "doing well what can be done", paying attention to what cannot be done, focusing on recovery as well as prevention, and communication with all workers on safety strategies,. Similar remarks apply to the oversight capability of assessing the actual level of proactive safety management as undertaken in practice.

As the ships were approved year after year with only few non-compliances the method effectively ensured compliant ships. Bureaucracy constituted by the institutionalized complex of rulemaking, rules in terms of the Orders, and the oversight process of surveillance, enforcement and approvals constituted the main mechanism of power. It may be seen as an example of Weber's "rational legal authority" (1925), which is essentially a "top-down" approach where the Authority dominates companies and operators through legal powers entrusted by political and public mandate to prescribe and enforce rules. On micro-level, mainly operators but also surveyors referred to a dominant relation with mainly one-way communication and a rather inflexible approach dictated by regulations. The company's arguments in court, which may be paraphrased into "We wish to operate safely, tell us what to do, and we will do it" reflects this domination.

Within the scope of prescriptive regulations, rules, checklists and formal approval formed specific means of power which directed focus of attention of operators and surveyors towards explicit prescriptions. These means shaped and reinforced a tunnel view on what is explicitly in rules and survey checklists, while simultaneously creating blindness towards any other issues like specific risks emerging during operation, organizational issues, or more generally how safe operation was managed within the company. This may be illustrated by the accident report noting that the sightseeing boat was operating with several unmanaged risks, for instance non-presence of simple physical or operational barriers against passenger injuries when berthing, passing low bridges etc., which had not been identified during surveys. Such blindness towards non-prescribed issues constitutes a form of structural secrecy (Vaughan (1996), which may explain why the theoretical perception of safety among operators and surveyors as referred to in the accident report, was not challenged by surveys, but were rather re-instated by them.

In such "areas of blindness", the bureaucratic mechanism of power was non-effective, exemplified by the above and more saliently also by the statements of survey managers on the Authority's inability in general to affect any company's proactivity in safety management, at least as long as the ship and its safety management system are formally compliant and there is no indication by incidents or the like of ineffective safety management.

Based on oversight practices and results in terms of annual approvals together with the survey manager statement of above, it appears that the dominant power relation on specifically regulated items changes outside the clear scope of prescriptive regulations. There, in the area of managed safety, the power relation turns away from dominance and towards an equal or fluid power relation (Hayward, 1998), as the Authority faces great difficulty in effecting changes as found necessary. In case of non-regulated matters then, operators and companies were in fact responsabilized, although not explicitly by detailed prescriptions, but rather by default due to the general obligation of companies to operate in an adequately safe way (section 2 of the Act). They were also abandoned as such issues were not dealt with in oversight at all.

From the Authority's arguments in court it follows that approval does not cover safe operation in an exhaustive manner, but is rather an acceptance of compliant ships and a bureaucratic safety management system as a necessary basis for managing safe operation. In contrast the company's arguments seems to reflect a perception of "approval" as the Authority's acknowledgement of "safe operation" understood exhaustively as from a Newtonian and Hobbesian perspective. By this perspective the Authority gets responsabilized for any outcome provided that the ship is approved and in compliance. The logic being that since the ship was surveyed and approved by the Authority according to rules it had implemented, the accident must have occurred due to some failure in either regulations or in oversight, which in any case will be a matter under the Authority's responsibility. Hence the stance "*We wish to operate safely, tell us what to do, and we will do it*" implicitly means: "*We want you to tell us what to do, and when you have done so, the safety of our passengers is your responsibility!*"

As the survey process is standardized, transparent and repeated year after year, it would be rather easy for operators to predict what would be surveyed and how, and then to prepare accordingly. The Authority's practice of submitting the checklist to the company for preparation more or less formalized this process. In this companies then had by default effective means of power available to dominate the Authority: By complying with the specific, well-known set of reductionist, prescriptive rules, the Authority is as stated by some surveyors obliged to approve the ship for operation, possibly despite observations or doubts concerning safety related issues as long as they are not explicitly regulated. This way the Authority gets responsabilized while operators correspondingly get de-responsibilized, the central means of power to effect this reverse domination being for operators to ensure compliance with prescriptive regulations.

The bureaucratic approach of compliance based regulation and oversight then does not only imply bureaucratic accountability "up" the safety control hierarchy as identified by Dekker (2014, p. 351), but also a simultaneous responsabilization "up" of the Authority.

Pillar 3: Capable and motivated companies/facility operators (crews)

The company considered its responsibility was to comply with rules, and that it had evidently done so effectively since surveyed and approved for years without substantial remarks, and further it referred to an excellent accident record. The company then considered itself proven to be motivated and capable, which makes good sense if applying Newtonian and Hobbesian views on safety and role of the State. From the Authority's perspective, which rather perceived safety as an emergent property, the picture was different. Without going into any substantial discussion of the specific case, it suffices here to say that to the Authority, the accident revealed vulnerabilities in safety work and proactive safety management, despite evident compliance to the letter.

