How can leadership strategies be improved to prevent major accidents in tanker shipping operations?

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Master Thesis in Master of Economics and Business Administration

Specialization in Strategy and Management

Preface

The Thesis is written as a part of Master Program within Economics and Business Administration at the University of Stavanger, with specialization Strategy and Management. This report's main focus is leadership strategies in shipping industry directed towards prevention of major accidents by increasing safety culture awareness.

The study would not have been possible without the oil company that cooperated in project. We would like to express our gratitude to Arthur Skartveit, the responsible for T/C fleet assurance program in the oil company and Torkel Soma, partner at Propel for their valuable help and advice. Also, we would like to thank Terje Våland for being our academic supervisor.

Finally, we sincerely thank our families who supported us during this process.
Without your help and support this study would not have been possible.

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Stavanger, 14 June 2012

Summary

Major accidents in tanker operations lead to considerable losses and irreversible consequences (Karlsen, 2010). Even though the shipping industry has been operating for centuries, and there are numbers of requirements aiming to maintain and improve standards for safety, accidents still occur. Nowadays shipping companies are occupied to find more effective strategies that can mitigate risks and prevent accidents.

This study analyses safety culture awareness in shipping tanker operations and compares safety awareness of management on shore and crew onboard. We have conducted a questionnaire survey based on real accidents and near misses happened. Participants from selected shipping companies evaluated decisions taken in given dilemmas.

It has been explored that there are gaps among managers and crew. Also, gaps between manager to manager; crew member to crew member were found. Finally, the study explored different safety culture awareness between three companies that an oil company should be aware of (Appendix F). These gaps need to be minimized in order to prevent major accidents.

 Question of the research is as follows:

How can leadership strategies be improved to prevent major accidents in shipping tanker operations?

Findings of this research indicated that particular areas of the leadership strategies need to be improved. We summarized them in the final model (Appendix E). Even though these activities are being applied by leaders from before, the results of this study indicate that they do not close all gaps. Strategies should be constantly improved in the following areas:

- creating and maintaining philosophy of "mindfulness" in every day practice
- promoting clear communication on all levels of organization

- creating a "learning organization" culture
- learning from earlier errors
- organized experience sharing with each other

Suggestion for further work is to conduct in- depth research of the findings presented by this paper. For example, to find the correlations between safety culture awareness and such strategic elements as clear communication, learning from errors, experience sharing, principles of mindfulness etc. and how those influence on accident prevention. In addition, if improvement of safety awareness can be a mediator to accident prevention.

Finally, further work can be focused on creation of an "action plan" to implement the strategic improvements step by step.

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Abbreviations

T/C – time charters

UKOOA – United Kingdom Offshore Operators' Association

IRSOC – Internal reporting system of Oil Company

HSE – Health, Safety, Environment

STCW - for Standards of Training, Certification and Watch keeping for Seafarers

International Safety Management Code

SOLAS - the International Convention for the Safety of Life at Sea (SOLAS) is an international maritime safety treaty, the most important concerning the safety of merchant ships

ISPSS code - the International Ship and Port Facility Security (ISPS) Code is an amendment to the Safety of Life at Sea (SOLAS) Convention (1974/1988) on minimum security arrangements for ships, ports and government agencies.

IMO - the International Maritime Organization (IMO), with its primary purpose to develop and maintain a comprehensive regulatory framework for shipping and its remit today includes safety, environmental concerns, legal matters, technical co-operation, maritime security and the efficiency of shipping.

AML - Arbeidsmiljøloven, - Labor Law

CIP - continuous improvement process

SMS – Safety Management System

IEA – International Energy Agency

1.0 - Introduction

This Master thesis starts with a background description of the research topic, introduction into problem and its relevance nowadays, and scope of the project.

1.1 - Background

Processes of globalization and internationalization bring new opportunities to energy industry together with challenges which solutions are crucial for organizational reputation and survival.

Nowadays companies wish to concentrate their activities on main value drivers, which arise from company's knowledge, expertise and technology. This, among other reasons, led to outsourcing practices conducted by companies in order to reduce cost and utilize best available competence at the market.

For example, when an oil company focuses on oil and gas production, it may decide to outsource such activities as oil and gas transportation. These services are then being provided by shipping companies, owners of vessels and tankers, which meet certain challenges while conducting tanker operations for the oil company.

Shipping of crude oil and petroleum products has the potential of causing disastrous environmental damages if the ships are involved in major accidents. A tanker accident involving a major spill may seriously harm business for even large and well-established oil companies. In that respect, the shipping activity is a key value driver for an oil company contributing to as much as 70% of the company's overall risk.

Effective leadership strategies are necessary to regulate the relationships involved in this business. These strategies can bring sustainability to the organization if assured their correct implementation and continuous improvement. That is why the topic of our research is formulated as follows:

How can management strategies be improved to prevent major accidents in shipping tanker operations?

The reason for choosing this topic is that both of us have worked part-time in the oil industry, which built up our interest to investigate on this problem. Also, this project is a cooperation with an oil company who is focused on preventing major accidents in shipping tanker operations. Therefore, we decided to get better understanding of how leadership strategies can be improved.

We chose Principal – Agent theory as the departure point of this study, where we call management of shipping companies for Principal, and crew members including Captains, the 2nd, and the 3rd officers for Agent. This choice is explained in Chapter two.

It was decided to explore safety culture awareness and analyze it in three shipping companies, because they have been in a long time business relations with the oil company, and have a size of fleet that fits a survey. Assuming that forming a safety culture in every organization is something leadership strategies contribute to, awareness levels between managers and the crew will be compared and will provide us with the idea for potential improvement for the leadership strategies. In discussion part we will present the debate about strategic elements or activities that should be considered in shipping operations when the mission is to prevent accidents.

Principal- Agent theory presents challenges that both parties face while in the transaction or exchange. Asymmetric information, aligning different interests, opportunistic behavior is some of them. These problems were broadly researched since the 90s from economical, sociological and psychological dimensions (Holmstrom & Milgrom, 1990; Gayle & Miller, 2009; Aulakh & Gencturk, 2000; Kreps, 1997; Gibbons, 1998).

However, the areas of the mentioned research was aircraft industries, nuclear industries, offshore or financial sector, and very little research was conducted as for Principal - Agent problem within shipping industry.

Due to the fact that Principal can not directly monitor ("geographical distances increase the cost of monitoring" Aulakh & Gencturk, 2000) whether the Agent follows the strategies thoroughly, it leads to the fact that Agent has much more information than the Principal and often results in moral hazards such as opportunistic behavior. Challenge for management is to find the strategy that can reduce these hazards. Opportunism was widely studied by Williamson (1991); Rindflesch & Heide (1997) etc. within theory of Transaction Cost Economics (TCE).

As in shipping, it is difficult for management on shore to monitor and control the work being done by the crew onboard. As a result, management often has a biased view on everything what happens onboard. Seafarers might break some procedures to get their job done. And due to the fact that people might have been brought up with assumption like "reporting an error could endanger their career" or other possible assumptions, the errors are not reported, cannot be uncovered, and can lead to management taking a wrong decision that may also lead to an accident.

One suggested solution to this was to incorporate in process- control mechanisms, which will lead to a better monitoring and consequently improve performance. This type of controlling gives an opportunity to monitor the routine work and not only the result of the job done (Aulakh & Gencturk, 2000).

Another solution is to create a strategy which will unite individual goals with those of the overall of an organization (Hoff, 2009) and will encourage Agent to make choices in Principal's benefit with the help of incentives. Questions of incentives were researched by numerous scientists and researchers (Laffont & Martimort, 2001), what contributed to historic theory development.

In the incentive literature (economical studies) it is normally assumed that individuals are primary interested in their own financial wealth. Osmundsen (1999) suggested that manager's profit should depend on achievement of the company's interests, which would result in top management seeking to maximize the value of the company. Various solutions were suggested such as shared ownership, bonus schemes linked to the company's profits, possibilities for maintaining his competence, which is seen as the future earnings or reward and recognition for achieved results etc. However, non – economic incentives play also a role.

Principal and Agent in shipping tanker operations have their own peculiarities which will be addressed in this thesis. To be more precise, strategies used by Principal influence Agent's performance as they can create certain safety culture with its mission to prevent accidents (Campbell & McCloy, 1993; Kuvaas, 2005; Manski, 2000).

This thesis will contribute with the analysis of which particular areas of leadership strategies can be improved to prevent accidents in shipping industry by exploring awareness gaps between Principal and Agent.

However, we understand that there are more challenges than mentioned in our study that can cause poor safety culture in shipping (Hetherington, Flin, Mearns, 2006; Arslan, 2008; Emondson, 1996). Some of them as well as possible solutions of those will be discussed and summarized further in the conceptual model and in a discussion part.

1.2 - Problematization

Having discussed with the oil company and having completed a literature review, the problem statement was agreed to be as follows:

How can leadership strategies be improved to prevent major accidents in tanker shipping operations?

Shipping activity is a key value driver for an oil company contributing to 70% of the company´s overall risk. Due to the high importance of energy (oil) industry in the world, as well as the high importance of safety in all activities involved, and often irreversible consequences of an accident, we consider the topic to be highly relevant. 60% to 90 % of accidents in oil transportation occur because of human errors (Dhillon, 2007; Soma, 2010), it is of crucial importance to have right strategies and be able to assure their appropriate functioning to reduce and eventually prevent accidents.

We have created this strategy to address the research problem:

First, literature and theory review as for strategies, strategic management, Principal – Agent phenomenon, Transaction Cost Economics; safety culture, organizational performance, HSE management will be studied. Secondly, we will identify the most interesting aspects for further study by analyzing investigation reports registered in the Internal Registration System of the Oil Company (IRSOC). Thirdly, questionnaires will be created in order to explore on safety awareness in three shipping companies. Fourth, the results of the survey will be analyzed and two groups' answers will be compared, and gaps will be identified. Finally, the discussion of findings will be presented in relation to relevant theory.

1.3 - Relevance

«Langsiktige konsekvenser av kortsiktige handlinger skal telle med...» Karlsen J. E., 2010
"Long-term consequences of current actions should be considered..."

The relevance of the research is to explore the eventual gap between management and crew as for safety awareness in order to be able to identify areas of leadership strategies that can be improved.

During the research, we have learned, that in shipping industry, which is of a high risk, leaders have to find more innovative ways to make sure agents act in the company's interests (for the sake of safety) in addition to applying traditional organizational motivators such as employment contracts, financial incentives and performance monitoring or output control. It is time to start thinking "out of the box" and be more proactive and creative by establishing a solid culture that will stimulate agent to maintain safety on board, and even more than that, make it natural for agent to act this way as there is no other way. Leaders should become Ambassadors of safety culture promoting life dependence on each employee's everyday choice while he is performing operation or function he is assigned to. We believe it can take time to change the whole mindset of those involved in shipping, and teach them "a new life style" which also will be their work style, as they spend significant part of their life onboard, but this safety philosophy and constant improvement (Sharma, 2004; Hoff, 2009) principles (CIP) will contribute to accident prevention.

This study will be relevant for several parties, both academics and business practitioners. It will be important for management who are occupied with accident prevention, safety improvement, and those trying to reduce opportunism in the company, see necessity in motivating employees to perform better and understand the importance of constant improvement of the operations they are in charge of.

On a global level not being prepared for errors to occur, poor solutions and not maintaining sufficient safety culture in operations result in irreversible consequences brought by accidents (Smith, 1999; McMillan, Whalley, Zhu, 1989; Cox & Cheyne, 2000). Big international companies in energy field are convinced that "all accidents can be prevented" and therefore therefore near miss and incidents are reported officially and registered. Oil and shipping companies analyze this information in order to learn from previous incidents and to prevent them from happening in the future.

We had access to the near miss and incident reporting system in the oil company (IRSOC) and analyzed the investigation reports on near misses and incidents. This was the basis for questions of the survey.

We have learned that near miss and incident is an unplanned event that resulted or had the potential to result in injury, damage or fatality. Near miss and incident report contributes to minimizing similar situations in the future.

Leadership strategies that can prevent major accidents are something that world is occupied with today, as well as constant improvement and strengthening to maintain those strategies sustainable.

1.5 – Empirics

First of all, since this project was facilitated by an Oil Company, we had the opportunity to discuss challenges tankers experience while in transit with vessel's inspectors working in the Vetting department and responsible for the T/C fleet assurance program. Also we had some discussions with relatives and acquaintances that have long experience in oil industry from Norwegian and Russian companies, including seniors who have worked onboard of tankers. These discussions and interviews were rather informal and therefore not registered in this

paper; however, they gave us much better understanding of the research problem. Theoretical perspectives of discussions were found in the relevant theory and will be presented in chapter two.

Secondly, the empirical part was conducted by sending out the survey with 12 questions. We devoted quite some time to design dilemmas which can help us to uncover the information we intended to collect. Questions were built on the real situations found in the investigation reports, adjusted them according to the recommendations received from the inspectors in the Vetting department. It gave us the necessary learning in the process, and assisted us to understand the reality of problem addressed deeper. In addition, as a result of focus group we have realized how challenging it can be to link theory to real life, due to specificity of the research area we have chosen for our Thesis.

Survey questions and responses provided will build up the background of the analysis in this Thesis. The data was analyzed in Survey Monkey. The shipping companies included in the project were represented by 3 companies: Shipping Company 1 (SC1), Shipping Company 2 (SC2) and Shipping Company 3 (SC3), where 3 representatives from each of the 3 vessels, and 3 from on shore management in each of the 3 companies were participating (totally 36 participants). They were selected by the oil company. Due to the resources available the study conducted is a qualitative rather than quantitative, and we will explain this later in Chapter three.

1.6 - Scope and structure

This paper will focus on exploring gaps in safety culture awareness, and identification of potential improvement areas in leadership strategies. Due to abundant amount of literature on leadership strategies, we limited our research as follows.

We decided to start with Principal and Agent theory and looked at how challenges between the two parties are applicable in shipping industry. In order to answer the research question, we summarized factors leading to accidents in tanker shipping operations, and chose to concentrate on human errors as one of the factors (Xhelilaj & Lapa, 2010; Rydstedt & Lundh, 2010). We have focused on attitudes as a dimension of safety culture awareness. Also, we identified what strategy is and what it consists of, as well as what we mean under "improved leadership strategies".

The structure of thesis is as follows.
Chapter one is an introductory chapter presenting problem statement. Chapter two describes how Principal- Agent challenges are addressed in relevant theory. Chapter three presents the design and methodology behind the research. Chapter four covers the empirical part of the study and presents main results. The fifth chapter will present analysis. Chapter six is the discussion of findings. Conclusion, limitations of the research and contribution of the study will be presented in chapter seven. Suggestion for further research will be given in this chapter as well.

2.0 – Theory

This chapter covers theories relevant for the current study. First of all, we define strategy and parts it can include. We explain what we mean under improved leadership strategies and a leader; present such definitions as safety culture awareness, tanker operations, major accidents and human error. Secondly, Principal- Agent theory, challenges in the relationship between two parties and theoretical approach to solution of those is described. In particular, we look closer at the role of contracts in Principal - Agent context, monitoring and control as remedy to opportunistic behavior and incentives as a remedy to interests' collision. Finally, the theoretical chapter ends with a framework relevant for this Thesis further.

2.1 - What is a strategy?

To understand the research problem we consider it is important to find out what a strategy is. As we have learned, it is not easy to define it by any of the standard definitions as every strategy may include various "ingredients" depending on the industry and company goals. Strategy can be explained as a direction or course of actions and according to Wit & Meyer (2010) "strategy is consisting of logically interdependent steps that can be an effective tool in solving challenges".

Historically term Strategy has its roots from "*stratos*" which means "*army*" and "*agein*" means "*to lead*", and is emerging from military decision- making (ibid).

Main strategic elements are as follows: first, strategic analysis evaluates organization's objectives, ideas and way of doing things vs. company's resources and the environment it is placed in. The second element is strategy development, when alternative strategies should be developed, evaluated and selected, with consideration of main vision, mission and goals. The next is implementation and execution of selected strategy. This is when leaders will have to coordinate and integrate systems and employees and existing resources effectively to

achieve the strategic objectives. Important contribution to this process is organizational culture, which can give employees common ground and influence their behavior. The fourth element is establishing of control, following up and reward mechanisms to maintain sustainability of the applied strategy. The strategic elements are shown in Figure 1.3.

Figure 1.3 *Elements of strategy formation*

Leaders are forming their strategy through main activities demonstrated by Figure 1.3. Furthermore, the leaders must find a course of action that will allow the organization to adjust itself in such a way that it will be able to achieve its purpose. Next is option generation, which is a creation of potential strategies when leaders explore a number of various avenues for approaching a specific strategic issue, and leads to option selection. After the option is selected, action can be taken with further control of the performance. Control can demonstrate a deviation from intended results, and it can signal the need to re-evaluate the original selected strategic solution (Wit & Meyer, 2010).

As each strategy has its mission within a certain field or industry, we would like to focus our strategy on shipping tanker operations.

Tanker operations form tanker industry and represent an individual segment that is conducting the transportation of liquids in bulk such as oil, chemicals, crude oil, liquefied natural gas and petroleum gas (UNCTAD, 2011). As world economics generates most of the ship demand, its growth and stagnations have always been driven by market. For example, when the economy is in a stable or growing phase, the demand of raw materials and products are increasing and vice versa (ibid).

In the shipping industry the Captain is the formal leader onboard of a vessel and is in ultimate command of the vessel (Fleming, 2001; ISPS). All persons on board, including the crew, guests, pilots and passengers are under his authority and his responsibility. Master must have a marine certificate, which can be obtained after several years of seagoing as a deck officer and certain education from maritime college or academy (http://www.ifsma.org/). Captain's responsibilities among other responsibilities are to assure that ship complies with international and national laws and company's policies and following the security plan as required by IMO and ISPSS code, which is amendment to SOLAS. Safety culture on board and awareness among crew members is a part of Captain's concern (http://www.bridgedeck.org/).

We have understood from theory review that leaders' of shipping companies can influence Captain's decisions, and are responsible for incorporation of any changes or improvements into company's strategy. Having implemented each new activity, it should be followed up and controlled to be able to analyze deviations from initial goals of the developed strategy. First of all it is important to know which improvements are necessary to be done. This will be main focus of our study.

2.2 - Improved leadership strategies

By improved leadership strategies we mean changed strategies that will bring better results, which in our case mean better and safer culture and understanding of safety importance. The idea is that improvement of the strategy leads to safety awareness increase, which again reduces number of accidents in tanker operations. Nowadays one of the focuses managers and leaders have in their organizations is how to improve safety, health and environment related conditions at the working place, and how to maintain them constantly.

Karlsen (2010) argues that leading an organization should be based first of all on HSE values which must be a starting point for a company's culture and must be incorporated into organizational strategy.

Today, society is concerned about improvements of HSE area due to irreversible consequences brought by toxic gas' emissions, climate changes, oil spills, waste, pollution and other environmental threats. "HSE leadership is a change leadership" (ibid), which is leadership that makes health, safety and environment conditions better by conducting HSE activities at a working place, and according to Labor Law §2- 1,3; §6-5; §4-2 *(in Norwegian: AML)* is the leaders' responsibility.

To be able to improve their strategy, leaders of shipping companies firstly must know where the improvement is needed which is a challenge due to asymmetric information, and then find appropriate mechanism to implement changes following those up after implementation. How can they improve anything in their strategy without knowing what to improve? As Decision making theory indicates first step to solve a problem is to identify the problem (Ward, 1954).

As a part of the strategy monitoring, in- process control, observations can be chosen as mechanisms to identify the improvement potential. Other alternatives can be internal control as for HSE, system revisions, external experts' analysis. However, these methods are once

per a period of time and will only demonstrate some of the aspects that are more visible and able to be measured. However, what is more interesting is how to identify the level of safety awareness people have when they are performing their tasks, especially in critical situations. We consider this not to be an easy task due to complex psychological processes going on in one's head, as awareness is an intangible construct and consists of several elements, as will be explained later in this paper.

Tanker operations and shipping industry need more than well-designed contracts, salaries, bonuses and performance measurement that can keep crew interested in maintaining safety onboard. Something that can influence peoples' mindset, change or even replace the whole way of thinking, creating intrinsic motivation and keeping risk and safety awareness on a high level.

The other challenge is when it is concluded which aspects of their strategies need improvement, how to assure that it will be performed constantly so that it will maintain safety level in all tanker operations at the desired level. What motivates employees to keep doing their job as best as they can in benefit of company's interest?