The perception of the company's capability and motivation depends then entirely on which underlying perspectives on safety and responsibilities that are presumed.

The focus of attention towards formal approval creates extrinsic motivation for operators to comply in order to obtain approval, but it provides no incentive or inspiration for operators to improve proactive safety management. Further the purpose of compliance means that surveys are inherently focused on non-compliances, since what is distinct and deviant is what is looked for. This is reflected by the fault finding approach referred to by operators and survey reports containing only negative reporting. According to operators, this focus on negatives was counterproductive and created adversarial surveys and resistance rather than constructive cooperation. Finally, as the compliance based approach is self-evidently developed for ensuring literal compliance, it left only narrow space for enforcing flexibly. In the passenger ship cases, operators referred to many examples from earlier compliance based surveys of strict enforcement to the letter, which they found meaningless, troublesome and annoying. As requirements were made anyway, operators referred to surveys as demotivating and disempowering.

Pillar 4: Genuine representation and participation of workers (crews)

The top-down approach did not invite for operator participation. Especially on one passenger ship operators referred explicitly to the compliance based survey practice as a one-way communication, which left little space for alternative perspectives or options. Operators had then neither “voice” nor “choice” in direct micro-level interaction to influence contents or decisions of surveys. They were hence neither empowered nor responsabilized as “activated citizens” in neo-liberal terms capable of managing own safe operation. Rather they were acting under the responsibility of the Authority who had made the rules, enforced them and finally approved the ships. The sightseeing boat company’s perception of being freed of responsibility as long as its ships and safety management system was approved reflects this. Disempowerment by excluding worker participation to any significant extent is explicitly illuminated by the practice by which a technical manager and one operator selected by the company and the surveyors interacted directly during checklist-surveys of numerous boats in a non-operative environment without crews on board..

Through the process of rulemaking, the company and operators had influence through the democratic hearing process including shipowner and seafarer organizations. According to Authority representatives, owner and seafarer organizations had this way considerable influence on final regulations. There are thus notable limits to the Authority’s power in terms of ableness to impose regulatory provisions if they are not supported by owner or seafarer organizations.

Responsibilization, empowerment and effectiveness

The above outlines an approach effective in ensuring compliance with prescriptive regulations, but which entails ambiguity about responsibility for safe operation, tunnel view on detailed prescriptions and the surrounding bureaucracy, while omitting focus on the company’s proactive safety management in terms of continuous efforts to reduce risks inherent in operation in its local context. The dominant, top-down approach left little space for adaptation and vigilance, and did not empower, but rather responsabilized and abandoned operators on aspects not covered by prescriptions, although this was implicit.

5.2 Dialogue based oversight

The following analysis is based on observations during annual surveys of two passenger ships. During these, operators and surveyors referenced the dialogue based surveys with the former compliance based approach also.

Pillar 1:

Appropriate regulation

The underlying regulations consisted basically of the Act on Safety at Sea and a set of prescriptive requirements in a detailed Order, Notice B from the DMA, which essentially implements international conventions into Danish Legislation. In principle this is the same kind of regulation as was dealt with in the sightseeing boat case, the only difference is that the detailed Order in this case was far more comprehensive as its provisions are designed for large ships in international trade. In principle, the Orders are however very similar in structure and basic line of thought as they contain a set of requirements on construction, equipment, navigation and safety management, thereby introducing a comprehensive set of structural, functional and operational barriers aiming at “defense in depth”.

The regulations had not been changed to facilitate the new dialogue based approach. In principle survey provisions were designed for the traditional approach of requiring comprehensive compliance checks of regulated items and issues. The same observations on safety perspectives and responsibilities as for the compliance based surveys (see section 5.1) therefore apply in principle for the dialogue based context too. It must be said though that as there was no court case to observe, arguments were not drawn up explicitly, and especially not sharply as in the sightseeing boat case. On the contrary, the approach of the new dialogue based surveys seemed to soften up the sharp edges of prescriptive regulations, even though compliance is still an issue.

Pillar 2:

Effective implementation and enforcement

Survey instructions outline an approach containing basic elements of the traditional approach, but which is significantly developed. The former is necessary as surveys need to document compliance with International Conventions, and then still need to end up with formal approvals and certification. In contrast to the former approach, the contents and reporting of surveys do however reach into how safe operation is actually managed on all levels. This way surveys have evolved from looking at controlled safety only into reaching also into managed safety as far as unfolded during dialogue in work settings and emergency exercises.