This research intends to explore leadership strategies in selected shipping companies and compare with the theory.

2.3 - Safety culture awareness

Safety culture awareness is defined as understanding of certain assumptions and practices, which build beliefs about danger and safety, and guides employees' behavior (Pidgeon, 2000). As Lee (1996) has defined "safety culture is the product of individual and group values, attitudes, perceptions, competencies, and patterns of behavior that determine the commitment to and the style of proficiency of, and organization's health and safety management" .

Awareness is also referred to as mindfulness, which is defined by Weick et. all (1999) as the "mental awareness to manage unexpected events via the capability to see significant meaning of weak signals and give strong responses to them". Mindfulness is associated with rich safety culture awareness, and is a byproduct of 5 cognitive processes, which are tied together to induce a high awareness (Table 1). Model of mindfulness is built upon the principles of High Reliability Organizations (HRO) (ibid).

Categories of mindfulness	Description
Preoccupation with failure	Search for potential errors and those occurred earlier; Prepare for threats and prevent errors to occur
Reluctance to simplify interpretations	Perceive suspicious signals as novel every time
Sensitivity to operations	Alertness to look for possible errors; share with others; follow up signals and develop collective solution
Commitment to resilience	Anticipation (Prediction and prevention of potential dangers before the damage is done) Resilience (Capacity to cope with unanticipated dangers after they have happened), simulator! As example capability to create "epistemic networks"
Under specification of structures	Decision taking on all levels of organization; no standard structure with 1 taking decision; collective leadership

Table 1. *Categories of mindfulness defining safety culture*

We intend to compare Safety Culture Awareness between management of shipping companies on shore and the crew onboard. We assume that due to asymmetric information and different interests there is a gap between Principal and Agent when it comes to safety awareness as it is shown by Figure 2.
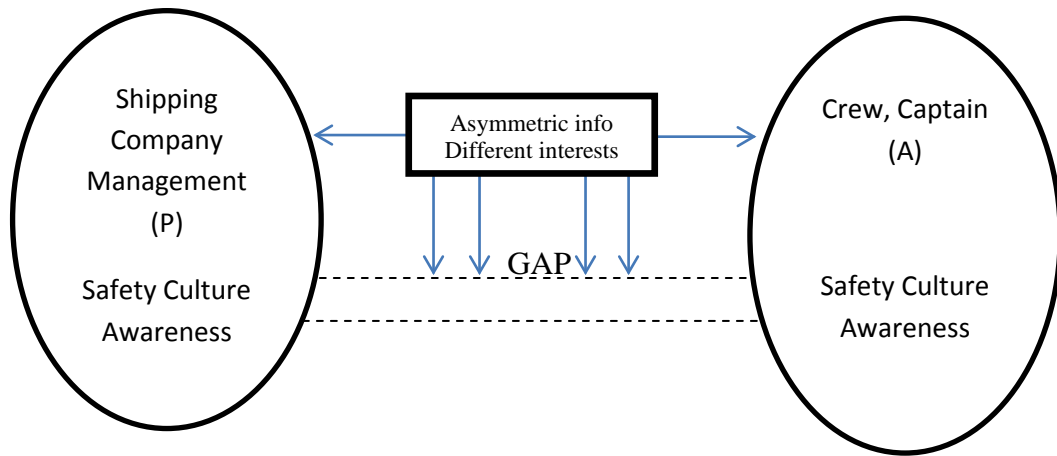
Figure 2. Safety Culture Awareness Model

2.4 - Human errors

Human error can be defined as "the failure of planned actions to achieve their desired ends – without the intervention of some unforeseeable event" (Reason, 1990). There are 3 elements of this definition: intention plan, that incorporates not only goal but the means to achieve it, a sequence of actions in that plan, and the extent to which "these actions are successful in achieving their purpose".

He (ibid) suggests the following reasons of why the planned actions may fail: due to unintended failures while executing tasks, which are called slips, lapses or trips. Those happen even though the plan was adequate. Slips are mostly observable actions and happen due to attentional or perceptual flaws. Lapses generally involve memory failures. The other reason is the plan itself. Rule – based mistakes, which is a failure to apply normally good rules (a violation), or the application of bad rules; knowledge- based mistakes, when we lack well planned solutions, and need to come up with solutions immediately. The summary is represented by Figure 3.
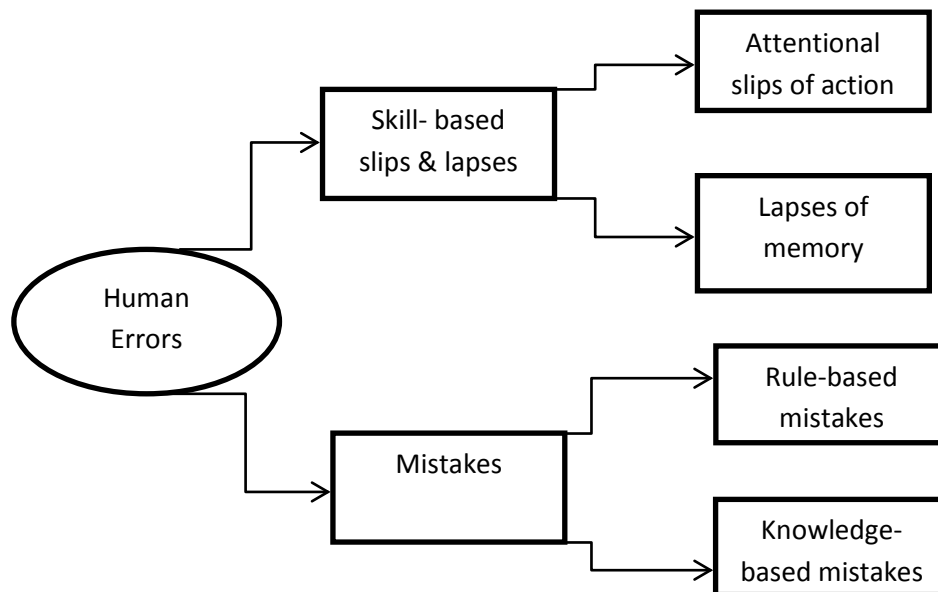
Figure 3 *Types of human errors*

Human errors are very common reasons for major accidents (Petrovski, 1992; Salvesen, Soma, 2009; Soma, 2010; Stellan, 1996). First of all, it might be because of individual decision made onboard. For example, the shortcuts captain decides to make to save time or taking more cargo than allowed, overestimating his long experience and expertise in maneuvering the ships. The captains might be simply fatigued and worn out and are not able to be attentive enough sailing in the seas.

Soma (2010) explained the problem of involving human factor into decisions during tanker operations with the help of Titanic example. Back in 1912 it was on its voyage in the Atlantic, when it received the signals about an iceberg in the area, and still tried to make a cross- Atlantic record. The explanation for that desire was competition with other shipping companies and its reputation as "the unsinkable ship". However, the collision with the iceberg resulted in 1517 fatalities. Captain Smith considered that reducing the speed would have brought negative effects businesswise. Moreover, the risk for hitting iceberg was not so big. The decision taken by Captain demonstrated lack of safety priority when it is in conflict with other organizational goals and lack of risks awareness. Can this example give us an idea that management of the company did not make it absolutely clear for its staff that one should choose safety before other benefits when the risk is there?

As DNV reports, types of accidents that occur due to human and organizational factors have been rising for the last years (http://www.dnv.com/industry/maritime). According to Marine Accident Investigation Branch (http://www.maib.gov.uk/home/index.cfm) and to the reports of Mary Rose & Ship Vasa, Exxon Valdez, Torrey Canyon, Amoco-Cadiz, Prestige, and also Texas City tragedy, Minamata, Challenger, Bhopal; and a number of scientific articles analyzing reasons and consequences of errors and accidents we have collected them into the following groups as shown in the Table 2.

Reasons leading to Accidents	Reasons leading to Human errors
Environmental/force Majeure 10%	Fatigue; Stress/Health/Well- being; Alcohol consumption; Situation awareness; Risk awareness; Knowledge &skills; Communication difficulties; Misunderstanding; Error reporting; Rules negligence; Unknown unpredicted
Economical pressure	
Technological 20-10% -equipment design error	
Organizational - Structure -company policies - Work environment (shifts,rotations,hours)	
Cultural differences/langauge	
Political/Governmental	

Table 2. *Reasons leading to accidents*

Reasons leading to *human* errors are represented as a separate group by itself with detailed classification since we chose to focus on these types of errors. This table will be applied further to the theoretical framework of this paper.

2.5 - Major accidents

In order to understand what major accident is we found explanations in the literature. Accidents include loss of life or major injury to any person on board, or when a person is lost from a vessel; the actual or presumed loss of a vessel, her abandonment or material damage to her; collision or grounding, disablement, and also material damage caused by a vessel (Marine Accident Investigation Branch UK (Maib)).

Reason (1990) defined an accident as "comparatively rare, but often catastrophic, events that occur within complex modern technologies such as nuclear plants, aviation, the petrochemical industry, chemical plants, marine and rail transport, banks and stadiums". He (ibid) argues that accidents are "the product of technological innovations which have radically altered relationship between systems and their human elements". Organizational accidents have not a one cause led to the accident and many people involved at different levels.

As we realized, major accidents cause significant losses and involve populations and environment, and can have devastating effects (www.ptil.no/major-accident-risk-article4172-144.html; www.comcare.gov.ua/safety).

An accident is a diverse phenomenon, and can be classified and grouped according to several dimensions (Hovden et. al, 2004). Therefore, we intended to find out this classification in shipping, and found it in the IRSOC. It includes accidents, incidents, near misses and hazard conditions.

Accidents, near misses, hazardous conditions must be registered and reported as fast as possible, so that investigation can be launched before the evidence of the occurred decays or is lost (http://www.maib.gov.uk/about_us/index.cfm).

Table 3 summarized the classification of accidents.

Hazard and accident situations	Undesirable incidents and situations that have resulted in, or could have resulted in, harm to persons, the environment or to material assets and other financial losses
Incidents	Hazard and accident situations that have resulted in, or could have resulted in, harm to persons or the environment. Harm to material assets and other financial losses resulting from such undesirable incidents and situations shall be included when classifying them. HSE incidents also include spills exceeding permits, work related disorders/ illnesses and other undesirable incidents and situations related to health and working environment as well as security incidents
Near miss	Hazardous incidents that under slightly different circumstances could have resulted in harm or loss as described above
Hazardous conditions	Condition that under slightly different circumstances could have resulted in harm or loss as described above

Table 3. *Classification of accidents*

During this Master thesis project we found out that the oil company has its internal registration system for storing investigation reports (IRSOC). We have used the reports to design dilemmas for the survey, and as we learned, an investigation report is a formal document that is meant to provide information about an occurred accident. An investigation is focusing on finding out what happened and why, and try to identify measures to keep it from happening in the future. A report is usually written by investigators who have researched and analyzed the accident short time after it happened. A report begins with a summary section followed by sequence of actions led to an accident, which is date, time, location, and consequences. Further, route cause analysis, conclusion and recommendation for prevention follow.

2.6 - Principal - agent phenomena. Challenges and solutions

The second part of this chapter introduces Principal- Agent Phenomenon and challenges between the two parties.

2.6.1 – Monitoring & Control

When considering relationship between the company's management and company's employees, we call management for Principal, and employees for Agent. (Laffont & Martimort, 2002). Principal (she) has delegated job to her agent (he), and expects him to do it according to her expectations. However, the challenge is that Principal is not able to evaluate whether agent does a good enough job, because of lack of direct control and monitoring. The Principal can only see the outcome of the job. This challenge is known as asymmetric information (Fig. 4) between two parties, where agent has access to information, the Principal does not. Moreover, it can also be that the agent would not like to uncover all that information to the Principal neither, in case if he has his own interests that can be in conflict with Principal's interests.

In addition, the agent will try to optimize his interests without any concern for those of Principal. This is known as a problem of moral hazard. The challenge is aligning interests of both parties, so that agent is motivated to do his job with voluntary desire to achieve results that will be aligned with Principal's interests. Therefore, it is of a great importance to design a reward system which will include incentives for the agent to make choices which are also within Principal's interests (Hoff, 2009).

Hill & Jones (1992) argue that since the agent (captain and his crew in our case) has authority to filter and decide over information flows, this control complicates asymmetry problem, and makes Principal want gather more information to understand whether agent acts in her interest and to what extent. In attempt to illuminate the problems, they (ibid)

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suggest that the Principal can enhance monitoring. Lorsch and MacIver (1989), referred to several American case studies, and supported that more complex structures involve increasingly extensive monitoring. Structures that perform a co-ordination function, such as labor unions, consumer unions, special interest groups, can play a "police" role.

In opposition to previous, Jie Cai et. al. (2009) found that firms facing greater asymmetric information tend to use less intensive monitoring, because of the high cost, and instead have higher monetary compensation schemes for executive managers. Gayle & Miller, (2009) argue that "unity of goals between the Principal and Agent can be achieved by establishing correspondence of the value of the company and the managers' wealth, which means, by other words, that if manager serves company's interests, his own profit grows".
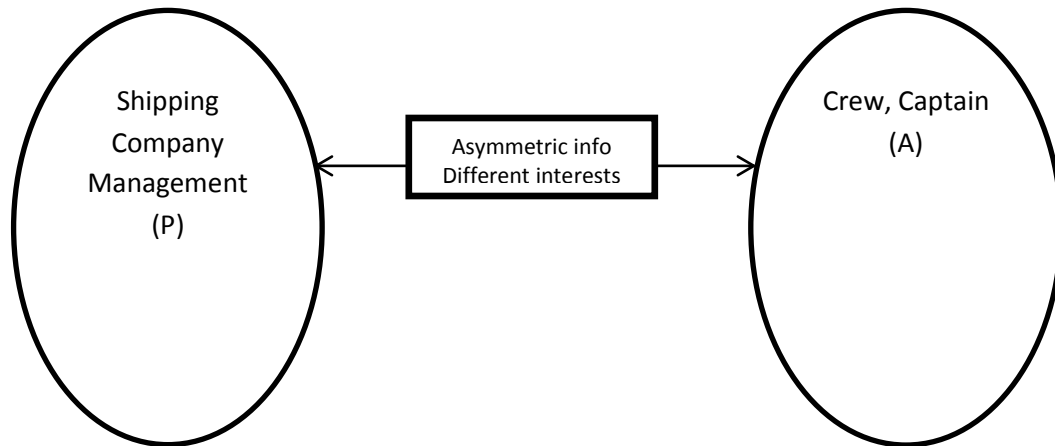
Figure 4. *Principal (P) and Agent (A) relationship*

Instruments of influence here can be opportunities for the manager to hold shares in the company, or bonus schemes linked to company's profits. Maintaining manager's competence is considered to be another incentive. Possibilities for personal development are seen as the future earnings. Some managers need to make sure their competences are visible

to the industry (reward, recognition), which brings this person status (Kahn & Sherer, 1990; Hall, Liebman, 1998; Kevin, 1999; Nastanovych, 2009).

Knott (1993), however, claims that certain performance incentives can stimulate hidden information and hidden actions. He explains asymmetric information as the construct consisting of two forms: adverse selection and moral hazard. Adverse selection came originally from insurance business, and is applied in employees – managers' relationship, when employees know much more about their own pure interests, motivation and skills than the managers, hiring them, do. He (ibid) argues, this "knowing more" can be misused and lead to opportunistic behavior, which is known as "moral hazard", which was identified as the problem of "inducing agents to supply proper amounts of productive inputs when their actions can not be observed directly", and among other "remedies" for this, increased monitoring of performance and control were suggested again (Holmstrom, 1982).

Aulakh & Gencturk, (2000) have researched Principal and Agent relationship on the international scope. They argue that control plays a major role in reducing asymmetric information between Principal and Agent. "Principal sees the Agent as the instrument for achievement of her objectives". Interestingly, they found that 3 types of control (output control, process control and social control) may influence differently behavioral performance in Principal – Agent relationships. It was concluded that process control has the most effective influence on agent's performance rather than other two types of control. "The Principal can direct the Agent toward performing certain behaviors that are consistent with the achievement of firm's long term economics performance objectives". Figure 5 will be included into the theoretical framework.
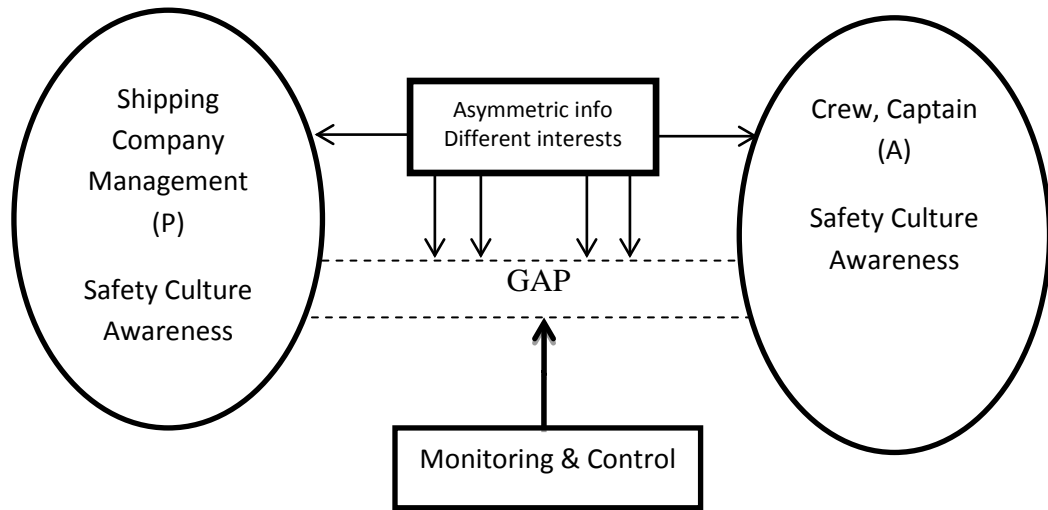
Figure 5. *Monitoring & Control is a solution to P-A problems*

2.6.2 Incentives

Incentives are studied from the views of economics, sociology and individual and social psychology, at different levels of management: top management and middle management, middle management and employees, and even between company owner and company manager.

Incentive theory covers the means that managers have at their disposal for obtaining the correct output from employees and suppliers. The challenge for the crew is to pull in the same direction as top management to do the correct things. Since employees (crew and captain) sometimes have their own agendas, their objectives are not automatically the same (Fehr & Schmidt, 2004; McLeod & Siebert, 2001; Groves et. all, 1994; Osmundsen, 1999; 2002). This challenge of Principal – Agent relationship we refer to as "problem of aligning interests". Interests' collision is referred as "bureaucratic power struggles" among divisions and units, and can be resulted by grouping activities into categories, including certain functions, geographical regions, product lines etc. (Knott, 1993). As Knott referred to Baker, Jensen, Murphy (1988), conflicts of interests also inhere in the monitoring systems.

So how can leaders manage their employees and motivate them do the job in their interest?

Research proves ineffectivety of traditional incentive techniques such as policing opportunism, as it can lead to not willing to take responsibility by employees. It is rather recommended use of monetary compensations, bonuses, recognition etc. (Holmstrom, 1981; Osmundsen, 2002) that is factors leading to extrinsic and intrinsic motivation. Figure 6 will continue development of theoretical framework for this research.

Lazear and Gibbs (2009) discussed that employees respond strongly to incentives, therefore if correctly designed, incentive schemes can be very effective. They also mean that modern management is focused on incentives more than on control.

Leaders should use rewards to cause others care about their own objectives according to Kerr (1995). He (ibid) drawn some conclusions and meant that in reality management has numerous reward follies, and they apply rewarding strategies that discourage types of behavior which can be rewarded. Having done analysis in politics, war situation, educational sector, consulting, sports and business, he gave numerous examples of when incentives are not used in a correct way. "In universities professors are expected to be highly motivated and be aware of the contribution to society with their teaching, however, are rewarded for research and publications. And since the cliché "good teaching and good research go together" does not work in practice, professors claim they have to choose between those activities when allocating their time. Or, in sports even promoting a "one – for – all" spirit by coach, individual performance is rewarded". Kerr alerted managers complaining lack of motivation in their employees, saying that they should re consider incentive systems they have installed by analysis of what type of behavior is currently being rewarded. He (ibid) argues that managers will be surprised that their strategies are not rewarding what they assume they are.