From this perspective, controlled safety as defined by prescriptive regulations forms basis from which operators are responsabilized to manage operation proactively to learn from operation to identify and handle risks as they emerge with a view to maintaining the ship and its equipment, and to prepare and build capacities for responding effectively to worst thinkable emergency scenarios whatever they may be. It maintains focus on safety work and normal operation as intertwined and concerns safety as an emergent property of normal operation. Rather than pretending exhaustive control and approval as sufficient for “ensuring” safety, surveys are meant as Authority’s look into how the company and crews on all levels work to create structure implying a certain level of control while also acknowledging and thereby urging and supporting adaptive capacities to continuously manage uncertainty. This follows from ongoing dialogues and discussions of observed conditions and activities, which served to create attention, consciousness and mutual learning for operators, company representatives and surveyors.

This corresponds more with a view of safety as an emergent property of complex systems which contrasts the reductionism of the former compliance based surveys and represents a development from Newtonian and Hobbesian perspectives and belief in exhaustive governance of safe operation through regulation. The perspective of safety and operation as intertwined and observed during operation through concrete observations and discussions on physical conditions, operational patterns, maintenance, emergency preparedness and how this is all managed, whether proactively or not, yield substantial insights into how process safety as well as workplace safety is organized and practiced. This seems to reflect essential elements of Amalbertian “Golden rules” (address system, enterprise and work place levels, focus on “doing well what can be done”, prevention and recovery, safety communication with all levels etc.) as well as of the Safety-II

perspective (proactivity in management of safe operation). Rather than being directed by bureaucratic goals, the surveys served to get an understanding of work as undertaken as starting point for dialogue. This way the company and its crews are seen as experts during the survey. This was stated explicitly during the opening survey meeting, but was also emphasized in survey practice.

The approach changes the overall power relation. The dominant relation inherent in the compliance based surveys still exists, but was given less emphasis. Instead, professional knowledge of operation and safety as well as communication skills was given more space and weight. They then became salient means of power exercised during micro-level survey interaction on the expense of rules, which hitherto worked as the only means inherent in the institutionalized mechanism of rational legal authority. In this regard surveyors normally have an educational and professional background which is similar to that of operators. The main differences concern operators' deeper in-depth knowledge of their specific system, and surveyors' more diverse knowledge gained from surveys of numerous other companies and ships in different segments. The dialogue unfolded as exchange of views between equal professionals and it was notable that prescriptive regulations became secondary in these processes in the sense that they were not the focal point of everything. The relation thereby changed towards a more fluid one. This was amplified through the explicit acknowledgment of operators as experts in own operation and the focus on how safety work was actually managed and undertaken as part of normal operation rather than the focus on negatives inherent in the compliance based approach.

Flexible enforcement was inherent in this relation as good arguments on interpretations and equivalent solutions had a tendency to naturally soften up requirements of formal compliance with detailed prescriptions provided that the intention behind is still accomplished. Based on observations during surveys the two relations of power as referred to interacted as the dominant relation seem to influence the fluid relation exemplified by surveyors' tendency to prescribe solutions, and vice versa, as the dominant relation became influenced by professional judgment despite rules. In this regard, operators' countervailing powers are legitimized and thus strengthened through surveyors' explicit acknowledgement of operators' expertise of own operation. This contains a further possibility also for operators of hiding or explaining away things. Both seemed to be active mechanisms counterbalancing the dominant relation.

As surveys end up with approval according to prescriptive regulations, the reverse domination and responsabilization of the Authority as a consequence of approval also exists with dialogue based surveys. This overall mechanism of power responsabilizing the Authority is however counteracted by the dialogue evolving in somewhat unpredictable ways, which implies an extended scope of surveys as they may now concern in principle any aspect of work, arrangements and management related to safe operation. The unpredictability makes surveys less transparent than compliance based surveys. This will not necessarily affect approval as this is closely related to prescriptive requirements only, but it leads to observations being noted in the main part of the survey report, which responsabilizes operators in excess of what is required to obtain approval. The requirements relating directly to compliance issues, which form basis of approval, are downplayed by being reported in an appendix only. This way the Authority is extending the scope of its dominant power relation from the scope of prescriptive regulations only into in principle any aspects influencing safe operation, however in these cases by a more fluid and less dominant relation.

Pillar 3: Capable and motivated companies/facility operators (crews)

Dialogue evolving from observations, exercises and functional tests of equipment served to get deeper insights than observations themselves. This counts for surveyors and operators as well. Mostly dialogue served to enlighten ways of operating through providing "voice" for operators.

Apparently this was motivating in itself: Based on operator statements, the holistic and acknowledging approach by surveyors seemingly made a significant contribution to more positive perceptions of surveys among operators, not only concerning the atmosphere, but also with a view to surveys' potential to provide a constructive contribution to safe operation. In several instances evolving dialogue served to direct operators' focus of attention towards unacknowledged safety issues, this way dialogue challenged existing beliefs and routines. This was without necessarily proposing or prescribing any solutions, but leaving that for thoughts, discussion, and ultimately for operators to work out. Whether this actually contributed to enhance capabilities is difficult to say, but it created focus of attention, which is a precondition for doing so.