On top of that, there are many ways to motivate employees. Recent studies of social psychology and organizational learning suggest that financial reward should be given at a separate time from other rewards which are referred to as "intrinsic motivation" (Mayfield & Mayfield, 2012), leading to employees feeling inspired and affectively committed to their job.

2.7.2 a- Intrinsic and extrinsic incentives

Extrinsic motivators are monetary rewards and verbal reinforcement, coming from outside to the person, and intrinsic, is mediated within the person (Frey & Jegen, 2001; Kuvaas, 2005).

To attempt to apply incentives for aligning interests, Bragelien (2001) looked at extrinsic incentives and their influence on performance. He discussed advantages and disadvantages of "pay-for – performance" schemes. He suggests that if the job goal is clearly described, and can be measured, the employee can respond positively to individual financial incentives. Moreover, bonuses can be used for aligning interests of principal and agent and by doing this reduce problems of asymmetric information and moral hazard. However, more important tasks should be prioritized over less important, which has to be taken into consideration while implementing the incentive schemes.

Merchant and Van der Stede (2003) defined several criteria for evaluating rewards and incentive systems. First of all, the reward should be significant enough to have an impact on the agent. Secondly, it has to be durable, to motivate the agent for a certain period. Next, the reason for the reward should be understood by all agents. Fourth, the reward should come in time, which is as soon as possible after the performance in order to get the best motivational effect. Also, the reward has to be reversible, for example, bonuses; salary increase on a regular normative basis is a standard change, which is not reversible. Finally, the reward should be cost efficient.

In opposition to those who support extrinsic incentives, Motivation crowding theory (Frey & Jegen, 2001) means, monetary mechanism might undermine intrinsic motivation to do the job. Karlsen (2010) means that performance should not be motivated by salaries, bonuses and similar, because it can lead that employees start finding "short cuts" for the sake of getting the reward. "People are born with intrinsic motivation, self- esteem, dignity, curiosity and joy to learn" (Senge, 1990).

Deci (1971 & 1972) suggests that management may prefer using verbal reinforcement rather than monetary incentives due to the cost difference.

However, intrinsic motivation is often disregarded in economics. Reason for that is difficulty to measure and identify which parts of employee's motivation was intrinsic, which not; and difficulty to control and influence, especially when there are other scales and extrinsic schemes to motivate. David Kreps (1997) gives example when high salary provided by employer leads to fear of being dismissed from the side of employees, which brings an intrinsic motivation as a result of extrinsic incentive. The same with peer pressure, which is also "fuzzy" and difficult to observe, but employee can be perceived to have his intrinsic motivation.

Kerr (1975) disagrees with the above presented ideas, and claims that there do exist "soldiers who are patriotic, players who are team oriented, and employees caring about doing their job well", and formal incentive system is not the only motivation for the agents to fulfill principal's requirements.

To continue development of the theoretical framework we would like to underline that monitoring and control, extrinsic and intrinsic incentives are important parts of leadership strategies and should be paid attention to when trying to motivate employees to perform safely. Figure 6 will be taken to theoretical framework of this work.
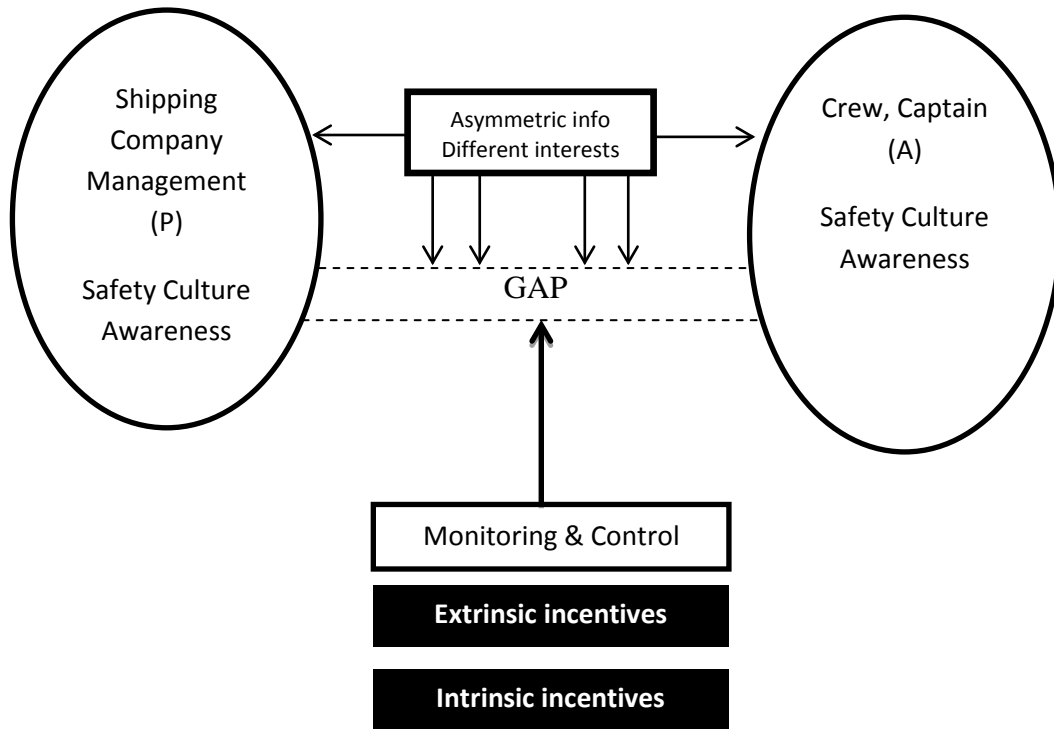
Figure 6. *Incentives for solution for Principal Agent Challenges*

2.7.3 – Employment Contracts

"Contract is a governing mechanism where parties agree to obey certain rules to certain extent" (Williamson, 1975).

The purpose of contracting relationships among individuals in a firm is to provide incentives for efficient behavior. The contracting approach has come to dominate the study of incentive and organization problems. It is motivated by the idea that markets are incomplete and consequently firms and other institutions needed to supplement market allocations. These have origins in Coase (1937), Williamson (1975) initiating the modern revival of these issues.

Gibbons (1998) in his paper discussed the models of "relational" incentive contracts. He argues, having relied on most of the literature, that the worker's contribution to company's business output is "observable but not verifiable". He (ibid) explained how including a bonus into a contract can be used by the company to motivate employees on the job, by promising to pay a bonus based on the worker's contribution. He supposed that worker's contribution can be either high or low, and that higher level of worker's action increase the probability that the high contribution is occurs. This can increase cooperation among parties, between Principal and Agent.

However, if the company does not pay the bonus in a given period, then the workers will loose trust and the company can receive normalized to no pay off from its workers in every future period. So the company has a choice whether to pay bonus now and get expected profit after, or not to pay bonus and earn zero thereafter. Economically and cost-wise (opportunity cost- wise) the firm will prefer to pay the bonus if the present value of increased future profits from paying it exceeds the cost of paying the bonus today. For the company paying a bonus yields a reduced current profit and the increased future profit in every future period if the employee is kept motivated, whereas not paying a bonus yields the larger current profit but zero profit in every future period.

If bonuses are included in the contract, how high or low should they be is one more question. Stewart (1993) gave an example when the employees of First Boston bank left the firm because they claimed that bonuses were too law, and lower than other banks in the market. But the management said that bonuses were law because performance was law. All of the relational contracts are incentive contracts, where pay depends on performance, and has its advantages and disadvantages, that will be more discussed in a discussion part.

Lazear and Gibbs (2009) studied change of the wages' influence on the change of the performance, which is one of the most important parts of the contracts for many employees. When management changes the wage system from fixed salaries to piece rates, productivity rose by 35 %, while wages rose by 12 %. And he found out that the third of the improved performance can be attributed to selections effects; the less able left the firm and more talented workers replaced them. However, selection and recruitment are out of the scope of this thesis.

Effect of compensation policies on performance is drawn by Banker et al. (1996), and found out that store productivity rises by 9- 14 % after the change in wage system. McMillan, Whalley, Zhu (1989), Groves et. al (1994) address how Chinese economic reforms have effected performance levels through changed compensation practices. It shows that perhaps 75 % of the increases between 1978nto 1984 in agriculture can be because of introduction of the responsibility system, which allows local communities to retain shares of their profits. Groves et al. (1994) used survey data on 800 enterprises in China, industrial sector, where managers reported that there is a strong link between industrial performance and the use of bonuses in contracts. Employment contract is included into theoretical framework (Figure 7).
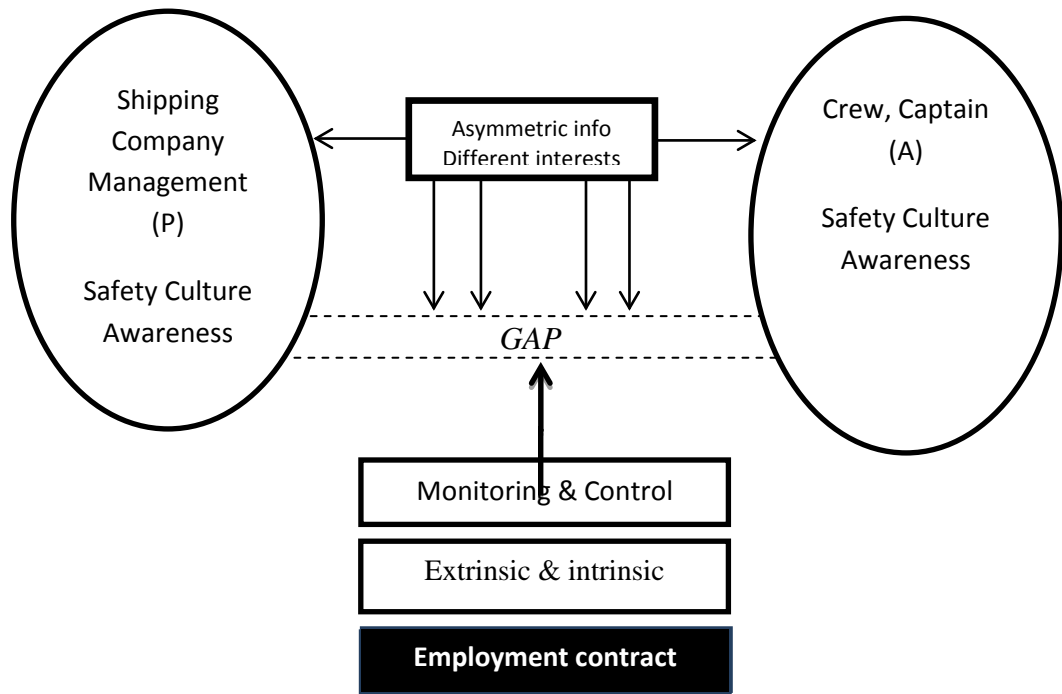
Figure 7. *Employment contract for Principal Agent challenges*

2.8 TCE about Principal – Agent challenges

Drawing on Transaction Cost Economics (TCE) theory asymmetric information (imperfect information) is seen as one of the main characteristics of business exchange transactions. From the point of view of TCE asymmetric information arises when there is public information available to all parties but also private information which is only available to selected parties (Hobbs, 1996). This is considered to be a reason of opportunistic behavior, first of all, (prior transaction) opportunism called ex ante is known as adverse selection. Ex post (after a transaction) opportunism arises due to hidden, not directly observable actions of the individuals of the company, for example to benefit individually (Hobbs, 1996).

Having conducted an integrative reviews of 45 key empirical examinations of the TC Analysis framework, Rindfleisch & Heide, (1997) suggest opportunism is one the main assumptions of a human being.

Opportunism is a self interest oriented behavior that can include lying, stealing, cheating and other forms of deceit. It is presented as an assumption that the decision maker (in our case agent) may seek to serve his own interests, which cannot be known to principal beforehand. "Self- interest seeking with guile" (Williamson, 1985). Also, opportunism refers to the incomplete or distorted disclosure of information, especially to calculated efforts to confuse or mislead and is the source of asymmetric information (ibid).

Problem of opportunism in TCE is viewed together with involvement into relationship specific assets, (which we will not focus in this paper), and behavioral uncertainty and difficulties connected to monitoring performance. As the review suggests, in opposition to markets, firms have stronger ability to control and monitor, which can reduce opportunistic behavior (Rindfleisch & Heide, 1997).

TCE is focused on the role of efficient governance and explaining firms as an institution for organizing economic activity. Therefore, having conducted literature review, we concluded

that TCE has its own remedies to opportunistic behavior, which will contribute to "lower cost activities of the firm". These are vertical integration, strategic alliances, formally written contracts, concurrent sourcing.

Vertical integration is the type of management control, when companies are integrated into the supply chain through a common owner, and each member of this chain produces different products (service), and they will satisfy common need. Strategic alliance is defined as an agreement to serve a common strategic objective between independent firms, where trust is the main condition to success (Hobbs, 1997).

Parmigiani (2007) argues that concurrent sourcing, when firms use both markets and hierarchies as governance structures to solve opportunism, asymmetric information and reduce costs, can be considered as one more solution. She suggests that it is possible for firms both "to make and buy" if the leaders manage internal and external processes simultaneously. Internal production can lead to reduction of information asymmetry, however "firms may be willing to pay more to a supplier rather than invest into additional production internally".

 Williamson (1985) suggested that "opportunism ex post can be prevented by appropriate safeguards ex ante", which gives us an idea that management should be better focusing on planning for unforeseen circumstances. However, planning beforehand is not so easy due to existing uncertainty and bounded rationality (Rindfleisch & Heide, 1997).

2.9 - The theoretical framework

Having presented theory above in this chapter, we will present the theoretical framework. Due to existing barriers between Principal and Agent, we assume their safety awareness levels differ from each other, and this gap will need to be minimized by conscious actions from management, which can be done after shipping companies identify the areas for improvement, and work directly towards those to be improved. Solutions suggested by theory of Principal and Agent are well designed contracts, extrinsic and intrinsic incentives and enhanced control and monitoring of performance. Those are included into what we call "leadership strategies", and are presented in the framework (Figure 8). Most of these activities are already implemented in the leadership strategies nowadays, however, this research will explore if there are any other aspects that can be included to improve the strategies.

This theoretical framework is the foundation for the empirical work of this study and will also serve us as an outline for the structure of analysis and discussion.

Onshore management (P)

Safety Culture Awareness

Asymmetric info
Different interests

Crew, Captain (A)

Safety Culture Awareness

GAP

Improved Leadership strategies:

- Monitoring & Control
- Employment contract
- Extrinsic & Intrinsic incentives

Human element / human error 60-90 %

Fatigue;
Stress/Health/Well- being;
Alcohol consumption;
Situation awareness;
Risk awareness;
Knowledge &skills;
Communication difficulties;
Misunderstanding;
Error reporting;
Rules negligence;
Unknown unpredicted

Reasons leading to accidents

Environmental/force Majeure 10%

Economical pressure

Technological 20-10%
-equipment design error

Organizational
- Structure
-company policies
- Work environment
(shifts, rotations, hours)

Cultural differences/language

Political/Governmental

P R E V E N T

ACCIDENTS

Figure 8. *Theoretical Framework*

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3.0 – Methodology

This chapter will present what we did and how we did it. Main aim of this chapter is to demonstrate how the research was accomplished – what the data consist of and how the data were collected and analyzed (Lawrence, 2003). Choosing appropriate methodology is important before initiating the study. Methodology is a tool to describe reality (Jacobsen, 2005), and choosing improper methodology can lead to wrong interpretation of findings.

In this part we will describe the methodology used for our research in more details.
Firstly, the field of study and the reason for the choice of field is discussed. Secondly, research design and choice of research design are discussed. Third part presents the method chosen for data collection. The fourth discusses the analysis and handling of the data. Last, quality of the methodology and the research is discussed.

3.1 - Field of study

Even though shipping is a key value driver for an oil company, it is not a core activity. For that reason, among others, the shipping activity is often outsourced to independent shipping companies. The challenge with major accident risk is that it cannot be measured directly making it even more difficult to control accident risk through contractual clauses and requirements.

Inspectors of the vetting department approve or disapprove vessel's condition for the intended transaction. The owners of tankers are dependent on the approval, without which shipping companies can loose jobs and cargoes.

OCIMF (Oil Companies International Marine Forum) was the first to set out a vetting inspection program. Another advanced inspection system for shipping industry is SIRE

which is used by all its members. In addition, the vetting system is strongly regulated by IMO, an organization issuing regulations, such as conventions SOLAS 1974, STCW and MARPOL, Liability Convention and the Fund convention. These authorities in cooperation with Port State Control and Classification Societies issue all the inspection's requirements and formal documentation (Boge, 2009).

One of the other organs regulating international labor standards is the International Labor Organization (ILO). This agency brings together representatives from governments, employers and workers to shape policies. The Maritime Labor Convention (2006) was adopted by 314 votes in favor, and none against, at the 94th ILO Maritime Session in 2006, in Geneva. The MLC seeks to ensure that there is the world wide equivalence of employment and social rights for seafarers on ships, as well as to create conditions for fair competitions among ship-owners. The MLC will develop the existing maritime system to enforce IMO Conventions through Port State Control (Marine periodical 2011).

Statistics for major navigational accidents for the international tanker fleet shows that all these authorities and regulations do not suffice on preventing major accidents. The likelihood of a serious collision, contact or grounding has doubled over a few years time, implying that oil companies must do things differently to improve major accident risk (http://www.maib.gov.uk/home/index.cfm). Because such accident causes are related to human and organizational factors, it is plausible that new and improved leadership strategies can be a tool to mitigate the risk.

3.2 - Research design

Johannessen (2010) explains that research design is about who and what will be researched and how the research will be done. Research design should be a helpful tool to approach the research problem looking for its solution in the best possible way with the given constraints, such as time, budget and other resources. There are three main types of research design: exploratory, descriptive and causal/explanatory (Ghauri and Grønhaug, 2005).

Exploratory research is applied to get a better overview of the topic, learn about something unknown, getting new insights. Qualitative data is often used for this type of research and methods applied are very flexible. It helps to answer following questions: what, when, where, how, who or why, or combination on those. (Saunders et al.,2012; Shields, 2006; Neuman, 2009). "The focus is initially broad and becomes progressively narrower as the research progresses" (Saunders et al., 2012).

Descriptive research is used for a well-defined subject and as an extension to the exploratory research (Saunders et al., 2012, Neuman, 2009). This research intends to answer the question "how?" and "who?" and presents a qualitative or a quantitative detailed description of the subject (Neuman, 2009). Instruments used are surveys, sampling, interviews or content analysis (Shields, 2006).

Causal or Explanatory research is based on cause and effect relationship (Ghauri & Grønhaug, 2005, Saunders, 2012). Relationship between variables is attempted to be explained by answering the question "why". It often can be quantitative, experimental or quasi experimental and employs formal hypotheses (Shields et. all, 2006).

To be able to answer our research question, we have to do partly a "detective" work, what identifies exploratory design. In our study the problem is known partly prior the research. It is known that accidents occur even though there are lots of regulations, control and multiple activities being performed with focus on safety in the companies. We presume that there is

more efficient work to be done in order to prevent accidents and this can be effective smart leadership strategies. Current levels of awareness among employees and leaders, among the Principal and the Agent is not known, therefore we do not know which elements of the strategy should be improved in the selected companies.

To answer the question "How can leadership strategies be improved to prevent major accidents in shipping tanker operations?" we designed our study as follows.

First of all, the theoretical background of the relationship between Principal and Agent, challenges and solutions to those have been studied. Second, we assumed a gap in safety culture awareness between managers and crew and wanted to explore it in reality. Gap was identified, analyzed and discussed. Third, the gap was taken as the departure point for suggestions for strategic improvements.

The objective of scientific research is to integrate theory with empiric by one of the following methods. Deductive method is used when the research proceeds from theory to practice, from more general to specific. "Inductive" method is when the research starts with data collection without any initial theoretical base. Consequently, the researcher observes general patterns which can be translated by theories further on (Johannessen, 2010).

Our study is based on solid theory, problem statement was clearly defined at the early stage, and the conceptual model was built while moving from the phenomenon towards a specific research problem.

3.3 - Data collection. Quantitative and qualitative research

Data collection has been an interesting and educational process for us due to several sources used.

In the following section the nature of quantitative and qualitative data will be discussed (Neuman, 2009), types of research, data gathering and the sampling technique.

There are two main methods of data collection: qualitative and quantitative. The qualitative method is commonly applied through interviews, observations, and participation in the setting and answer questions why, how, what and when. Qualitative data is collected in the form of visual images, words or sounds. There will be fewer participants in qualitative research then in quantitative (Johannessen et. at., 2005; Neuman, 2009).

Quantitative research collects numerical and/or statistical data in the form of numbers. With the help of surveys, reviews and archival information the data from a large sample can be collected (Johannessen et. at., 2005; Neuman, 2009). Anyway distance to data is the major disadvantage of the method.

Our research is based on qualitative method as we have an opportunity to involve not so many participants. We consider this approach to be appropriate to answer our question, because we will be able to obtain subjective "insider view" and have closeness to data, however, it will limit generalization ability (Ghauri and Grønhaug, 2005).

3.3.1 - Primary and secondary data

This research is a "good deal of flexibility" (Saunders, 2012) while collecting the data. We used both secondary and primary data.

Secondary data is collected by others in earlier researches in the form of raw data or publicity available documents. That data might have been collected for other purposes than our research question therefore can be of a less optimal fit with our study's problem. Secondary data gives a broader base such as: it can aid the researcher in segmenting, sampling and allowing the comparison between time and space, cultures or nationalities (Ghauri and Grønhaug, 2005; Jacobsen, 2005).

To be able to answer the research question it has been necessary to understand general reasons for accidents. To do that we started with the review and analysis of investigation reports for accidents happened in the Norwegian seas which was one of the source of secondary data. Besides, scientific articles, peer reviewed journals, publications, and books have been used as secondary data sources.

Primary data may be collected through interviews, questionnaires, experiments or observations directly from the people and collected for the purpose of current study (Ghauri and Grønhaug, 2005; Jacobsen, 2005). The primary data collection is time- and resource-consuming, and this may limit the amount of gathered information. However, it provides with specific information like details, in depth information through the interaction with the informants. Sampling of primary data is easier to control, but the challenge is the dependency on the willingness and ability of the primary sources to contribute to the study. Collecting primary data, the researcher can assure the validity of the process (Ghauri and Grønhaug, 2005; Neuman, 2009).

In the current study we have conducted informal discussions with several seniors from shipping industry and run questionnaires for management and crew in the shipping. Having

collected the answers from participants it gave us general understanding of how safety culture is perceived, and what is the gap between Principal and Agent.

3.3.2 –Sampling technique and data gathering

In our case the most suitable technique for data gathering was a survey. According to Saunders (2012), the survey is a "research strategy which involves the structured collection of data from a sizeable population in the form of questionnaires, structured observation or structured interviews".

It is common to apply surveys in business and management research, and for exploratory and descriptive studies. Responses can be analyzed easily due to standardized questions.

We used Survey Monkey Software for creating our survey. The survey had covering letter (Appendix B), 9 situations with 5 rating types of questions (statements) to each for evaluation (Appendix D) on a scale from 1 to 7 and three category questions for finding out the background of the respondent (Appendix C). We chose not to have too many questions as it would limit our comprehensiveness (Saunders, 2012). We chose to use Likert Scale with a set of answer choices, such as strongly disagree, disagree, more disagree than agree, partly agree, more agree than disagree, agree, strongly agree. Answers in Likert Scales can consist of two to six categories. The number of answer choices should rather be under nine. We consider the questions to be sensitive and that's why we build our questions in an alternative way, but interesting for the participants based on real situations dilemmas that they were evaluating from their own experience. The questions were relevant as for the participants' professional area.

One of disadvantages of the survey is that the collected data can not be as detailed as other possible research strategies could have gathered, however due to the time limits the survey was the most suitable tool to use. Cases of earlier accidents served us the base for survey

questions (IRSOC). We have not selected interview as alternative or supplementary tool for information gathering as the participants would have tried to answer "politically correct".

Before sending the survey to respondents, we conducted pilot testing (Saunders, 2012) in order to find out if the survey tool was working and that there would be no problems in answering questions. Afterwards, the survey was sent electronically to the crew on board and management on shore.

In addition, we chose to apply case study as a helpful tool while preparing questions for questionnaires by a prior analysis and comparison of earlier accidents and errors in Norwegian shipping business (IRSOC). Each accident happened in past served us as a case relevant for our research topic. Having researched it we had an overview of the root causes, chain of events led to that particular case. However, it needs to be underlined, that we were aware that case study is quite different from historical review as a method. As we had to assure content and construct validity for our questions (Saunders, 2012), several discussions were held with seniors working in Vetting and oil industry who shared their experience as for importance of safety awareness in high risk industries. Thus we secured that our questions would be realistic and provide us with necessary data.

According to Ghauri and Grønhaug (2005) case study is particularly used when there too many variables to be considered, and when the phenomenon is difficult to be studied outside its natural setting. Case study method is used for theory development and testing, and allows the researcher to compare the phenomenon observed in different cases in a systematic way. Cases related to Principal Agent theory were presented by IEA (2007).

To present shipping case in the light of Principal – Agent phenomenon we summarize it in Table 3.

Dimension	Transportation of oil/ gas
Unit of analysis	Relationship between shipping company management and the crew
Problem domain	Relationship in which the Principal and the Agent have asymmetric information, not the same interests and not the same level of understanding/ awareness of safety and risks involved
Goal orientation of the actors	Perform transportation in a efficient way economically while minimizing risks; Prevention of accidents,- low to no errors
Key objective	To explore and compare level of awareness between P and A. Increase safety culture in tanker operations
Human assumptions involved	Bounded rationality; Self interests; Opportunistic behavior;
Organizational Assumptions	Principal gives tasks to agent; P and A posses different information about the task after it is being performed by A; Gap in safety awareness between P and A

Table 4. *P and A theory presented in case of shipping*

3.3.3 – Sampling

Choosing an optimal sample is important both for validity and reliability of the findings. Random sampling (Ghauri and Grønhaug, 2005) is the best for getting a more accurate representation of a population (the universe of units from which a sample is to be drawn), however, it is difficult to conduct. Therefore, nonprobability sampling is widely used. Out of four existing types of nonprobability sampling techniques, we chose a purposive or judgmental sampling (Neuman, 2009).

Our research has a goal rather than getting a representative sample; therefore, we used judgment to select cases as the oil company had specific companies in mind. As we are not aiming for getting statistically based conclusions, but rather to understand and get the insights, we chose to explore a certain number of companies, which will be our samples. Out of the population of over 50 shipping companies that are cooperating with the oil company 3 of them were selected (SC1, SC2, and SC3), because they have been in a long time business relations with the Oil Company, and have a size of fleet that fits a survey; we trust they would be able to facilitate completing a survey due to internet access while in transit. Selected companies were contacted by a responsible for the project "T/C fleet assurance program".

3.4 - Data analysis

To be able to understand and explain the findings we structured the data by dividing it into constitutional parts. There can be noticed three main steps of dividing of analytical process: data reduction, data displaying, conclusion drawing and verification (ibid).

According to Ghauri and Grønhaug (2005), data reduction is about selection, focus, simplification, abstracting and transforming the data through writing up field notes and transcribing collected information. On this step the researcher have to identify relevant themes and patterns. The challenge is that there can be different interpretations of the data, so the conclusions have to be drawn very carefully (ibid).

Data displaying is about organizing and compressing the data into the format which allow making a conclusion. On this stage categorization, abstractions, comparisons, dimensionalization, integration, iteration and refutation can be used. Coding is the valuable tool in order to classify, categorize and compress found information. This step helps to be able to display the data easily and identify findings. Last step is to make conclusions and identification of findings (ibid).

3.5 - Evaluation of quality

The measures have to be reliable and valid so the research would be truthful, credible and believable (Neuman, 2009), though a perfect validity and reliability can never be achieved, because of measurement errors. Those can be systematic and random. Systematic errors occur whenever the measuring instrument is used and they appear with all cases and studies. This shows the degree of invalidity to the findings. Random errors, by contrast, affect each instance of the measuring instrument's use in a different way. The seriousness of the issues of validity and reliability prompted the development of techniques for reducing measurement errors (Frankfort-Nachmias, 2008).

3.5.1 - Validity

Frankfort-Nachmias (2008) refers to three basic types of validity, each of which is concerned with a different aspect of measurement: content validity, empirical validity, and construct validity.

Content validity consists of face validity and sampling validity, which means that everything that is relevant to the study is included. Face validity rests on the investigator's subjective evaluation of the appropriateness of the instrument for measuring the concept rather then whether the instrument measures what the researcher wishes to measure. For example, when creating the questions for interview or questionnaire, number of specialists in the field might be consulted in order to make sure that the questions capture all necessary elements of the phenomenon. So the researcher can use the instrument with confidence. In our case this role was played by the focus group and is critical for the future conduct of research.

Sampling validity looks at whether a given population is adequately sampled by measuring instrument in question.

A highly valid instrument is composed of a representative sample of measured items. Sampling validity is especially useful in exploratory research, when investigators attempt to construct instruments and employ them for the first time (ibid).

Empirical validity is concerned with the relationship between a measuring instrument and the measured outcomes. Scientists assume that if measuring instrument is valid, the results produced by applying the instrument and the relationships existing in the real world should be quite similar (ibid).

Construct validity is possible to establish by relating a measuring instrument to the general theoretical framework within which they conduct their studies in order to determine whether the instrument is logically and empirically tied to the concepts and theoretical assumptions they are employing. Strong construct validity is based on the good fit between the conceptual framework and the empirical data.

Ghauri and Grønhaug (2010) say that there are many types of validity. In addition to above mentioned, there are also internal and external validity. Internal validity refers to whether the results obtained within the study are true. We have to be confident that causal variation among variables our study is suggesting is true, that X is really causing the variations in Y, at least as one of the influencing factors. On the other hand, external validity refers to the question of whether the findings can be generalized, for example to other populations, settings of periods, beyond the study at hand. This become extremely important in quantitative research, as only in the case of a representative sample can one claim the generalizable of the results.

3.5.2 - Reliability

Reliability refers to the stability of the measure (Ghauri and Grønhaug, 2005). Due to the complexity of the research problem, it often happens that measuring instruments applied in the research are not completely valid according to all the tests of validity.

Therefore, researchers need to test reliability of their measuring instruments. Reliability refers to the stability of the measurement (Ghauri and Grønhaug, 2005), which means that if the process is repeated it will give the same results. However, researcher has to be aware of the variable error, that is errors that appear between observations either during one procedure or each time this variable is measured by the instrument. Consequently, each measurement includes both a true component and an error component (F - Nachmias, 2008).

There are four threats for reliability: participant errors, participant bias, observer error and observer bias (Saunders, 2012). To avoid participant error for possible answers to the questions, those should be neutral and not intending to influence the informant's opinions.

Participant bias happens if the informant is resistant to give all necessary information in an open way, hiding parts of information, or answering "tactically" to maintain his face in the eyes of the company. Therefore, we have chosen to send questionnaires online instead of personal meetings with the participants. The participants know about their answers to be anonymous and that it will not be possible to identify each participant. Trying to eliminate participant bias we put questions in a dilemma - shape and provided informants with the evaluation scales. So that they would express their opinion (from strongly disagree to strongly agree) about somebody else's taken in past decision.

Since we do not have marine competence, drafted questions demonstrated lack of face validity when we tested the questions with focus groups we were not able to understand all the technical details described in the investigation reports, because those contained lots of specific terminology, which we are not familiar with. Secondly, situations described in the Investigation reports might have happened only to some of the tankers (crews, captains), and

not to all. Therefore questions built up on those reports could have been limited as for their generalizability. Due to our fear that this might most likely negatively influence the findings, we were in constant contact with highly competent people, with several years of experience in the field of research. Discussions with them helped us to formulate correct dilemmas based on reported accidents, and formulate questions that can uncover information we are looking for while doing this study.

We were skeptical about the possibility that informants might answer the questions "tactically" or "politically correct" as they were aware that this was the company which outsourced services to them who was conducting this research. Trying to minimize risks for bias we were rather focusing on the fact that we were students conducting neutral investigation for our university as a part of the Master programme. Also to minimize possibility of bias we tried to construct questions in a way that could be informant- friendly, for example, rather then asking how would *you* act in a given situation expecting informant to take a decision; we chose to give a situation where *somebody* has already taken a decision, and informant will be asked to give his evaluation on the taken decision. This way we believed participants will not feel decision taking pressure, but rather expressing their opinion.

4.0 - Empirics

In this chapter we will describe how we conducted data collection and explain choice of the model.

Shipping industry in Norway is presented by numerous shipping companies which provide service for oil companies by transporting oil and gas from one destination to another. Managers of shipping companies are responsible for their vessels being reliable in these operations as their business relationship with energy actors are of a great importance for the company's sustainability.

Technical condition of each vessel is critical due to significant and irreversible consequences accidents result in. However, human element proved to be one of the major reasons for 60-90% of all accidents in this industry. As a result shipping companies are responsible not only for meeting technical and documental requirements but also for preparing their crew for a more professional and qualitative performance when it comes to safety, what makes each tanker operation safe and cause in an ideal case zero accident.

Striving for high safety performance and prevention of accidents leaders must realize that constant improvement of their strategies is necessary. However, to know which aspects of the existing routines must be improved is not always an easy task due to distanced management and different interests, and safety awareness parties have. Different understanding or misinterpretations also may lead to wrong decisions and cause errors and accidents.

Empirical data collection of this work is based on exploring the gap between managers and the crew when it comes to safety awareness, and is done with the help of electronically sent survey.

Email invitation was sent to email addresses first, and they followed the link to participate in the survey. Respond rate is 100% which means that out of those who started the survey all

of them completed without skipping/ missing at least one question. But not 100% out of all received the survey participated (APPENDIX B – Invitation to participate in the survey)

4.1 - Background for the survey

Using a survey was the most convenient way to collect data due to several tankers sailing in the seas. Questions selection was done the following way.

First the determinants of accidents were identified. To do that we analyzed scientific theoretical materials and were inspired by well-known accidents happened in shipping industry many years ago such as Titanic, Exxon Valdez, Prestige etc. (http://www.maib.gov.uk/home/index.cfm). Also more practical information found in the reports on accidents and near misses happened on Norwegian continental shelf. This information was found in the archives of the oil company for the period 01.01.2007 until 03.2012. We have used filter "all vessels" to widen our search and get more accidents to analyze rather then only "tankers".

The reports were classified according to where it happened (Norway, sea and not land accidents), and loss potential (severity level 1 and 2 were selected). Information provided root causes and sequence of events leading to an accident, as well as the recommendations from the investigation group which activities should be implemented in order to prevent similar accidents and errors in the future. To support two mentioned approaches (reading theory and investigation reports) we have had a number of discussions with ship navigation experienced (10+ years) personnel and tested our questions on a focus group in vetting department and Working Safely with Suppliers responsible in the oil company.

As a result we have read and analyzed around 100 reports and structured the data before designing survey as we drafted an example in a table (see Appendix A).

As a result of this analysis we designed questions in a form of situations with a decision that does or does not contribute to safety. We improved the questions significantly and discussed them several times with the oil company before finalizing them. Scales were also improved

and changed after testing them on the Vetting department. Also both questions and scales were tested and improved with the help of Propel, a company focused their business on maritime management consulting, supporting maritime organizations in development and implementation of change (www.propel.no). Highly professional specialist with great experience contributed significantly to development and improvement of the questions and scales used in our survey.

4.2 – Questions selection

Questions of the survey were built up as dilemmas inspired by real situations (as given on the example in Table Appendix A) from the shipping industry in the Norwegian seas, it was possible to see attitude of the informants to solutions taken in each dilemma. Dilemma is a problem offering two possibilities, neither of which practically acceptable (Wikipedia). So, attitude is what lies in focus of evaluations of the respondents.

Giving score from 1 (strongly disagree) to 7 (strongly agree) the informants expressed their attitudes towards one's decision in emergency situations. This demonstrated their personal safety awareness. Dilemmas included many aspects discussed in Chapter two of this thesis and they are summarized in the Table 5 below.

Dilemma 1	Lack of cooperation in a team; lack of effective communication; lack of training/ simulation of a similar situation with roles; lack of learning from previous cases (learning on errors), Lack of "good leadership" on board; Not motivating culture for crew members to contribute to safety on board, lack of safety culture.
Dilemma 2	Prioritizing economic benefits over safety demonstrates lack of safety and risks awareness and lack of effective safety culture. Lack of explicitly communicated values from the management side or misinterpretation/ misunderstanding between management on shore and crew. Lack of Captain's own intrinsic motivation to perform every transaction as safe as possible.
Dilemma 3	Prioritizing time saving and cost saving over safety; lack of learning from errors/ training/ lack of safety promotion over other aspects on the corporate level; lack of cooperation with the team, lack of communication;
Dilemma 4	Ignoring crew being fatigued signals about prioritizing time saving and cost saving over safety; lack of risks awareness and lack of safety culture understanding. Lack of preoccupation with potential errors. Lack of intrinsic motivation to perform safely.
Dilemma 5	Lack of learning/ training for juniors, lack of risk awareness, learning from errors is not communicated explicitly/ not encouraged as a part of the culture. Might be fear to report as he is a new employee? Again proves lack of communication as for values from management side, lack of monitoring/ control of juniors' performance
Dilemma 6	Lack of risk awareness, lack of safety culture
Dilemma 7	Lack of training/ learning; lack of risk and consequences awareness, lack of safety culture
Dilemma 8	Lack of learning, training or misinterpretation / misunderstanding of the orders; lack of learning on errors, lack of intrinsic motivation or courage to over convince the Captain
Dilemma 9	Prioritizing time saving and cost saving over safety; not effective communication with VTS, Lack of "good leadership" on board

Table 5. *Questions selection based on areas for improvement in past accidents*

4.3 - Choosing the model

Principal – Agent model is widely used in the literature for analyzing information asymmetry and interests collision leading to moral hazards in many scientific areas wherever customer- supplier relationship is present.

Conceptual model we use in the Thesis was assembled also as a result of reviewing alternative models suggested in economics, HSE management and shipping related readings about safety culture awareness. Investigation reports and findings we explored in this research helped us to find more variables that influence safety culture in tanker operations, and therefore we included them into our model.

4.3.1 - Traditional application of Principal – Agent Model

Traditionally Principal – Agent model was used to demonstrate difficulties which arise when Principal hires Agent under the condition of asymmetric information, which leads to moral hazards. Originally this model was used in economics and management in order to align interests between two parties with the help of particular instruments such as wages, bonuses, profit sharing, and performance measuring (Krishnaswami, Spindt, Subramaniam, 1999; Desiraju & Moorthy, 1997; Prendergast, 1999; Milgrom & Roberts, 1998; Banker, Lee, Porter, 1996; Deci, 1997).

In political science these problems are suggested to be solved by an employment contract (Holmstrom & Milgrom, 1990; Poppo & Zenger, 2002). However, in this case Principal cannot know if the contract satisfied the agent and to what extent, but tries to include various appropriate financial incentives to motivate the agent. The purpose of contracting relationships among individuals in a firm is to provide incentives for efficient behavior. The contracting approach has come to dominate the study of incentive and organization problems. It is motivated by the idea that markets are incomplete and consequently firms and other institutions needed to supplement market allocations. These have origins in Coase (1937), Williamson (1975) initiating the modern revival of these issues.

4.3.2 - Linear model

Game theory (Summer, 1994) suggests this model for demonstration of main challenges between Principle and Agent.

If an agent takes an action (a) which is not observable for Principal to produce output (y), the production function can be linear, $y = a + e$, where (e) is a noise term. Principal is the one owns output (y), but contract is there to share it with agent by paying him wage, (w).

Model describing wage is presented as $w = s + by$, where (s) is salary and (b) is bonus rate. According to this model Principal gets her payoff in a form of $y - w$, realized output net of wages. Agent's payoff can be represented by $w - c(a)$, realized wage minus cost of action he performed.

This model gives an idea that agent is risk-averse; therefore a higher bonus rate (b) plays role of a stronger incentive, but at the same time indicates more risk he will have to tolerate. From this model we can understand that if $b = 0$, it will not bring any incentives to the agent. If $b = 1$, it gives the agent full title to output (y).

It is important for leaders to use bonus as influence instrument in their strategies in a proper way otherwise it will de-motivate agents to do a good job. To specify, bonus should be paid in a given time, else workers can lose trust and company can receive normalized to 0 pay off from its workers in every future period. So the company has a choice whether to pay bonus now and get expected profit after, or not to pay bonus and earn zero thereafter. Economically and cost-wise the firm "will prefer to pay the bonus if the present value of increased future profits from paying it exceeds the cost of paying the bonus today" (ibid).