The other way round, dialogue based surveys seemed to provide also a better possibility for surveyors to identify actual motivation and capabilities of operators. This is due to the dialogue going beyond formal compliance and reaching into how safety is actually managed.

The focus of attention towards issues of professional substance rather than bureaucracy was seemingly motivating.

Pillar 4: Genuine representation and participation of workers (crews)

Dialogue during survey interaction is all about effective mutual exchange of information, views and perspective on matters pertaining to safe operation based on actual observations. Apparently this worked as intended, and gave "voice" to operators by providing possibility to inform and explain of work and arrangements, and to take up any matters for discussion.

Dialogue provided "choice" as it was predominantly open and served to create focus of attention and insights rather than narrowing down to formally prescribed matters and solutions only. This mainly concerned issues of managed safety in the "gap" between overall principles of the Act and controlled safety required by prescriptive regulations, but concerned also deviations from prescriptive rules by considering alternative solutions that would still achieve the intention behind.

In providing "voice" and "choice" the approach entailed explicit empowerment and responsabilization with regard to safety as managed. As the Authority actively engaged into and discussed how operators actually had effectively taken this responsibility, and also interfered when deemed necessary, there was no abandonment.

Essentially this is empowerment of both operators and also surveyors as their professional judgments gets emphasis in contrast to the machine-like dominant enforcement of the compliance based approach. This empowerment and responsabilization while not abandoning represents a genuine participation of all operators involved which apparently served to acknowledge and support operators' ownership of safe operation thereby contributing to intrinsic motivation.

Effectiveness and need for improvements

The dialogue based approach was newly implemented on the ships surveyed during participant observations. The overall perception was promising in terms of the ability of the approach to provide deeper insights for surveyors in assessing not only the level of compliance with prescriptive regulations, but also and maybe more important to the way safety and operation was intertwined and managed in practice. This way the method provided a more holistic perspective bringing more aspects into play than compliance surveys was able to. At the same time the

method is essentially empowering and responsabilizing operators in principle of all aspects of safe operation while still engaging in qualitative assessment of proactive safety management as practiced by the companies and crews. This represents “responsibilization and empowerment” which assigns responsibility while also contributing to build authority, which contrasts “responsibilization and abandonment”, which would assign responsibility without engaging in capacity building. The method further had mechanisms that were tending to limit the Authority responsibilities to matters over which it had in fact authority, namely things it has regulated and actively surveyed.

There were also issues of concern with the new method as it evidently requires strong professional competencies of surveyors with a view to safety, operation, communication skills and competencies as authority persons in general. Further, surveyors as well as operators had pointed to challenges for the dialogue to work as intended, and to the challenge of structuring the surveys. As the survey form is still in a transition phase where surveyors are still developing the method as well as changing their mindsets, such challenges are however expectable.

5.3 Rational data driven approaches

Pillar 1: Appropriate regulation

A precondition for transition to data-driven oversight would be development of suitable regulations. Compared to the former regimes, the main difference would be supplementing or replacing prescriptive means standards with performance goals by measurable, and then likely quantitative, indicators. These should be causally linked to safety performance, be it directly or indirectly, be practically measurable, collectable and enforceable. First this presumes definitions of “safety” and “safety performance”, and secondly a set of relevant indicators by precursors (leading) and outcomes (lagging) as well as causal relationships between them would need to be identified.

While this may at a first sight appear to be a paradigm shift compared to compliance based oversight, it can be argued that it rather constitutes a differently organized efficiency-thoroughness trade-off which basically rests on exactly the same assumptions of Newtonian linearity, cause-effect symmetry and rational predictability. Assuming that quantification and measurability is a precondition for management and control of safety is a basic argument for applying the method at all. Hence it will be dealing with safety through a reactive perspective as of Safety-I reified in enforcement through bureaucracy, however adjusted such as to deal with measurable data instead of overseeing compliance with prescribed means.

This may be illustrated by revisiting the sightseeing boat oversight. By perceiving this as an extreme example of data-driven oversight, each prescriptive rule may represent a leading indicator, and survey observations (of conditions and of safety management activities) may represent measured, quantitative data of leading indicators, while the number of accidents may be considered a lagging indicator. Further, as compliant components and safety management system activities are thought to effect safe operation, a causal relationship is considered established through practice. Then, for the company both lead and lag indicators indicated safe operation (low number of accidents and ships and a safety management system that were considered compliant each year). This is actually what the company argued in court. Anyway, the accident occurred despite compliance and the subsequent report revealed significant vulnerabilities in operation, oversight and rules. These vulnerabilities, which may be seen as significant latent conditions in a Swiss-cheese perspective (Reason, 1990), implies that the perceived causal relation between rule compliance (lead indicators) and safety (outcomes) does not hold in fact.