However, Gibbons (1998) argues that the worker's contribution to company's business output is "observable but not verifiable". He stresses that if the job performance is not easily monitored then it is difficult to use bonus system as in the described model. Therefore use of the suggested model is also limited in our thesis.

4.3.3 - "Get what you paid for" model

Holmstøm and Milgrom (1991) suggested a model which can be called "get what you paid for". In this model (y) for Principal is not an output presented as (y-w), but (y) is the agent's "total contribution to firm value", which includes all the actions and long- and short- term effects of those actions performed by the agent. Gibbons commented that it will be very difficult to enforce contracts based on (y) in court, and other types of contracts based on (y) can be used such as based on the number of produces units, for example. He suggested such wage contract can be presented by linear model w= s+ bp, where (p) stands for this alternative performance measurement. This model indicates that now (p) creates a stronger incentive and agent aims to produce a high value of (p), not of (y).

Another model suggested by Holmstrøm and Milgrom (1991) splits agents' action into two, action (a1) and (a2). If (a1) contributes both to (p) and (y), while (a2) contributes to (y) only and does not effect (p), where (p) and (y) are performance measure and total contribution, this discourages him to perform (a2). Oppositely if (a1) contributes to both (p) and (y), while (a2) contributes only to (p) and does not affect (y), contract ties wages to such a performance measure which motivates agent to take action a2, even if it reduces agent's total contribution (y).

Consequently, it was concluded (Gibbons, 1998), that objective performance measures do not create ideal incentives; bonuses are often not enough to influence agent; and it is better to use multiple instruments to provide efficient incentives for higher worker's contribution. Lazear and Gibbs (2009) studied change of the wages' influence on the change of the performance. When management changes the wage system from fixed salaries to piece rates, productivity rose by 35 %, while wages rose by 12 %. And he found out that the third of the improved performance can be attributed to selections effects; the less able left the firm and more talented workers replaced them.

In our case all the mechanisms mentioned by the existing models will not create better safety awareness alone among those involved in high risk tanker operations. We suggested that systematical strategic actions from management side can influence way of thinking and behavior in the company. Choices made daily on board contribute to safety culture and prevention of accidents. Their everyday choices must be based on high level of safety awareness. In addition, there are so many factors causing Agent not to act in benefit of the Principal that they cannot be ignored in our research, and were taken in the conceptual model. This explains choice of our model.

Working on the model we had a disagreement between each other, while discussing weather economical reasons leading to accidents belong to a separate group or it should be placed in "human factor" group since it's an individual who takes decision based on his/her extrinsic motivation. However, we decided to follow theory of "extrinsic motivators causing intrinsic motivation" (Staw, 1997), and placed it into a separate group.

We have seen that while human errors are blamed on mistakes from the operator part, more often they are deeper and more complicated than that. Some studies argue that accidents are socially constructed (Mearns, Whitaker & Flin, 2003; Pidgeon, 2000).

4.4.4 - Safety Culture Maturity Model

This model was initially developed by the Software Engineering Institute (SEI) to address issues such as project management, human resources, usability and quality (Fleming, 2001).

This model (SCMM) seems to be useful and applicable to safety culture development within the offshore oil and gas industry. It was developed to assist organizations to establish their current level of safety culture maturity and to identifying the actions required to improve their culture. The model can be relevant if organizations fulfill specific criteria, such as having an adequate Safety Management system; if majority of accidents are caused by other reasons then technical; a company is compliant with health and safety law; prevention of accidents is the main focus of safety culture. If we assume that the shipping companies we are researching on meet these 4 requirements, then the elements of this model could be included into ours.

Elements of the model are: productivity versus safety, communication, learning organization, training, participation, management commitment and visibility, industrial relations and job satisfaction, shared perception about safety, safety resources and trust.

In our model we selected elements from presented models, and elements we have explored due to investigation reports and discussions with the vetting department employees. We have chosen exactly those variables which were considered the most important for our study and included them in the conceptual model. Later on, findings will show if these variables were verified or not.

5.0 - Analysis

The main goal of the analysis is to answer the question:

How can leadership strategies be improved to prevent major accidents in shipping tanker operations?

The analysis will be based on theoretical review presented in chapter two, empirical support described in chapter four, and data collected with the help of the survey.

This chapter will consist of three parts. First each company will be analyzed separately to see the general picture of safety culture awareness in each company, highlighting existing gaps among crew members as well as among leaders. Secondly, gap between Principal and Agent will be identified. Then a discussion regarding certain areas of strategic improvement will follow.

To be able to maintain the anonymity, the companies will be labeled with SC1, SC2, and SC3. In the tables presenting main findings management will be colored black, crew members will be red. Numbers 1to 7 have the same meaning as it was explained in the survey: from 1 – strongly disagree to 7 strongly agree.

5.1 –Safety culture awareness

This section first of all will critically discuss findings looking separately at safety awareness in each situation presented by dilemmas with reference to the Table 5, Chapter four, and section 4.2. Secondly, scales analysis will be performed.

5.1.1 - SC1 Safety culture awareness. Dilemma analysis

As we have explained earlier, each dilemma included several possible aspects that may be leading to accidents, based on the reasons caused accidents in the past. Detailed description of each dilemma was presented earlier in Table 5, section 4.2. Looking at the findings we can monitor the differences in safety culture awareness between the respondents.

1. *Imagine the following situation and evaluate it according to the scales provided. Even though the captain was advised from the 2nd officer to change to manual steering while sailing through a narrow channel, he proceeded with the vessel in autopilot. He thought he was well aware of situation himself, and would not consider advice from his colleague.*

Findings (Table 6) can indicate that there is a disagreement among leaders to leaders; crew to crew; crew to leaders. The gap between answers can be resulted by career lengths differences that were uncovered in the last questions of the survey, and/ or if some of them experienced something others did not. However, it does not indicate that the one with longer career path experienced this particular situation, and the one with fewer years did not. This can mean that the experience between colleagues is not being shared. Also the answers show that part of the crew and the leaders disagree as for captain's/ crew's responsibility to solve this dilemma (scale 4, table 6). Managers mean that crew/ captain should solve this dilemma, while the crew thinks its management's responsibility to solve it. Is this because of the responsibility for consequences?

Summarize Dilemma 1		1		2		3		4		5		6		7	
		P	A	P	A	P	A	P	A	P	A	P	A	P	A
Scale 1	SC1		2	1			1					1	3		1
	SC2		2	1	2						1	1	2		
	SC3		3	1								2	1		
Scale 2	SC1	1	2	1	3						1				1
	SC2		2	2	3								2		
	SC3	1	3	1			1					1			
Scale 3	SC1			2	3		1		2		1				
	SC2			2	1		1		1		3				1
	SC3	1	1	1	1					1	1		1		
Scale 4	SC1				3			1		1			2		2
	SC2			1			1	1					2		4
	SC3				1				1	1		2	1		1
Scale 5	SC1						2					2	2		3
	SC2		1	1	1				1	1	2		1		
	SC3			1					1	1		1	2		

Table 6. *SC1 Dilemma Analysis. Dilemma 1*

Scale 1 "this situation s relevant to your company"; Scale 2 "Described decision contributes to safety"; Scale 3 "Shore management has no impact on solving this dilemma"; Scale 4 "This should be solved by captain/crew on board"; Scale 5 "solving this dilemma one should rely on SMS rather than one's experience"

It seems that the situation requires an urgent decision, which means it has to be decided on board. Can bonuses and penalties be applied as regulating mechanisms in order to motivate agents to act in the interest of the principal (safety)? Even though the majority means that management can have impact on the solution, they confirm that captain/ crew are the ones taking a decision.

2. *A vessel is expected to arrive in the discharge terminal today. There is a falling tide at the approach to the terminal and the next high tide is in 5 hours. The UKC (Under Keel Clearance) is absolutely the minimum level, and the officers also know that the draught on the chart is uncertain for this terminal. This interruption will cause further delay for 2 days due to the loss of the slot at the terminal. To justify continuing the Master/officers filled in a risk assessment form where the uncertainties were ignored.*

Summarize Dilemma 2		1		2		3		4		5		6		7	
		P	A	P	A	P	A	P	A	P	A	P	A	P	A
Scale 1	SC1		3		1							2	2		1
	SC2	1	2		1		1	1	1		1		1		
	SC3	1	3		1							2			
Scale 2	SC1	1	4	1	1								1		1
	SC2	1	2	1	4										1
	SC3	2	3		1									1	
Scale 3	SC1	1	1	1	5				1						
	SC2	2	1		5										1
	SC3	3	3						1						
Scale 4	SC1	1			3			1			1		2		1
	SC2	1	1		1		3					1	1		1
	SC3		1					2				1	1		2
Scale 5	SC1										2	1	2	1	3
	SC2		1						1		1		3	2	1
	SC3		1			1			1			2	1		1

Table 7. *SC1 Dilemma Analysis. Dilemma 2*

Scale 1 "this situation s relevant to your company"; Scale 2 "Described decision contributes to safety"; Scale 3 "Shore management has no impact on solving this dilemma"; Scale 4 "This should be solved by captain/crew on board"; Scale 5 "solving this dilemma one should rely on SMS rather than one's experience"

Dilemma two is focused on such possible reasons led to accidents as prioritizing economic benefits over safety; lack of safety and risks awareness and lack of effective safety culture; lack of explicitly communicated strategic values from the management side or misinterpretation/ misunderstanding between management on shore and crew; lack of Captain's own intrinsic motivation to perform every transaction as safe as possible (Table 5, section 4.2).

The companies have different opinion as for relevance of this situation. Table 6 demonstrates a visible gap in the pre last scale: this dilemma should be solved on board. Why do some crew members as well as one of the managers consider this to be solved on board and not consulting the leaders?

Surprisingly there are some respondents considering taken decision contributed to safety. We can see lack of risks awareness due to prioritizing economic benefits over safety. However, it looks like the majority prefers relying on SMS rather than on one's experience. But there are a small number of people who think opposite. For certain cases it should really be clearly explained and taught what does not contribute to safety.

3. *During transit visibility was limited due to fog. However, ice was observed in the water ahead. Instead of sailing with reduced speed through the ice, it was decided to slightly alter the course and sail around on full speed to maintain schedule.*

Summarize Dilemma 3		1		2		3		4		5		6		7	
Dilemma 3		P	A	P	A	P	A	P	A	P	A	P	A	P	A
Scale 1	SC1		2	1	1						1	1	3		
	SC2	1			2		2		2	1			1		
	SC3	1	1		2	1		1	1						
Scale 2	SC1	1	4	1			1				1				1
	SC2	1			4		2	1							1
	SC3	1	1	1	2				1					1	
Scale 3	SC1	1	1	1	2		2		1				1		
	SC2	1			2		3	1			1				1
	SC3	1	2	2			1								1
Scale 4	SC1	1			2			1			1		3		1
	SC2							1	1		2	1	3		1
	SC3							1				2	2		2
Scale 5	SC1								2			2	2		3
	SC2				1		1	1	1	1	2	1	2		
	SC3					1			1	1		1	1		2

Table 8. SC1 Dilemma Analysis. Dilemma 3

Scale 1 "this situation s relevant to your company"; Scale 2 "Described decision contributes to safety"; Scale 3 "Shore management has no impact on solving this dilemma"; Scale 4 "This should be solved by captain/crew on board"; Scale 5 "solving this dilemma one should rely on SMS rather than one's experience"

Looking at the scale 2 scores from 4 to 7 (Table 8), some managers as well as crew mean that altering the course and speeding up will not contribute to safety. Still there are some convinced in opposite. Most of the respondents agreed that shore management has impact on solving this dilemma, but why do they say that "this dilemma should be solved by captain/ crew on board"? This seems to be colliding with each other.

4. *The deck officers and crew are fatigued due to busy work load over the last few days. But if the crew is to rest, they will not make it in time for their laycan at the oil terminal, which will be noticed. Furthermore, missing laycan will in turn result in further delays making them also unable to make their next planned voyage. It was decided to continue the voyage without rest.*

Dilemma number 4 is mostly about ignoring crew being fatigued; prioritizing cost saving over safety; lack of risks awareness and lack of safety culture understanding; lack of preoccupation with potential errors; lack of intrinsic motivation to perform safely (Table 5, section 4.2).

Summarize Dilemma 4		1		2		3		4		5		6		7	
		P	A	P	A	P	A	P	A	P	A	P	A	P	A
Scale 1	SC1							1	2		1	1	4		
	SC2				2		1	1		1			4		
	SC3		2	1					1			1		1	1
Scale 2	SC1		2	2	1		2				1		1		
	SC2		1	1	6	1									
	SC3	1	3	1	1									1	
Scale 3	SC1	1	1	1	4								2		
	SC2		1	2	5										1
	SC3	1	3	2					1						
Scale 4	SC1	1			2			1	1		1		3		
	SC2	1	1				1	1	2		1		1		1
	SC3	1	1				1	1		1					2
Scale 5	SC1								1		1	2	2		3
	SC2										1	2	5		1
	SC3							1				1	1	1	3

Table 9. SC1 Dilemma Analysis. Dilemma 4

Scale 1 "this situation s relevant to your company"; Scale 2 "Described decision contributes to safety"; Scale 3 "Shore management has no impact on solving this dilemma"; Scale 4 "This should be solved by captain/crew on board"; Scale 5 "solving this dilemma one should rely on SMS rather than one's experience

Referring to Table 9, this situation is evaluated as relevant, and most of the informants agreed that the decision did not contribute to safety, and shore management is the one having impact, and still we see the gap for "this dilemma should be solved by captain/crew on board". It looks like economic benefits are prioritized over safety. So when we are talking about "impact management has" it can be both positive and negative. Negative impact can be to promote "saving time" over safety, or simply passing responsibility. What other incentives do they have for working overtime? On the other hand, answers "agree" can simply indicate that they can decide/ be forced on board whether to work overtime or not?

5. *A junior officer made a mistake that he knows he should report to the Master. But the mistake had no consequences and nobody observed it, so he decided it was unnecessary to report.*

Focus area of the fifth dilemma is lack of learning/ training for juniors, lack of risk awareness, learning from errors is not communicated explicitly/ not encouraged as a part of the culture. Might be fear to report as he is a new employee? Again proves lack of communication as for values from management side, lack of monitoring/ control of juniors' performance (Table 10).

Summarize Dilemma 5		1		2		3		4		5		6		7	
		P	A	P	A	P	A	P	A	P	A	P	A	P	A
Scale 1	SC1		2								1	1	3	1	1
	SC2		1	1	1		1				1	1	2		1
	SC3		1		1		1	1				2			1
Scale 2	SC1	1	5	1	1								1		
	SC2	1	4	1	3										
	SC3	1	3	1			1							1	
Scale 3	SC1	2	2		4				1						
	SC2	1		1	3							1	2		1
	SC3		2	3					1		1				
Scale 4	SC1				2			1			2	1	3		
	SC2						1	1	1		1	1	3		1
	SC3									2		1	2		2
Scale 5	SC1			1	1						1	1	1		4
	SC2				2			1	2			1	2		1
	SC3		1	1						1	1	1	1		1

Table 10. *SC1 Dilemma Analysis. Dilemma 5*

Scale 1 "this situation s relevant to your company"; Scale 2 "Described decision contributes to safety"; Scale 3 "Shore management has no impact on solving this dilemma"; Scale 4 "This should be solved by captain/crew on board"; Scale 5 "solving this dilemma one should rely on SMS rather than one's experience"

This table indicates that some of the informants prefer relying on one's experience over SMS, which can be crucial in accidents' prevention. Reporting on errors and near miss contributes to learning and builds up a wider "repertoire", widens horizons for common

understanding in the team (Klemsdal, 2006). This can bring a competitive advantage to the company, and prevent similar to occur.

When we see that most people agree that they can decide on board weather to report or not, moreover, not prioritizing SMS (see scale 5 answers from 4 to 7), can this reduce potential learning and accident prevention?

6. *Critical maintenance job needs to be completed for the vessel to continue the voyage. The experienced chief engineer is expected to be in charge of the bunkering operation. Therefore the junior engineer is assigned to the critical maintenance job.*

Lack of risk awareness, lack of safety culture is indicated on in the text of Dilemma number 6 (Table 5, section 4.2).

It can be not easy to transfer all the experience and knowledge from one to another; junior engineer should not have been assigned for this job without somebody's monitoring or controlling, or a better advice. This situation seems to require an urgent decision, and is evaluated as "should be solved on board" by the majority (Table 11). However, leaders of SC do have their impact. Can this indicate a need for more efficient staffing? Or enhanced monitoring and control for juniors?

We consider sending a junior to do a critical job to be not a "good decision", and may be there should be a clear formal policy that juniors are not allowed to work without being watched. In this case, who was the one not being aware of the potential consequences? Junior engineer himself or the one assigned him to the task?

Findings demonstrate relevance of similar cases. Does it mean that it happens often that crew is assigned to do a job they are not qualified to? Does it mean there was not enough crew on board due to saving cost? If not, should not a junior be monitored by a more experienced colleague? Why do some leaders of the shipping companies accept this to be solved by one's experience rather than relying on SMS?

Summarize Dilemma 6		1		2		3		4		5		6		7	
		P	A	P	A	P	A	P	A	P	A	P	A	P	A
Scale 1	SC1			1	1				1		1	1	3		1
	SC2				3					2	2		2		
	SC3		1	1	2							2	1		
Scale 2	SC1		3	1	2	1	1				1				
	SC2		1		4			1	1	1	1				
	SC3	1	1		2	1	1							1	
Scale 3	SC1			1	4	1			1		1		1		
	SC2			1	3	1	1				1		1		1
	SC3		1	1	1	1	1					1			1
Scale 4	SC1			1	2				1	1			3		1
	SC2									1	2	1	4		1
	SC3							1				2	2		2
Scale 5	SC1								3			2	1		3
	SC2				2	1				1	1		4		
	SC3		1	1							1	2	1		1

Table 11. *SC 1 Dilemma Analysis. Dilemma 6*

Scale 1 "this situation s relevant to your company"; Scale 2 "Described decision contributes to safety"; Scale 3 "Shore management has no impact on solving this dilemma"; Scale 4 "This should be solved by captain/crew on board"; Scale 5 "solving this dilemma one should rely on SMS rather than one's experience"

7. *The gangway on the moored vessel was disconnected, but not fully pulled in. The Officer on duty therefore supervised the suspended gangway to ensure that it was not used in this position. But due to an urgent request he had to leave the post unattended for 10 minutes.*

Summarize Dilemma 7		1		2		3		4		5		6		7	
		P	A	P	A	P	A	P	A	P	A	P	A	P	A
Scale 1	SC1		1	1	1		1					1	3		1
	SC2		2	1	1						2	1	2		
	SC3		1		1	1	1			1		1			1
Scale 2	SC1	1	4	1	2							1			
	SC2		4	2	3										
	SC3	1	3	1	1									1	
Scale 3	SC1			2	3		1		2			1			
	SC2				1		1		1		1	2	2		1
	SC3		1			1		1	1		1	1			1
Scale 4	SC1			1	2			1					3		2
	SC2										2	2	3		2
	SC3											3	2		2
Scale 5	SC1								1		1	2	2		3
	SC2			1			1		1		1		2	1	2
	SC3		1			1				1		1	2		1

Table 12. *SC1 Dilemma Analysis. Dilemma 7*

Scale 1 "this situation s relevant to your company"; Scale 2 "Described decision contributes to safety"; Scale 3 "Shore management has no impact on solving this dilemma"; Scale 4 "This should be solved by captain/crew on board"; Scale 5 "solving this dilemma one should rely on SMS rather than one's experience"

Lack of training/ learning; lack of risk and consequences awareness are stressed in this dilemma; lack of monitoring / controlling the unsecured gangway (Table 5, section 4.2).

This situation is considered relevant by some of the informants, but not by all. Same as "described decision contributes to increased safety (scale 2)". Does this mean they are not aware that "7% of fatalities occur while passing the gangway" (investigation statistic of the Oil Company)? Should more barriers be applied to prevent using a disconnected gangway (automatic yellow warning light lits)? Does this mean that the ones saying "irrelevant" have a "bullet proof" routine for similar cases? And if they do, can it be transferred to other tankers?

Giving a negative answer to "shore management has NO impact" can indicate that the leaders should strengthen the activities promoting safety and increasing risks awareness (Table 12).