A good question then is why? A main answer might be as pointed out by Kongsvik et al (2010) that the (quantitative) indicators represent a reduction of a complex reality, and that counted numbers of non-compliances in itself do not carry information on the qualities of the diverse reality they somehow reflect. It is for instance difficult to see how quantitative indicators might possibly illuminate the qualities of work and management as seen in the lens of Amalberti's "golden rules" of intervening in systemic safety. Further, according to Hopkins (2009) low numbers (in this case of accidents) will not provide a statistically significant population, and will hence not provide reliable prediction. Likewise the perceived causal relation was presumed without imagining or capturing complexities inherent in operation and thus represents a significant oversimplification of complex causal relations in reality.

As proposed by Kongsvik et al (2010) this might be addressed by incorporating supplementing qualitative methods. The accident report may be considered an example of such, which captured unrecognized safety aspects. Such qualitative examinations could be specifically designed to address inherent qualities of the way safe operation is pursued in safety management as regards for instance proactiveness concerning activities reflected in Amalberti's "Golden rules".

Pillar 2: Effective implementation and enforcement

Enforcement is intended to be radically different from the two formerly discussed approaches by as default not participating in the operational context. Instead, oversight is made at distance by monitoring and analyzing data represented by key performance indicators. This may be done online, through software or manually at pre-defined intervals where the entity presents and explain data and corresponding findings or trends etc. to the Authority. Depending on figures, if data are considered to indicate undue risk and trends, if they are not "in green", the entity as well as the Authority is supposed to react and initiate plans and corrective actions. This may be seen as a development into bureaucratic "meta-enforcement". While intended to enhance resource efficiency and effectiveness through focus on measurable activities and outcomes, it is not concerned with direct observations of qualities inherent in operation. This is what constitutes the efficiency-thoroughness-trade-off. Its effectiveness will depend on how well performance indicators capture aspects that influence safety performance, and further on how well the subsequent analysis is capable of illuminating actual conditions, interdependencies, movements and tensions. As has been argued just above this must be expected to be a difficult task whenever complexities are at play, and as argued by many it is not likely that numbers that do not carry qualitative information can solely be used to sufficiently assess an issue as "safety performance", which is essentially of complex, qualitative nature.

Data driven oversight will change power relations as well. Regulated entities will literally be responsabilized to operate by any means as long as performance criteria are complied with. In principle, this reflects a domination with regard to compliant outcomes as measured, while the relation is fluid with a view to the means applied. The freedom to choose means may however in practice be rather limited as mentioned by Coglianesse (2015), and the domination may be more or less superficial with a view to safety performance depending on how well (or not) indicators, causal relations and analysis actually reflect and capture what they are intended to. If not, datasheets "in green" will be misleading. According to literature this may well be the case as identifying indicators and causal relations is notoriously difficult when dealing with complex systems. As the Authority will have abstained from direct interaction in operational context, qualitative insights will be limited. This backing out by the Authority will leave all aspects of operation, including complexities, to be managed by regulated entities without any possible intervention from Authority side until appearing as lead or lag indicators in datasheets. Due to lack of in-depth understanding of operation, the Authority will in turn have little ability to understand operation and hence to intervene competently when needed. This way "Meta-

enforcement” tends to turn the relation between company and Authority into a relation of trust based purely on bureaucratic exercises, where a less knowledgeable Authority will make assessments based on an overall and, from its perspective, superficial level only.

Phenomena of “number-gaming” and “teaching to the test” represent countervailing powers of manipulation exercised by operators and regulated entities with a view to meeting statutory requirements, and hence to obtain approval as a necessity for operation. Significant side effects are in the first place that intentions behind regulation are not met, secondly that important information is driven underground as an expression of structural secrecy (Vaughan, 1996) and thirdly that the Authority is reversely responsabilized through its approval although it does not really understand what is going on. This means that an apparent panoptic domination of regulated entities by the Authority due to performance criteria and “meta-enforcement” may erode due to an Authority left without substantial knowledge of what is actually going on and hence powerless with a view to assess operation and intervene competently as it is supposed to. Examples illustrating such difficulties are the Volkswagen case (Coglianese, 2015) and the New Zealand “Leaky buildings” case (May, 2003).

Compared to the ideal picture of safety performance indicators illuminating the safety landscape for the purpose of directing efforts to where they matter most, the above considerations are less optimistic.

Pillar 3: Capable and motivated companies/facility operators (crews)

In providing flexibility through focusing on performance criteria, the method leaves considerable responsibility and initiative to regulated entities to choose means, and hence “choice”. In case they are capable and motivated and is proactively managing safety “hands-on” as well as from an analytical perspective through analyzing and documenting data, this may work well to motivate regulated entities as they are relieved from unnecessary prescriptive constraints. However, the quantifiable goals supports extrinsic motivation, and in case the entity is neither adequately capable nor motivated to comply with intentions behind regulation but only to comply formally, then the method will hardly serve to motivate to use data and analysis for genuine, proactive safety management purposes. On the contrary it may rather create motivation for paper exercises, number-gaming and “teaching to the test”.