8. *During adverse weather a crew member believed that according to Standing Order he was not allowed to work outside on deck. However, Captain asked him to complete a job which could have easily been postponed. Crew member followed his request.*

Summarize Dilemma 8		1		2		3		4		5		6		7	
		P	A	P	A	P	A	P	A	P	A	P	A	P	A
Scale 1	SC1		2		1		1	1				1	2		1
	SC2			1	3				2			1	2		
	SC3		2			1	1					2	1		
Scale 2	SC1		5	2	1								1		
	SC2		6	1	1	1									
	SC3	1	3	1	1							1			
Scale 3	SC1	1		1	4		2						1		
	SC2				5	1				1	1				1
	SC3		1	1		2					2				1
Scale 4	SC1	1			2			1	1		1		2		1
	SC2									1		1	5		2
	SC3									1		2	2		2
Scale 5	SC1						1		1			1	1	1	4
	SC2								1	1	2		2	1	2
	SC3		1			1						2	2		1

Table 13. *SC1 Dilemma Analysis. Dilemma 8*

Scale 1 "this situation s relevant to your company"; Scale 2 "Described decision contributes to safety"; Scale 3 "Shore management has no impact on solving this dilemma"; Scale 4 "This should be solved by captain/crew on board"; Scale 5 "solving this dilemma one should rely on SMS rather than one's experience"

Leadership style; misinterpretation / misunderstanding of the orders or SMS; lack of learning on errors, lack of intrinsic motivation or courage to over convince the Captain are possible reasons led to accident (Table 5, section 4.2).

Findings (Table 13) demonstrate that most of the crew means "shore management should have impact on solving this dilemma". Can this mean that Captain is misusing his authority?

This is a quite relevant situation. Majority answered, that the solutions should be taken following SMS rather than one's experience. If it is so, why do still these situations occur? Is that due to hierarchy on board? Can sailors say "No" to Captain's orders? What are the consequences if he refuses to follow the order but acting according to the book?

9.   Captain was navigating the vessel in transit. The ship received a phone call from the local VTS (Vessel Traffic Systems) informing that they had to alter the course away from shallow waters. This would result in significant delays. Captain decided to follow the initial course relying on his experience.

Is this anything with Captain's personality to do? Is not there a rule to "always follow VTS recommendation"? What can give motivation not to follow VTS if almost everyone means that it does not contribute to safety? Do economic benefits weigh so much in this situation (Table 14)?

Summarize Dilemma 9		1 P	1 A	2 P	2 A	3 P	3 A	4 P	4 A	5 P	5 A	6 P	6 A	7 P	7 A
Scale 1	SC1		2	1	1		1					1	2		1
	SC2	1	3		1	1	2		1						
	SC3	1	3					1	1			1			
Scale 2	SC1	2	5		1		1								
	SC2	2	6		1										
	SC3	1	3	1										1	1
Scale 3	SC1	1	1	1	4						1		1		
	SC2	1	2		3		1			1					1
	SC3		2		1	2					1	1			
Scale 4	SC1	1			2		1	1			1		1		2
	SC2							1		1	1		4		2
	SC3						1			1		2			3
Scale 5	SC1						1					1	2	1	4
	SC2								1	1	1		2	1	3
	SC3		1					1				2	2		1

Table 14. *SC1 Dilemma Analysis. Dilemma 9*

Scale 1 "this situation s relevant to your company"; Scale 2 "Described decision contributes to safety"; Scale 3 "Shore management has no impact on solving this dilemma"; Scale 4 "This should be solved by captain/crew on board"; Scale 5 "solving this dilemma one should rely on SMS rather than one's experience"

Having analyzed the findings it has been explored that even though some of the respondents answered the same, or almost the same, which demonstrates common agreement and understanding of how these dilemmas can be solved in a safe way, there are always some answers on the opposite side. How can we achieve common understanding for everyone? Can anything be done to reduce all these gaps? It is important to take into consideration that even a single individual can cause a major accident.

Results of this section showed clearly that there are gaps between managers to managers, crew member to crew member, and of course between management to crew. This indicates that there are more gaps that we expected initially, and all of these leaders of the shipping companies should be aware of. Visually these gaps are demonstrated by Figure 19, Appendix F.

5.1.2 - SC1 Safety culture awareness. Scales analysis

Scales were the way to show informants' attitude towards the given statements. Differences in their scores can be explained from several points of view. We analyzed the scales having taken necessary assumptions, intending to be critical to the findings. To remind the values 1 is strongly disagree, 2 is disagree, 3 is more disagree than agree, 4 is partly agree, 5 is more agree than disagree, 6 is agree, 7 is strongly agree. Evaluations of the first scale for all 9 dilemmas are summarized in Table 15.

Scores ——————— Dilemma	1	2	3	4	5	6	7
1	22,2%	11,1%	11,1%			44,4%	11,1%
2	33,3%	11,1%				44,4%	11,1%
3	22,2%	22,2%			11,1%	44,4%	
4				33,3	11,1%	55,6%	
5	22,2%				11,1%	44,4%	22,2%
6		22,2%		11,1%	11,1%	44,4%	11,1%
7	11,1%	22.2%	11,1%			44,4%	11,1%
8	22,2%	11,1%	11,1%	11,1%		33,3%	11,1%
9	22,2%	22,2%	11,1%			33,3%	11,1%

Table 15. *Scales Analysis Scale 1.Given situation is relevant for your company*

Blue sector is indicating the relevance of the dilemmas used in the survey (Table 15). Among all the participants there is a different opinion as for the relevance of the given dilemmas. Five out of nine situations were considered irrelevant by 44, 4 % of the informants. Two situations were considered irrelevant by 22, 2% and 1 situation was considered 100% relevant. These can be due to difference in career length between the representatives. Those who have longer experience might have faced given situations while the less experienced did not. However, it should not mean that similar situations can not occur even though they have not happened with the tankers of this particular company. In

addition, experience sharing from seniors to juniors, from one crew to another is critical. Learning on past experience, near misses and errors should be considered. May be because of lack of experience sharing some informants think that similar situations can never happen to their company?

Scores / Dilemma	1	2	3	4	5	6	7
1	33,3%	44,4%			11,1%		11,1%
2	55,6%	22,2%				11,1%	11,1%
3	55,6%	11,1%	11,1%		11,1%		11,1%
4	22,2%	33,3%	22,2%		11,1%	11,1%	
5	66,7%	22,2%				11,1%	
6	33,3%	33,3%	22,2%		11,1%		
7	55,6%	33,3%				11,1%	
8	55,6%	33,3%				11,1%	
9	77,8	11,1%	11,1%				

Table 16*. Scales Analysis Scale 2.Described decision contributes to increased safety*

The majority was negative towards taken decision, and meant that decision taken did not contribute to safety on board (blue sector Table 16). Only a small part answered that taken decision contributed to safety, where some were "strongly agree" with the statement.

Even a single person can cause a major accident; therefore those in the black sector preferably should have been in the blue sector. But the results shown in the table indicate a different understanding among respondents when it comes to safety. How can shipping management assure that the safe decision is taken?

Regarding scale 3 (Table 17) average 78% of the participants agree that shore management does have impact on solving the given dilemmas (blue sector). However, 22% in average do not agree with them. This supports earlier indication to improve learning in the company.

The findings can indicate that most of respondents prefer management to be more involved in solving of the dilemmas. Obviously, it's the captain/crew who is onboard while the situation occurs and need to take urgent decisions. How can leaders of the company assure that the decisions taken will contribute to safety?

Scores Dilemma	1	2	3	4	5	6	7
1		55,6%	11,1%	22,2%	11,1%		
2	22,2%	66,7%		11,1%			
3	22,2%	33,3%	22,2%	11,1%		11,1%	
4	22,2%	55,6%				22,2%	
5	44,4%	44,4%		11,1%			
6		55,6%	11,1%	11,1%	11,1%	11,1%	
7		55,6%	11,1%	22,2%		11,1%	
8	11,1%	55,6%	22,2%			11,1	
9	22,2%	55,6%			11,1%	11,1%	

Table 17. *Scales Analysis Scale 3.Shore management has no impact on solving this dilemma*

Management should make sure everybody in the company is aware of the consequences of the decisions. If being aware that consequences are affecting ones own safety and/or endanger environment, would it increase intrinsic motivation to act safely? Clear explicit communication of the values, strategic mission and vision of the company, such as for example, prioritizing safety before economic benefits is playing an important role. Should there be a strict rule like "safety first, regardless economical loss or time loss etc."?

Table 18 represents scale 4, and reflected results of the previous scale in an opposite way. 22% answered that crew / captain are responsible for solving the dilemma, while 78 % did not agree with them.

Assuming that 22% is management representatives, if the decision is wrong, are leaders not willing to take responsibility for "wrong" decisions? Consequences? Or is the risk split between Captain and Shipping company's leaders?
Is decision taking routine expressed explicitly in the contract? Can proper financial incentives included in employment contract contribute to better decisions?

Scores ─────── Dilemma	1	2	3	4	5	6	7
1		33,3%		11,1%	11,1%	22,2%	22,2%
2	11,1%	33,3%		11,1%	11,1%	22,2%	11,1%
3	11,1%	22,2%		11,1%	11,1%	33,3%	11,1%
4	11,1%	22,2%		22,2%	11,1%	33,3%	
5		22,2%		11,1%	22,2%	44,4%	
6		33,3%		11,1%	11,1%	33,3%	11,1%
7		33,3%		11,1%		33,3%	22,2%
8	11,1%	22,2%		22,2%	11,1%	22,2%	11,1%
9	11,1%	22,2%	11,1%	11,1%	11,1%	11,1%	22,2%

Table 18. *Scale 4.This dilemma should be solved by captain/crew on board*

Table 19 summarized findings of scale 5. Most of the respondents (roughly 94 %) mean that the cases introduced should be solved following the company's ships management system (SMS) and approximately 6 % meant one should rely on his own experience rather than SMS.

Scores _____ Dilemma	1	2	3	4	5	6	7
1			22,2%			44,4%	33,3%
2					22,2%	33,3%	44,4%
3				22,2%		44,4%	33,3%
4				11,1%	11,1%	44.4%	33,3%
5		22,2%			11,1%	22,2%	44,4%
6				33,3%		33,3%	33,3%
7				11,1%	11,1%	44,4%	33,3%
8			11,1%	11,1%		22,2%	55,6%
9			11,1%			33,3%	55,6%

Table 19. Scales Analysis *Scale 5.Following the company's ship management system rather than one's experience*

Assuming that 6 % are very experienced and always taking right decisions, should their experience be transferred to the rest of the team? Or if these 6 % have never had any mistake in the past due to always taking "good decisions", will they start having "I know better" attitude? Would that mean that they will never make mistakes in the future? Can that experience be taken into account in every unique emergency situation? Should others' advice be considered?

It seems that SMS is taken very seriously in tanker shipping operations; however the results (Table 19) demonstrated that it is not always used in the emergency situations. WHY? Is it due to lack of the rules applicable to these particular cases? Do the crew members realize how important it is to obey and follow SMS requirements? Do they lack training? Or motivation while not being monitored? What can be done if SMS is not followed? Is SMS user- friendly? Is SMS' importance widely promoted by company's strategy?

These findings validated some theoretical points presented in Chapter two, as well as helped us to explore additional ones that will be included into what we understand under "improved leadership strategies", and the final model .

Next section will proceed with the analysis of SC2 and SC3. Due to the main focus of this study on the relationship between Principal and Agent, we choose to perform scales analysis as we did for SC1 without conducting dilemma analysis one by one. In stead, we decided to draft a summarizing table at the end of this section to show the complete picture for all the companies participated. However, in case of exceptional results for SC2 and SC3 we consider demonstrating that particular dilemma and the answers given.

5.1.3 - SC2 Safety culture awareness. Scales analysis

Some data gathered from evaluations of SC2 reflected findings of those of SC1.

Relevance can be evaluated basing on one's experience and career lengths. Can we assume that the answers in the black sector mean that respondents have not even heard of a similar situation? Is this due to lack of learning on past errors? Those who gave score "4" (Table 20), which is "partly agree" can be assumed as the indication to the fact that this respondent might have not experienced similar before, but most likely have heard/ read about it. At the same time, those giving score 5-7 can be assumed that have experienced this.

Scores ——— Dilemma	1	2	3	4	5	6	7
1	22.2%	33,3%			11,1%	33,3%	
2	33,3%	11,1%	11,1%	22,2%	11,1%	11,1%	
3	11,1%	22,2%	22,2%	22,2%	11,1%	11,1%	
4		22,2%	11,1%	11,1%	11,1%	44,4%	
5	11,1%	22,2%	11,1%		11,1%	33,3%	11,1%
6		33,3%			44,4%	22,2%	
7	22,2%	22,2%			22,2%	33,3%	
8		44,4%		22,2%		33,3%	
9	44,4%	11,1%	33,3%	11,1%			

Table 20. *Scale 1- SC 2 .Given situation is relevant for your company*

Findings demonstrated in Table 21 indicate consistent safety awareness in the given situations, as majority scored in the "black sector", arguing that the decisions taken did not contribute to increased safety. However, the table showed there were some representatives in the "blue sector". Are they those who had experienced these dilemmas (1, 2 and 6), and

managed to get through it successfully? Does it guarantee that they will always succeed in the future?

Scores Dilemma	1	2	3	4	5	6	7
1	22,2%	55,6%				22,2%	
2	33,3%	55,6%					11,1%
3	11,1%	44,4%	22,2%	11,1%			
4	11,1%	77,8%	11,1%				
5	55,6%	44,4%					
6	11,1%	44,4%		22,2%	22,2%		
7	44,4%	55,6					
8	66,7%	22,2%	11,1%				
9	88,9%	11,1%					

Table 21. *Scale2- SC2. Described decision contributes to increased safety*

Scale 3 (Table 22) depicts that management does have impact on solving dilemmas in most of the cases. Particular attention can be given to dilemmas 1 and 7, where the scores are in the "blue sector" indicating that management has no impact. This can mean that in 2-6, 8, and 9 situations it is possible for the leaders to influence the way solutions are taken on board. This validates our initial assumption of this paper that leadership strategies can be improved in order to prevent major accidents in tanker operations.

Having looked at the table 23, it can be noticed that most of the dilemmas occurred are expected to be solved on board (blue sector). However, as we have mentioned earlier on scale 3, managers do have impact on solving the dilemmas. This can indicate the necessity of the leaders to come with their strategies that can set certain way of thinking among the

crew and captain. By other words, decision taking should be in favor of safety, and to do that SC2 managers' need to change crew's and captain's mindset about what safety is about.

Scores / Dilemma	1	2	3	4	5	6	7
1		33,3%	11,1%	11,1%	33,3%		11,1%
2	33,3%	55,6%					11,1%
3	11,1%	22,2%	33,3%	11,1%	11,1%		11,1%
4	11,1%	77,8%					11,1%
5	11,1%	44,4%			11,1%	22,2%	11,1%
6		44,4%	22,2%		11,1%	11,1%	11,1%
7		11,1%	11,1%	11,1%	11,1%	44,4%	11,1%
8		55,6%	11,1%		22,2%		11,1%
9	33,3%	33,3%	11,1%		11,1%		11,1%

Table 22. *Scale 3- SC2.Shore management has no impact on solving this dilemma*

Scores / Dilemma	1	2	3	4	5	6	7
1		11,1%	11,1%	11,1%		22,2%	44,4%
2	22,2%	11,1%	33,3%			22,2%	11,1%
3				22,2%	22,2%	44,4	11,1%
4	22,2%		11,1%	33,3%	11,1%	11,1%	11,1%
5			11,1%	22,2%	11,1%	44,4%	11,1%
6					33,3%	56,6%	11,1%
7					22,2%	66,6%	22,2%
8					11,1%	66,6%	22,2%
9				11,1%	22,2%	44,4%	22,2%

Table 23. *Scale 4- SC2.This dilemma should be solved by captain/crew on board*

These results (Table 23) made us discuss how actually a captain is selected for the tanker. What are hiring procedures and requirements? Do career length and marine education compensate for a "having a difficult character", or "old way of thinking" where bureaucracy and hierarchical rules only apply in an organization? Or is it time to look for new more flexible methods to lead and concentrate on sustainable development?

Scores ——— Dilemma	1	2	3	4	5	6	7
1	12,5%	25%		12,5%	37,5%	12,5%	
2	11,1%			11,1%	11,1%	33,3%	33,3%
3		11,1%	11,1%	11,1%	33,3%	33,3%	
4					11,1%	78,8%	11,1%
5		22,2%		33,3%		33,3%	11,1%
6		22,2%	11,1%		22,2%	44,4%	
7		11,1%	11,1%	11,1%	11,1%	22,2%	33,3%
8				11,1%	33,3%	22,2%	33,3%
9				11,1%	22,2%	22,2%	44,4%

Table 24. *Scale 5– SC2. Following the company's ship management system rather than one's experience*

Findings (Table 24) indicate that SMS is preferred to be followed when solving given situations rather than one's experience. Answering in the "blue sector", which is agreed and strongly agreed, does not guarantee that SMS actually is followed in reality. Here we are referring to Principal – Agent problems. Is this SMS appropriate to follow? Is it user friendly? Should managers consider innovative solutions such as (for example) software which can easily search for necessary rule if needed?

5.1.4 - SC3 Safety culture awareness. Scales analysis

This section we will demonstrate findings of SC3. Evaluation of scale one in SC3 has similar pattern to SC 2 and SC 1, therefore is not presented in this section.

Findings from scale 2 (Table 25) demonstrate the majority of the respondents from SC3 agrees that taken decisions did not contribute to increased safety. However, we can see a small part in the "blue sector", which disagrees with that. That can be an area which needs attention from the leaders of the company.

Scores / Dilemma	1	2	3	4	5	6	7
1	57,1%	14,3%	14,3%			14,3%	
2	71,4%	14,3%					14,3%
3	28,6%	42,9%		14,3%			14,3%
4	57,1%	28,6%					14,3%
5	57,1%	14,3%	14,3%				14,3%
6	28,6%	28,6%	28,6%				14,3%
7	57,1%	28,6%					14,3%
8	57,1%	28,6%				14,3%	
9	57,1%	14,3%					28,6%

Table 25. *Scale 2 – SC 3. Described decision contributes to increased safety*

Scores / Dilemma	1	2	3	4	5	6	7
1	28,6%	28,6%			28,6%	14,3%	
2	85,7%			14,3%			
3	42,9%	28,6%	14,3%				14,3%
4	57,1%	28,6%		14,3%			
5	28,6%	42,9%		14,3%	14,3%		
6	14,3%	28,6%	28,6%			14,3%	14,3%
7	14,3%		14,3%	28,6%	14,3%	14,3%	14,3%
8	14,3%	14,3%	28,6%		28,6%		14,3%
9	28,6%	14,3%	28,6%		14,3%	14,3%	

Table 26. *Scale 3 – SC 3. Shore management has no impact on solving this dilemma*

It seems that dilemmas 1- 6, 8 and 9 require more attention from management according to what respondents are answering (Table 26). Only dilemma 7 indicates that management has not so much impact on the solution of this situation. Referring to dilemma 7 and the fact (mentioned earlier) that 7 % of fatal accident happens due to gangway crossing. It is still preferred that management has no impact to make a strict rule for not leaving post especially disconnected gangway. Is this the reason for so high rate of fatalities even not while in transit?

Scale 4 (Table 27) is supporting our initial assumption again about leadership strategies having impact on captain and crew on board, even though it is the captain and crew who will take decision while hazard is happening. However, saying first in scale 3 that management has impact can indicate that they "demand" more attention and contribution from management, which can mean that there are still things that can be done to prevent accidents as the respondents mean.

Scores ——— Dilemma	1	2	3	4	5	6	7
1		14,3%		14,3%	14,3%	42,9%	14,3%
2	14,3%		14,3%	14,3%		42,9%	14,3%
3			14,3%	14,3%	14,3%	28,6%	28,6%
4				14,3%		28,6%	57,1%
5	14,3%	14,3%			28,6%	28,6%	14,3%
6	14,3%	14,3%			14,3%	42,9%	14,3%
7	14,3%		14,3%		14,3%	42,9%	14,3%
8	14,3%		14,3%			57,1%	14,3%
9	14,3%			14,3%		57,1%	14,3%

Table 27. Scale 4 – SC 3. This dilemma should be solved by captain/ crew onboard

Scores / Dilemma	1	2	3	4	5	6	7
1		14,3%		14,3%	14,3%	42,9%	14,3%
2	14,3%			28,6%		28,6%	28,6%
3				14,3%		51,1%	28,6%
4	28,6%		14,3%	14,3%	14,3%		28,6%
5					28,6%	42,9%	28,6%
6				14,3%		57,1%	28,6%
7						71,4%	28,6%
8					14,3%	57,1%	28,6%
9			14,3%		14,3%	28,6%	42,9%

Table 28. *Scale 5 – SC 3. Following the company's ship management system rather than one's experience*

The majority agrees that SMS should be the key to solve dilemmas, however there are individuals disagreeing with that (Table 28). Ideally we prefer seeing everyone in the "blue sector" in this case. What can be done to diminish these differences?