Even if regulated entities are capable and motivated, the difficulties with identifying relevant performance indicators and causal relations in complex systems may question the methods’ effectiveness with a view to distinguishing capable from incapable companies and to provide motivation.

Pillar 4: Genuine representation and participation of workers (end users)

Under data driven oversight, regulated entities are almost free from regulatory constraints with a view to the means to fulfil acceptance criteria. They then have wide possibilities of “choice” in principle. However this may be utilized only if alternatives are economically and technologically viable, and further only if the regulated entity is capable of choosing. It is questionable whether the method provides “voice” since operational context interaction with Authorities is eliminated. The method is intended for Authority interaction on management level only through exchange of management information on key performance indicators. This provides almost exhaustive responsabilization to reach the performance criteria however without any participation in the operational process providing understanding of what actually goes on in substance. It then entails no empowerment, but rather abandonment, as the Authority backs out from intervening at all on substantial issues, at least whenever measured performance indicators are on the right side of acceptable limits. In case of passenger ships, this concerns not only companies and crews, but

also passengers, who presume a competent Authority that is able to intervene before the next accident.

Effectiveness

Based on the above it is questionable whether the method is effective and provides flexibility as intended. As stated by Coglianesse (2012) the method provides new, different means which may be applicable and useful in certain contexts, but not all, while Kongsvik et al (2010) argues that data-driven methods may be useful and effective when combined with qualitative methods. The difficulties in case of complexities (which are normally present), combined with the mentioned side effects constitute serious challenges, which may lead to determination of nonsensical performance indicators and “causal relations” which turn out to be muddled and will effect false beliefs concerning safe operation. The abandonment of entities may leave those incapable and non-motivated and hence with greatest need of intervention in a limbo. The abandonment may even go further, as the methods, if applied solely, will in the long term serve to distancing the Authority from qualitative knowledge about the operation concerned.

6. DISCUSSION

The compliance based and data driven approaches have more similarities than what might appear at a first glance. While the specific means in terms of prescriptions or performance criteria are different, the overall goals are identical and reflect a Hobbesian view on the role of the State. They rest on similar underlying perspectives and assumptions of Newtonian rationality, linearity and predictability, and their inherent safety perspectives concerns reactive, controlled safety for the purpose of avoiding negatives as reflected in the Safety-I perspective. Hence, none of the approaches acknowledges complexity and unforeseeability as basic premises.

Rather it is the other way round: They seem to constitute attempts to reduce and organize the management of real complex operation into bureaucratically manageable subsystems and tasks. As such the approaches constitute reduction and major efficiency-thoroughness trade-offs. Such simplifications are not necessarily wrong, they may work well in less complex contexts, but they inevitably omit something that may be important. Both approaches have merit also: The compliance based approach as it provides consistency and standardization of basic things considered important, and data-driven due to their attempt to apply quantifiable, documented information to create foresight. Neither approach is however designed to provide further qualitative insights than is already known, and is therefore unable to capture complex dynamics and relations that may ultimately lead to major mishaps in process safety. In that sense both approaches leave important aspects untouched.

For compliance based approaches those aspects are not covered by prescriptions, whereas it for data-driven approaches concern complexities of normal operation that cannot be grasped by simple, linear indicators and perceptions of causalities.

Complexities are per definition incomprehensible, they are not acknowledged, and remain implicit. For the same reason neither regulated entities nor Authorities will have power to manage them exhaustively. As the connection between power and responsibility are essentially negative (Morriss, 2012), any responsabilization assigned to the parties regarding these complexities will not be fully matched by their powers.

Nevertheless both approaches imply significant levels of responsabilization of either regulated entities or the Authority. The distinction of who this is assigned to is however not clear.

Regulated entities will be responsabilized through overall principle- or goal based regulations, which tends to abandon operators rather than empowering them. In any case abandonment may obviously have negative consequences for safety if entities are not sufficiently capable and motivated. For the compliance based approach, regulated entities perceived the Authority responsabilized due to approvals based on formal compliance with prescriptions. Similar might well apply to data-driven approaches if approvals are granted on basis of compliance with performance criteria. As managing complexity is assumed to require local management (Perrow, 1984) the latter may be to set expectations to high concerning the Authority's ableness to do so exhaustively.

Kongsvik et al (2010) therefore seem to have a valid point in suggesting that data-driven approaches need supplement by qualitative methods applied to the local context. This may well apply equally to compliance based approaches.

This is what is attempted by introduction of the dialogue based approach. Through its submersion in operational context, it aims at providing qualitative understanding. It concerns in principle all aspects of safe operation, controlled as well as managed. Roughly, the power relation is dominant on issues of controlled safety according to prescriptions, while it becomes more fluid on issues of managed safety. The dialogue based approach is different from compliance based and data driven approaches in that the fluid relation keeps regulated entities responsabilized while it also serves to empower. There is on the other hand no abandonment. Hence it serves to make a contribution to reinforce the 1st and 2nd lines of defense respectively and ultimately maintains these responsibilities on both parties. It is flexible towards different companies in that efforts can vary depending on perceived capabilities of the company in question.