5.2 – Principal and Agent Gap in safety culture awareness

This section of the analysis will underline challenges existing between Principal and Agent and demonstrate gaps indicating on potential strategic improvement for the leadership strategies. To specify we will focus on the largest gap between leaders and crew. Please note, under "Principal" we do not mean all of the managers, and under "Agent" we do not mean all of the crew members, instead we only chose to concentrate only on those who have the largest score differences.

Scale one (Figure 9) shows that the dilemma is considered to be very relevant by the leaders on shore, while not so relevant by the crew and/or captain. This can indicate that agent is not looking for potential risks while on board, and is not preoccupied with errors, which is lack of mindfulness (Weick et. al, 1999).

It seems that managers are aware that similar behavior may lead to an accident. Crew should have the same awareness as the managers considering that the situation could happen on board. Leadership style can influence culture on board. All levels of employee's opinion should be considered (Frick, 2000) if it contributes to safety. Is this applicable on a tanker? Does the 2nd officer have the right to refuse following the order? How much is others' opinion appreciated? Does this motivate crew to contribute to safety?
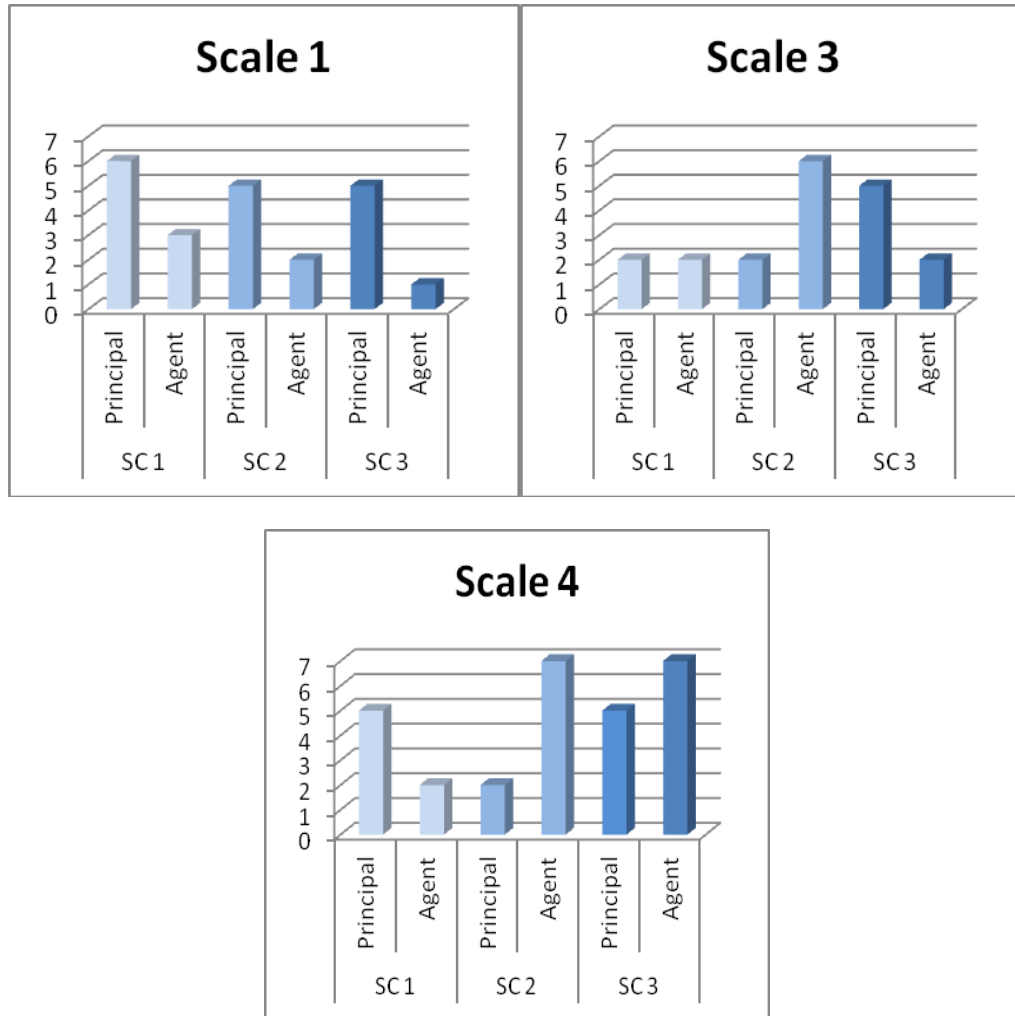
Figure 9. *Dilemma 1, Scales 1, 3, and 4*

Scale three is telling about "Shore management has no impact or has impact on solving the dilemma". If shore management is giving the crew opportunity to refuse to follow Captain's order in similar situation it could affect the outcome of the dilemma in a different way. Does the crew have authority not to follow order without permission from managers? Should management give a clear signal that crew could question and eventually refuse to obey if the decision suggested is evidently senseless?

Shore management has impact in similar situations, however whatever they want to do, should be communicated beforehand. Solving conflicts can be learned and trained by role games, which will also develop crew's capability to cooperate with each other. This is how tacit knowledge in a group working together can be "produced", consequently creating "epistemic networks" (Klemsdal, 2006).

Results on scale four support the results shown by scale three. Agent insists that Principal has no responsibility for solving the dilemma, while Principal thinks they should have influence on the solution.
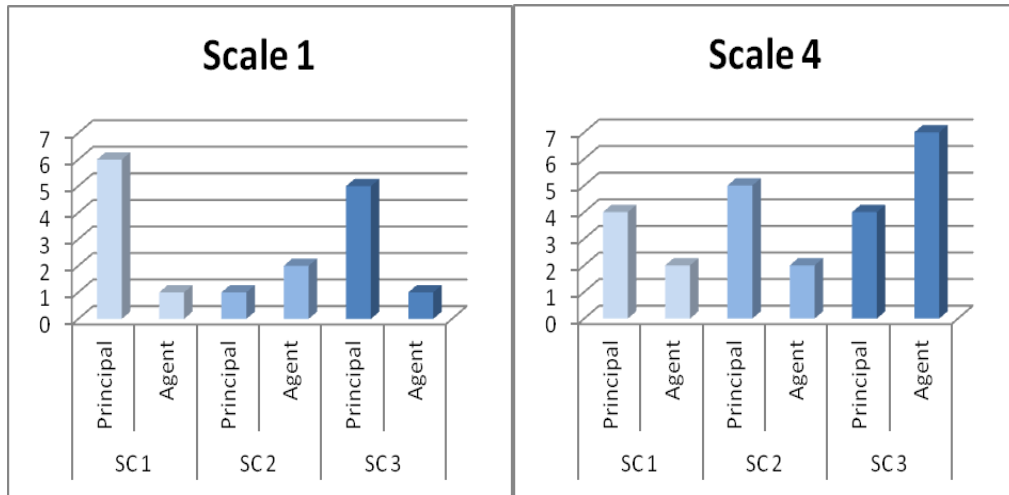

Figure 10. *Dilemma 2, Scales 1 and 4*

Dilemma 2 (Figure 10) had the largest gaps on scales one and four. As for the relevance of the situation, the largest gap is found in two companies where management on shore and crew disagreed. This can indicate that leaders are aware that similar situation might happen to their company, but this awareness is not transferred to the crew. This is a "red light" for lack experience sharing.

Scale four demonstrated a gap between managers and crew's awareness regarding captain/crew should solve this dilemma". Agent disagreed with that, and this can indicate that they prefer to consult management, while management sent responsibility over to Captain. Can this mean that Captain can take a decision different from what management would prefer? Safety should be promoted more explicitly as one of the corporate values in the company so that everyone involved is consciously doing what they are doing.

Dilemma 3 (Figure 11), scale one demonstrated that in this case Principal is aware of potential happening, but not the Agent. This indicates importance of sharing experience, learning to each other, learning from each other, learning on errors, and generally a learning culture in the organization.

Scale two depicted a gap in understanding of which decision contributes to safety and which does not. Principal on shore may think that Agent has the same perception. While Agent on board has a different perception of what a safe decision is, and acts according to his opinion, this is a possibility for an accident.

Scale three and four indicate that agent in SC 2 means that shore management has no impact and Captain/ crew who should take decision. However, Principal disagreed, saying that they do have impact on solving this dilemma, but Captain will take final decision while in the situation. This gap can indicate that Principal would like to impact on this situation, but Agent does not want that (SC 2, scale 3). Why would not Agent want the involvement of Principal? Agent means it should be solved on board (SC 1, Scale 4). This is a conflict of opinions. Who should have responsibility for solving the dilemma?
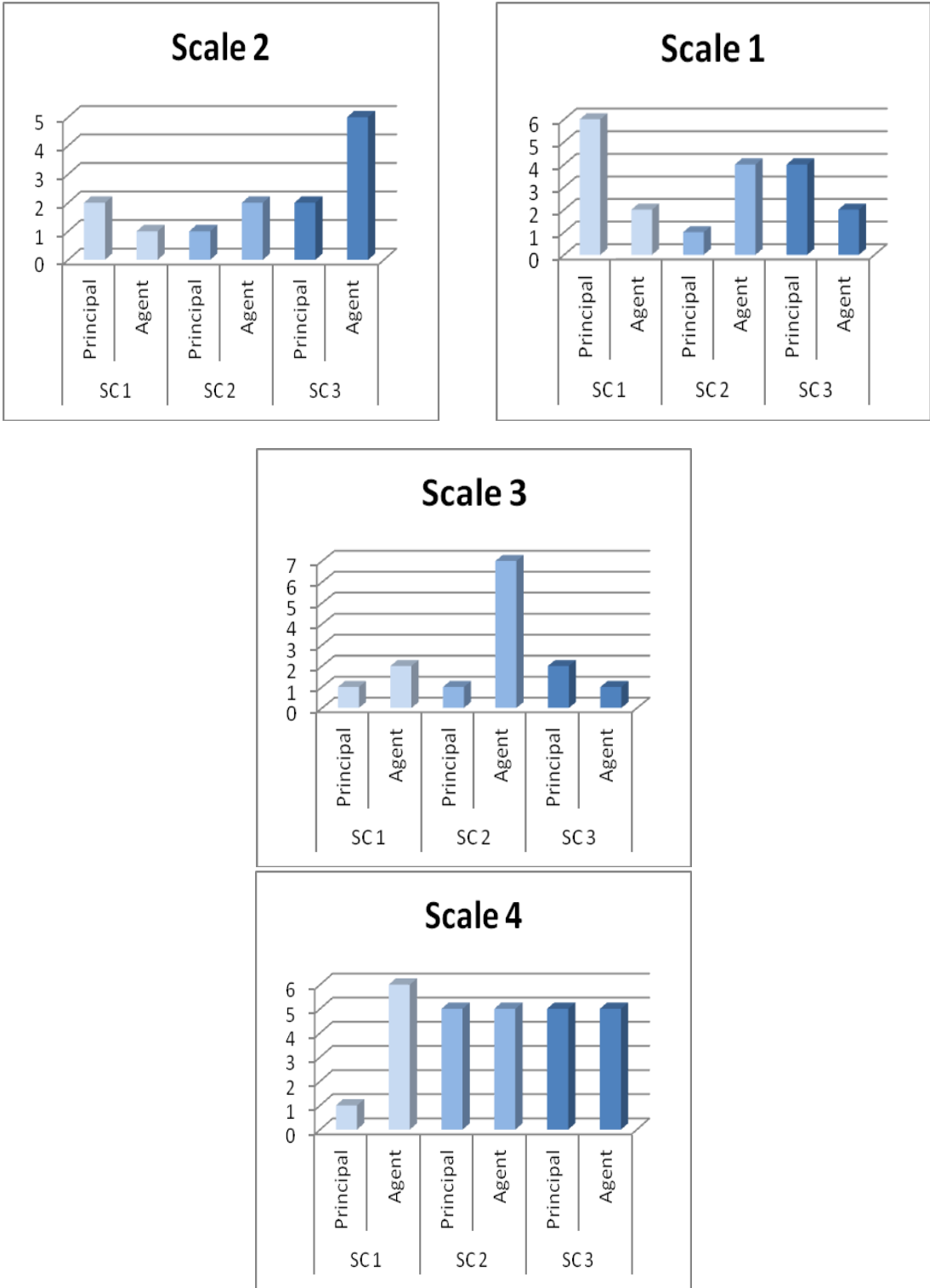
Figure 11. *Dilemma 3 Scale 1-4*

Findings of Scale 4 Dilemma 4 (Figure 12) demonstrate that all companies have a misunderstanding regarding who should solve the situation (referring to the work time and resting time). If Principal wants to participate in solving of this dilemma, would they come with a good suggestion? Or would safety be downgraded in opposition to time and cost saving?
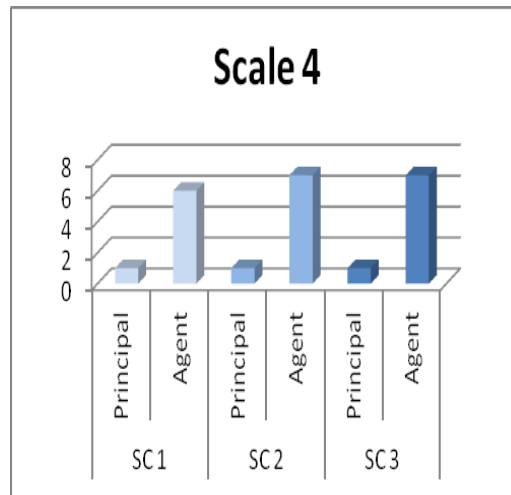

Figure 12. *Dilemma 4 Scale 4*

Dilemma 5 (Figure 13) is focusing on near miss reporting. It seems like Principal is aware of possible lack of reporting. Can this gap (Scale 1, SC 1 and SC 3) indicate that leaders should implement a strategy that will better promote near miss/ error reporting?

Having analyzed Scale 2 (SC 3) we can notice a surprising gap between Principal and Agent. How can not reporting an error contribute to increased safety? Or was the question misunderstood by the respondents?
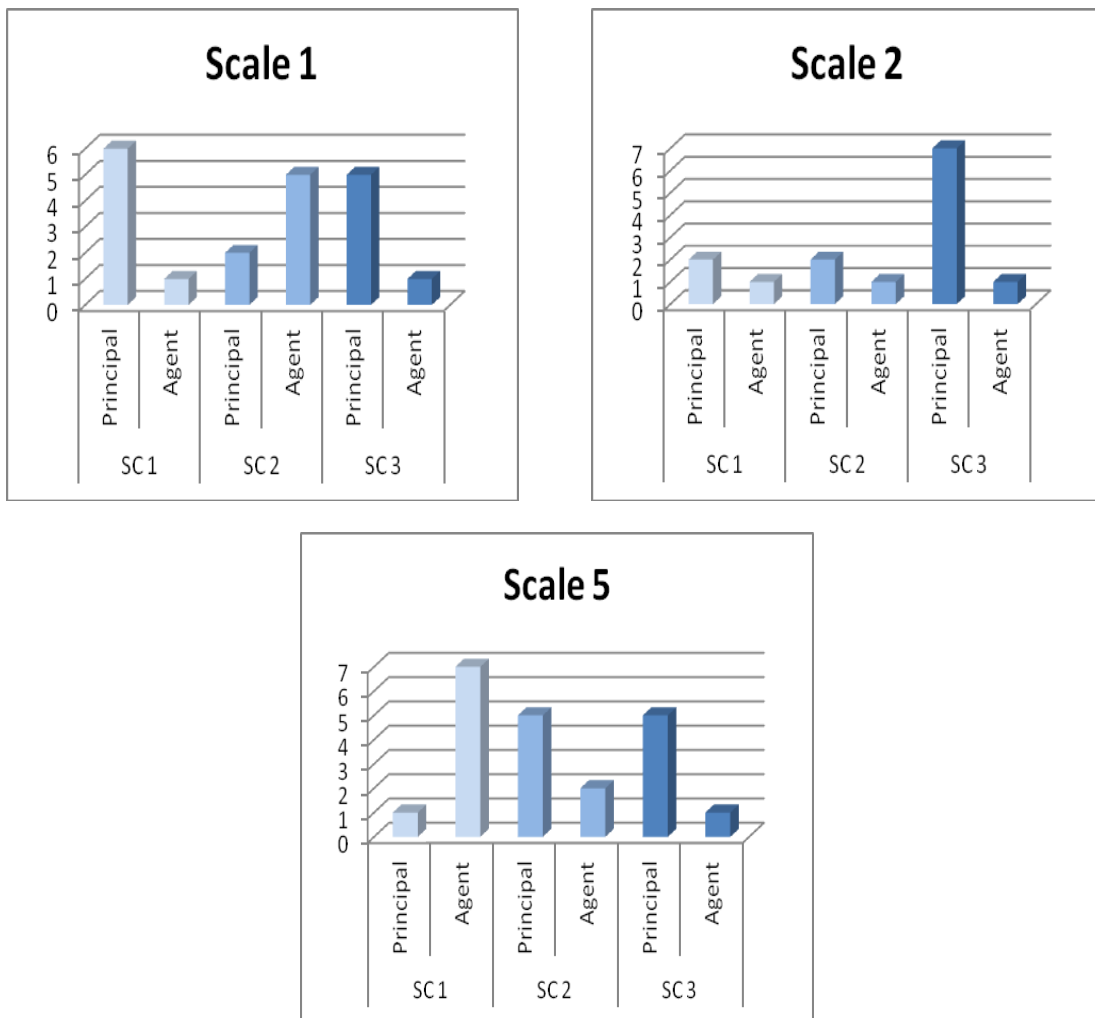

Figure 13. *Dilemma 5 Scale 1, 2 and 5*

Scale 5 demonstrated different opinions as for SMS to be relied on or not. Is this because agent is not willing to report on the errors? What can management do to motivate crew to report on their mistakes?

Dilemma 6 Scale 2 (Figure 14) depicts a gap between Principal and Agent in all three companies. The most critical is when one of the Principals believed that described decision contributed to safety. Also scale 4 (SC 1) demonstrates that Principal considers this dilemma should not be solved by captain / crew, while Agent means opposite.