These mechanisms seem effective to conduct passenger ship surveys: It has a holistic perspective by focusing on controlled safety to provide and reinforce the basic structure and also focusing on managed safety understood as actual work and management in excess of what is controlled. These are intertwined and supplement each other mutually and are applied under a basic principle of keeping companies responsabilized to arrange and manage their own safe operation. The Authority sticks in the starting point to monitor and assess from a holistic perspective whether intervention is desirable or necessary, and then do so in a differentiated way depending on actual needs in a way that is designed to responsabilize and empower rather than responsabilize and abandon. If the Authority was to "abandon" regulated entities (and the passengers not least), it would not take on its responsibility to act as a "2nd line of defense". The challenge is to arrange an oversight model that does this effectively without taking over any responsibilities that would better belong to companies, as they are basically meant to be responsible for own activities and operation.

The above conclusive viewpoints of this discussion section makes up the main answer to the research question on how the oversight model affects main power relations in terms of empowerment and responsabilization. They are briefly summarized in table 2 below.

Table 2: Summary of main findings

	Compliance based	Dialogue based	Rational data-driven
Type of Regulation	Prescriptive regulations (Overall principles/goals)	Overall principles/goals Prescriptive regulations	Overall principles/goals Acceptance criteria
Oversight scope	Compliance with Prescriptive regulations only	Compliance with overall principles/goals and prescriptive regulations, i.e. any matter pertaining to safe operation	Compliance with acceptance criteria.
Safety perspective	Safety as predictable. Reactive, linear perspective focused exclusively on controlled safety as guided by prescriptions. Complexity is unacknowledged.	Safety as an emergent property of complex systems, Focused on proactiveness to manage uncertainty, controlled and managed safety as manifested in work as done: “Doing well what can be done”, prevention and recovery.	Safety as measurable, predictable. Reactive, linear perspective. Focused on rational analysis of data and compliance with acceptance criteria. Complexity is unacknowledged.
Power relation	Full bureaucratic dominance by Authority within scope of prescriptions Fluid relation outside scope. Formal approval entails implicit reverse dominance by industry by responsabilizing Authority for non-regulated areas.	Bureaucratic dominance by Authority within scope of prescriptions however reduced due to flexible approach. Mutual relation based on knowledge outside scope due to dialogue on any matter pertaining to safe operation.	Dominance by Authority to satisfy acceptance criteria. Fluid relation otherwise. Dominance tends to erode due to reduced Authority insights and significant countervailing powers and mechanisms due to inherent unintended side effects.
Empowerment	No empowerment as interaction takes place only under full dominance	Empowerment mutually due to dialogue and exchange on any matter pertaining to safe operation	No empowerment as no interaction on operational substance takes place
Responsibilization	Companies are responsabilized to comply with prescriptions. Authority gets responsabilized for any outcome on a compliant ship if formally approved	Dialogue implies mutual responsabilization concerning in principle any matter pertaining to safe operation. Soften up responsabilization due to compliance issues	Companies are responsabilized to comply with criteria. Authority gets responsabilized for any outcome on a compliant ship if formally approved
Abandonment	No abandonment within prescriptions. Full abandonment (implicitly) on any matter outside prescriptions	No abandonment due to dialogue in principle on any matter pertaining to safe operation	Abandonment due to Authority withdrawal from operational substance. May be counter balanced in predominant linear systems by illumination of safety landscape due to analysis and meta-enforcement
Effectiveness	Highly effective in ensuring compliance with prescriptions. Non-effective outside prescriptions and in case of complexities.	Effective in providing knowledge of safe operation as managed and undertaken. Ability to get insight into complex issues as dealt with.	Effectiveness depends on identification of measurable indicators and causal relationships with desired effects. Difficult in complex systems

The views expressed may not be surprising taking into account my background and motivation. The dialogue based approach was developed on a background of acknowledged limitations of the compliance based approach to really capture what is important. Too often it has been the impression after such a survey that many concrete bits, pieces and documents were seen, but that most important aspects, and especially the holistic take were left behind: How is safety here, how is it managed, do things work? These things did not go untouched, but were on the other hand they were not addressed as explicit and conscious as they do now in dialogue based oversight as shown in this study.

It is evident that the dialogue based approach is developed from compliance based oversight and makes use of its basic elements. Likewise, despite the difficulties outlined on data driven approaches, quantitative data that contain relevant information may and should be used if they carry potential for relevant application. When knowing about qualities of a context, quantification may support understanding and mapping of issues and relationships between them. Especially for keeping track of records and using them to identify long term trends and areas of risk, data may provide useful input. To ignore the power of data and statistical analysis would not be reasonable to put it mildly. And finally, efficiency-thoroughness trade-offs are necessary and constitutes basic premises in most contexts, so also in oversight. Even though dialogue based surveys is less resource consuming than compliance based, they are thorough and hence time consuming, for which reason there will be inevitable pressure to improve efficiency. Some merger between the three oversight models may therefore be desirable and prove more powerful than dialogue based oversight alone.

Another issue that might be worth further studies is that this examination has been mainly concerned with oversight in terms of specific surveys as on board activities, but it would benefit from considering also a systemic perspective in a longer perspective of time. It has thus not here been examined how observations from one specific survey may be used in an even more holistic way to keep track of and assess developments on the ship and the company as a whole and possibly also in entire segment of passenger ships as may be comparable. This would be a data-driven approach based on qualitative data gathered during surveys.

A third issue central to the findings concerns how oversight can deal with complexities of safe operation. As has been argued, it is this aspect that constitutes the origin of main challenges. But not all systems, or parts of them, are complex. A central question then is to what extent complexity is inherent in a specific context. This is not a binary characteristic, but rather complex and linear may be seen as diverse endpoints of a continuous scale. To the extent that systems or subsystems concerned are well understandable, and the basic assumptions of predictability applies, compliance and data driven approaches can rely on identifiable causal relations and be manageable. The problem is that complexities always seem to sneak in here, there and everywhere to make analysis, assessments and developments more of a muddled puzzle-game to work out, if possible at all.

Such issues as just outlined would be obvious subjects for further studies.

Before concluding, it should be highlighted also that this study has been undertaken with limited resources and amounts of data. Analysis of all three survey models could benefit from gathering more data from a wider range of sources. The two passenger ships under study were both operated by companies that to my perception would be characterized as capable and motivated, which implies some bias in data. Things might appear somewhat different in case of companies of another characteristic. Further, despite all efforts to eliminate biased data due to the fact that I have tried to examine organizations and people within my own domain, it cannot be excluded

that it has had effects. I have abstained from using interviews, but there is little doubt that such performed by a neutral outsider might have been a powerful source of data.

7. CONCLUSION

Three oversight models have been examined: The compliance based approach, new rational, data-driven approaches of risk- or performance based oversight, and finally an approach gaining insights through dialogue in operational settings.

Compliance based and data driven oversight may be seen as variations over same theme: Rational, top-down, dominant approaches based on Newtonian perspectives of linearity, predictability and manageability combined with Hobbesian perspectives on the role of the State. Bureaucracy is their main mechanism of power, although exercised through different specific means. This may work when systems are functioning in linear ways, but is not capable of managing complexity and uncertainty – as will appear in most operational contexts.

Responsibilization and abandonment is inherent in data driven approaches. In complex systems, which are per definition unpredictable, and neither fully understood nor intellectually manageable (Leveson, 2011), such approach is far reaching. Regulated entities will be fully responsabilized, which may go beyond their – or anyone else’s – capability. Even if assuming full linearity, measurability and manageability, there is in fact no oversight at all until indicators whether leading or lagging are measured, recorded and analyzed, which inevitably leaves oversight lagging, also when it is perceived as leading. Data driven oversight have further well documented side effects, as “number gaming” and “teaching to the test” which may severely counteract its purpose.

While compliance based approaches entails oversight on specific prescriptions, and hence no “abandonment” in this scope, they have been found to implicitly and unintendedly imply significant responsabilization and abandonment on non-regulated aspects of safe operation. The implicit responsabilization leads regulated entities to believe that safe operation is a responsibility of the Authority, if approval is granted. An important side effect then is not only accountability-up as identified by Dekker (2014), but also an unintended responsabilization-up of the Authority. Another important side effect is directing focus of attention of operators and surveyors exclusively towards prescribed rules, whereas other aspects are not seen. For different reasons both data driven and compliance based approaches were found to significantly contribute to structural secrecy as they omit qualitative issues from the agenda.

The third approach of dialogue based oversight focusing on qualitative insights is argued to hold promise to empower and responsabilize without abandoning regulated entities. Further it also serves to empower surveyors through learning about specific operations. This is due to the submersion into operational context through interaction with operators on all levels. It contains the compliance based approach and its dominant relation of power within the scope of prescriptions, but with less emphasis, and introduces also a new more equal relation which is sensitive to operators, their expertise and efforts to operate safely. The approach is not without challenges; surveyors need strong professional competencies of maritime technology and operation, understanding of system safety and personal skills to communicate.

A merger between the three methods in terms of dialogue based oversight supported by prescriptions on means and data analysis to identify trends and areas of concern and specific efforts appears to be a way forward that might balance needs for effectiveness and efficiency in

oversight, while allowing not only discretion for operators and companies, but also acknowledge and rely on their expertise and motivation to operate safely. The goal being to effectively responsabilize and empower regulated entities without abandonment as a side effect.

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