Considering given situation in this dilemma, it may indicate that this should have more attention from the leaders in order to prevent similar to occur.
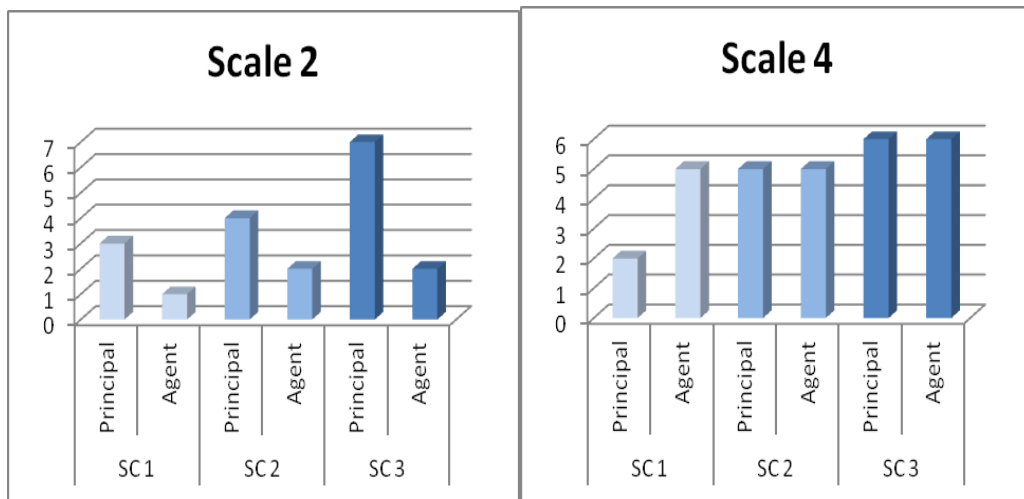

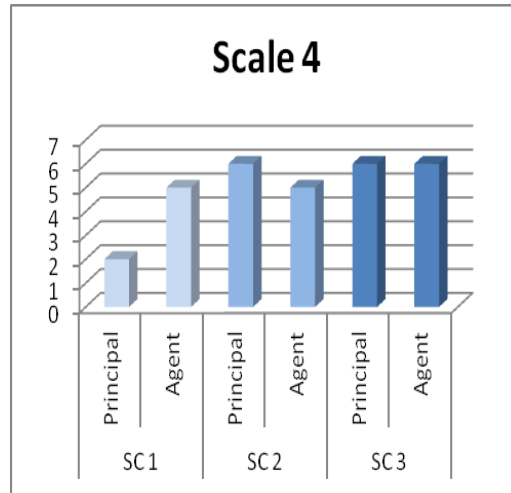**Figure 14.** *Dilemma 6 Scale 2 and 4*

Figure 15. *Dilemma 7 Scale 4*

Figure 15 indicates that respondents agree that the dilemma should be solved on board. This can be dangerous if there is no clear rule saying not to leave this particular post. Being aware of the risks involved can motivate one to prioritize better. If his leaving a post might lead to a life loss, what else can be more important?
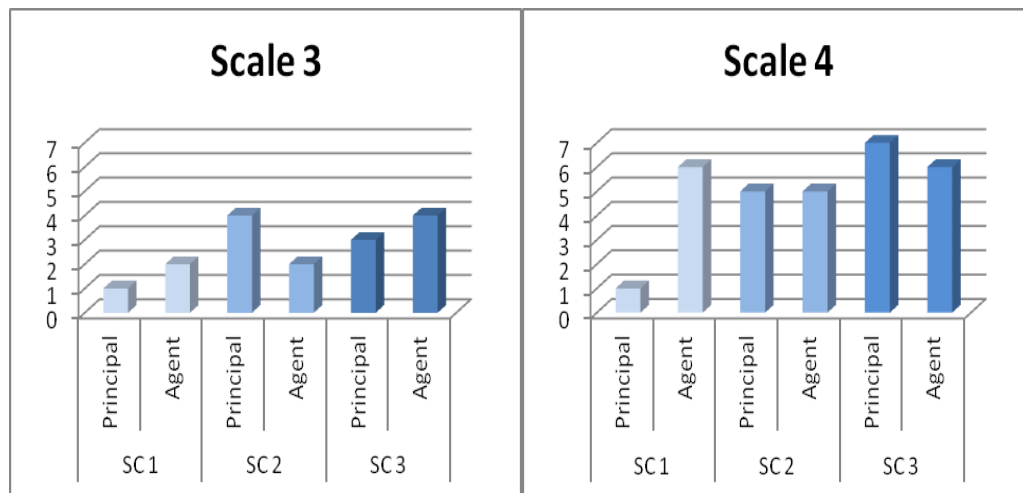

Figure 16. *Dilemma 8 Scale 3 and 4*

Regarding Dilemma 8 (Figure 16) partly agreeing that leaders have no impact (Scale 3, SC 2) can indicate that management is not trying to prevent authority misuse. Scale 4 (SC 1) shows a different way of thinking for the given situation. Principal means that it should not be solved by Agent.

Scale 1 Dilemma 9 (Figure 17) shows different perception of relevance among 3 companies, which can indicate not sharing experience with each other, and not learning on earlier errors. However, gap between Principal and Agent differs significantly in all three companies. Scale 4 is demonstrating attitude to VTS' recommendation and this should be taken more seriously.
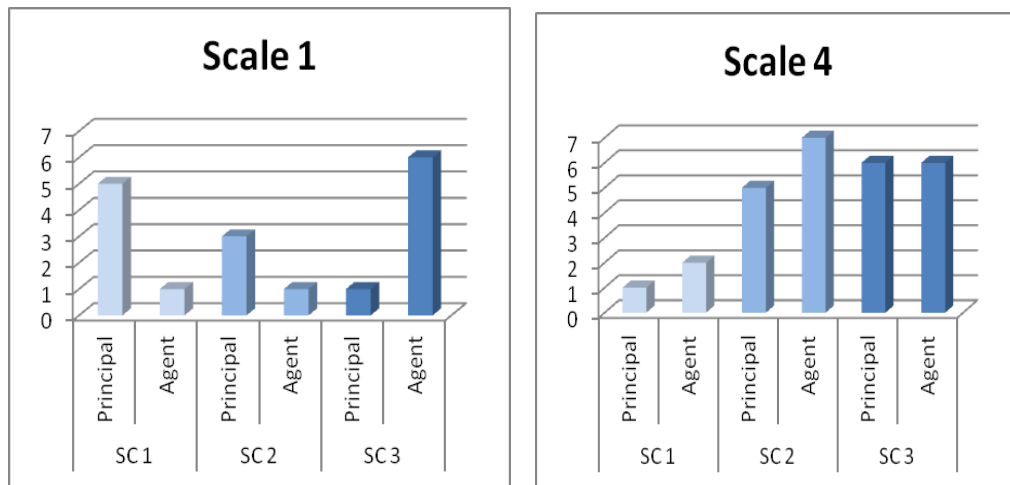

Figure 17. *Dilemma 9 Scale 1 and 4*

To conclude this chapter, safety awareness differs from company to company, from individual to individual. Even an individual can cause a major accident, it is crucial to minimize gaps, as this can prevent accidents to occur. To the Principal – Agent model we will add the following variables: philosophy of mindfulness, generate learning culture, experience sharing on all levels, enhance learning from errors, clear communication, prioritizing of HSE, and continuous improvement of these (CIP) (Appendix E). Some of the strategic elements are discussed in the next Chapter.

6.0 – Discussion

This chapter will start with three different perspectives on leadership strategies. Next, it will discuss leadership styles and such strategic elements as communication; learning culture and learning from errors that have been explored are needed to be improved. Finally, HSE theory point of view on leadership strategies will be presented.

6.1 - Leaders and leadership strategies

Different types of strategies and leadership styles can be used in an organization, as well as in shipping companies, and on board of vessels and tankers.

Traditionally, a leader is a strategic person, who can create an exact plan of how to make objectives realize in reality. Grey (2010) said that "a leader is not just something one does but who one is and how he relates to other. Successful leaders think strategically and excel at integrative thinking. They can hold two opposing ideas in their minds at the same time" (ibid).

Classical instrumental perspective (Fayol, 1916; Grey, 2010; Egeberg, 1989; Christensen et al., 2009) suggests that organizations can be managed with the help of formal structure, which includes hierarchy, formal rules and norms, where a leader is seen as the one who has authority and decides rationally. They identify the leader as an instrument of capitalism, rational problem- solver, a reflexive leader with ethical norms, a change agent, and as author of actions. However, the bureaucratic principles and rational leadership has been criticized for bounded rationality, hindering creativity and initiative among employees, social complexity in organizations that impact the way organizations are managed and led (Grey, 2009; Jacobsen, 2004; Mintzberg, 1994; Christensen et al., 2009; Selznick, 2003).

Mintzberg (1994) criticized planning and saw pitfalls of rational leadership. He argued that intended strategies had no value until a committed employee would come and implement them. Therefore he suggested there should be "planners" and "doers" in an organization.

Planners have resources to plan and no authority to implement, while doers have no time to plan, but have authority to implement changes. However, change cannot be planned, planning a change is paradox, because forecasting methods are weak and "change strategies cannot deliver what they promised" (ibid).

Criticism to instrumental perspective was found from those supporting institutional perspective on leadership, with its main focus on informal norms and values, which are "not written on paper", and can form an organization. However, the followers of this perspective split into 2 groups. One of them supported the idea that culture is something organization has, and therefore a leader can not control organization's development, it is reflected in behavior of employees; it can not be changed by rational instruments (Selznick, 2003). The second group meant that culture is something that is raised "within the walls of organization", and can be controlled, manipulated and is "installed" by leaders (Christensen et al., 2009). This perspective introduced a debate between "organization is a culture" vs. "organization has a culture". This "cultural" way of thinking developed a "vision oriented value based leadership", which is not technical and rational, but is a creative process; "statsmannskunnskap" (Selznick, 2003), where main tasks of a leader is to promote learning, encourage for better performance, include and develop people. He (ibid) proposed that leaders will lead and manage organizations in such a way that they promote learning, and it can be achieved via socializing with each other.

One more perspective on leadership is a new institutional perspective or myths perspective. This theory argues that organization can be managed and led taking into consideration the tendencies from the environment as main guidelines. Leader's task is to be able to accept those tendencies, consider if they fit to the organization and try to implement necessary changes to maintain those new tendencies. They are also called "recipes" and are about "good leadership", recruitment processes, HSE issues in an organization, what a leader must do, how the culture appears in an organization, social corporate responsibility etc. This view is criticized for making leaders "passive" as the "myths" from outside are coming themselves, and are granted so the leader does not have to be creative to solve eventual

challenges in the organization. HSE leadership is considered a "myth" coming as a new tendency from the environment, partners, authorities, competitors, suppliers, consultant agencies, media etc. (Nielsen, 2000).

We have realized that there is no pure clean perspective which can be applied in one particular organization solely, neither on board of a vessel or tanker. All 3 perspectives are interconnected to each other and support each other. One of the tasks for a leader is to be able to find equilibrium in his leadership style (Selznick, 2003).

As for shipping industry, and tanker segment, Captain is the leader, and he is the one bringing and maintaining culture on board of any vessel, as well as taking most important decisions. However, complexity of social development contributes to culture development every single moment (Johannessen, 2010). Leaders of the shipping companies should select a proper Master, and communicate strategic goals, values and priorities to him clearly. That is why our survey demonstrated that "management on shore has impact", even though it is "captain/crew who are taking decisions on board". In addition leaders have to motivate captain to act in company's interests. And this is also where Principal and Agent relationship come to the picture.

6.2 - Intrinsic vs. extrinsic motivation

Theory gives considerable importance to motivation and incentives.
Since "motivation influences safety performance" (Griffin, 2000), it is an instrument that can be used by leaders to encourage employees act in the benefits of the company.

For instance, Principal can think about motivating Agent by aiming for his needs' satisfaction. Considering Maslow's theory about needs, and the pyramid, where "lower order needs" have to be satisfied before "higher order needs", extrinsic mechanisms such as salaries, compensation and bonuses can satisfy the first ones, while such needs as self-esteem and self- actualization require a more efficient approach (Maslow, 1970). Deci

(1972) referred to a number of social psychological studies in this area, and suggests that leadership strategies should be motivational and focused on "higher – order" needs where the rewards will be mediated by a person himself, and get a worker's ego involved in his work.

Solutions for that were found in theories of management, suggesting that giving a voice in decisions which affect employees and making job tasks more interesting and challenging are sources of intrinsic motivation (Deci, 1972). So, a person will be intrinsically motivated to perform effectively by the job itself, and satisfaction he has from doing it well (ibid).
Important assumption in psychology is that man's behavior is directed by goal, in other words, a person will engage in behavior which he believes will lead him to desired end states. However, psychological studies argue that management should use such leadership strategies, which will arouse both intrinsic motivation, and extrinsic rewards for doing the job well.

Deci (1970) according to cognitive evaluation theory suggests that verbal reinforcement, by other words gives additional positive value associated with the activity. Positive feedback is considered to be influential on increasing intrinsic motivation is, because it strengthens worker's sense of competence and self – determination, while negative feedback decreases intrinsic motivation. Senge (1990) argues that performance feedback should be integrated into a strategic framework and the individual worker performance should be linked with overall strategic objectives of the company.

An attempt to arouse intrinsic motivation is known in social psychology as "participative management", which is focused on motivating effective performance at the same time to satisfying "higher-order needs" (Maslow 1970).

Knott (1993) supports that often managers have to rely on intrinsic motivation- friendly strategies that promote training, encourage developing norms of behavior, set a "motivating" organizational culture. "People are born with intrinsic motivation, self- esteem, dignity,

curiosity and joy to learn" (Senge, 1999). There do exist "soldiers who are patriotic, players who are team oriented, and employees caring about doing their job well", by other words committed to their jobs, and formal incentive system is not the only motivation for the agents to fulfill principal's requirements (Kerr, 1995).

Types of incentives that can influence performance of the employees are summarized in Table 29. These should be taken into consideration by managers and leaders in their strategies more consciously.

Extrinsic financial	Extrinsic non financial	Intrinsic
Pay for performance	Verbal reinforcement	Patriotism to the job
Bonuses	Positive feedback	Personal commitment
Shared ownership	Giving a voice to decide	Fear to be fired
Social pressure	Opportunity to learn	Fear to be disliked
Tournaments		
Employment contract		

Table 29. *Summary Extrinsic vs. Intrinsic motivations*

Our study covered some of these instruments and results showed that there were indicators of intrinsic motivation such as personal commitment to the job or patriotism; as well as fear to be fired and disliked. These are both positive and negative. Opportunity to learn, feedback and social pressure seem to be present in the shipping companies.
However, employment contract, bonuses, tournaments among employees, shared ownership, and pay for performance need more research to be able to conclude their role in shipping.

6.3 - Employment Contracts

Contract is defined as a device for conducting exchanges between parties involved, and focuses on two main goals: to plan rationally this exchange with careful provision for contingencies and to be able to motivate performance or to use legal sanctions for compensation in case of non-performance.

"Contract is a governing mechanism where parties agree to obey certain rules to certain extent". Contract execution problem is also known as King Solomon Problem and was discussed as Hybrid form of governance in organizational theories (Macaulay, 1963; Grannovetter, 1985; Wuyts & Geyskens, 2005; Poppo & Zenger, 2002). Classical contracting is known as a type of market governance. TCE suggests that legal rules, formal documents can be helpful if standard transactions dominate in the business relationship between Principal and Agent.

However, neoclassical theory states that the world is too complex to design complete contracts or agreements, and some of these can never be reached without being flexible and able to adjust to adaptations. Due to bounded rationality ("intended to be rational but only limitedly so") and opportunism contract cannot be considered as an efficient tool for planning (Williamson, 1985).

Relational Contract Theory is telling about how parties regulate their behavior without the assistance of written contracts. If problems arise, the parties often negotiate to a solution without relying explicitly on the written contracts or threats of legal sanctions (Macaulay, 1995). He (ibid) meant that due to the desire to keep it all simple, parties involved in business relationship prefer to rely on one's word, or a "handshake" or "common honesty".
It is obvious that employment contract plays its role in any organization and legitimize employer – employee relationship. So, we do consider this to be a relevant instrument which can be used by the leaders to influence crew's performance in shipping. However, as our

findings will demonstrate, more clever and efficient strategies are needed to prevent major accidents as classical and standard methods alone do not suffice.

6.4 – Communication

Effective communication is believed to be an indicator of "good leadership" (http://www.he-alert.com/documents/published/he00615.pdf).

According to the earlier research on aircraft segment it was found out that pilots did not succeed while performing a critical crew function because they did not manage to communicate their concerns to the other pilot (http://www.lcc.gatech.edu/~fischer/ISAP99.pdf). The findings concluded that the strategies pilots intended to use for eliminating the errors were not the most effective ones. Captain's and the 1st pilot's communication strategies were explored and compared with striking differences in them, however, there was considerable agreement between captains and first officers on what constitutes effective communication. Effective communication strategies used by crew on the aircrafts were highlighted to be important for coping with problem situations and their joint problem solving (ibid).

We consider communication between Principal and Agent as well as the Captain's ability to communicate effectively with his crew to be important to ensure safe conduct of the vessel and timely delivery of the cargo. Prove to these was found in numerous recommendations of the investigation reports in the IRSOC and validated by our findings. Communication challenges are present in tanker operations both between Captain and crew, and between managers on shore and those onboard, as was explored. However, a communication strategy in shipping tanker operations is a potential area for further scientific research.

6.5 - Learning

Development of learning theories started back in 1920s with behaviorism and cognitive revolution in 60s (Fiol & Lyles, 1985; Smith, 1999). Further it developed into cognitivism and constructivism (Vygotsky, 1978; Smith, 1999). Later on, - managing creation of knowledge and led to Agency theory when challenge of asymmetry between Principal and Agent appears.

Due to competitive surrounding, organizations are occupied with the professional and personal development of their employees. In modern organizations it is required that employees learn how to do a good job and a better job. If an employee has opportunities for development on the job, he will be more motivated to do his job well. Development will happen through learning (Karlsen & Gottschalk, 2002). Learning is defined as behavior of change (Spender 2008, Senge 1990, Smith & Lyles 2003).

"Learning organizations" are organizations which have culture of "continuous learning". In such organizations "knowledge is shared between each other; it is profitable not to keep the insight for you only". Knowledge takes central place in values for these organizations. Ottesen (2010) suggests that employees can learn "from themselves" giving their knowledge to their colleagues when they interact with them, and "learn to themselves" from their colleagues. To implement that, it is absolutely a matter how the organization is structured, as it is facilitating or not the interaction between employees, therefore leaders have opportunities to influence learning culture.

Smith & Lyles (2003) have done their analysis and compared "organizational learning" and "learning organizations" are different. "Organizational learning" refers to "the ability of organizations to learn in ways that are "independent of the individuals within". "Learning organization" is defined as having ability to learn like a biological organism, and can adapt to survive in changing environment" (Senge, 1990). McGill & Slocum, (2011) compared

"learning organizations" with computers which could have used their ability of programming to process all the information.

Wadel, (2010) supports Ottesen, (2010) suggested that learning is happening between employees when they are socializing with each other and performing certain activities together, which he calls for "informal learning". Eraut, (2011) as a result of his research projects also concludes that informal workplace activities provide 70- 90 % of learning. Experience sharing between colleagues has a big potential to contribute to learning culture in an organization.

Recent research suggests that a performance feedback is the condition for learning organizations, and a tool to maintain high performance at work life (Mayfield & Mayfield, 2012; Eraut, 2011). The research underlines importance to integrate feedback into company's strategic objectives and should be given clearly, timely, be tied to workers controllable activities and serve as encouragement of individual's unique organizational contribution.

How can leaders use Learning in their strategies?

"Leaderful practice" (Raelin, 2011) supporting and developing work- based learning, and is defined as "collective form of leadership" and promoting "living learning" by every employee. He (ibid) showed that learning in organization influence and changes leadership in this organization, making it concurrent (many members can serve as leaders at the same time); collective (everyone is participating in leadership); collaborative (everyone is in control of and can speak for the whole team); and compassionate (members commit to preserving the dignity of each other).

Emerald Research group Limited (2012) have published the review based on the study of 795 workers from 75 university departments conducted by Joaquin Camps and Hannia Rodriguez. Their findings supported mentioned above leadership as the one leading to performance increase. It is called "transformational leadership". They say that employees if

feel supported by their organization can be expected to perform better then those reporting lower levels of support.

It is important for management to notice that instead of being feared to invest into learning due to the possibility of loosing these workers (assumption that have acquired better skills they start looking for better positions) and "wasting the resources", managers should create such an atmosphere where workers are encouraged to perform better for their employer every time they have been through learning. In shipping learning is important for creation of common action "repertoire" in emergencies, and develop so called "epistemic network" (Klemsdal, 2006).

6.6 - Learning from errors

"Commit people to protect themselves and their organization against human errors.
Improve learning from errors"

Learning from earlier errors contributes to learning in the shipping industry.
It is possible to teach people to handle errors and risks in a constructive way, and learn from errors to improve quality and safety. Potential for performance improvement exists where the errors are corrected (Hovden et. al, 2010, Sklet, 2004).

In opposition, La Porte & Consolini (1991) means that organizations should strive for "trials without errors" at all, because "the next error can be the last trial", and promote failure – free performance.

Learning from errors has been studied in diverse contexts: education, engineering, warfare (Stellan, 2006). He (ibid) was first to propose theory of how people detect and correct their own performance errors. In his theory "error" refers to inappropriate action committed while performing a task. If people catch themselves making errors ("No, wait a minute, this can't be right"), the probability of the erroneous action subsequently decreases. Learners must be aware of their errors to learn from them.

However, people do not learn skills solely by correcting their errors. They also benefit from positive feedback, from tutorial instruction, from observing models, and traditional formal learning.

6.7 - HSE theories' view

Strategies for accident prevention in the tank segment have historically been strengthened after major accidents such as Torrey Canyon, Amoco Cadiz, Exxon Valdez, Erika and Prestige. A considerable shift was introduced in 2004 when the Oil Companies International Marine Forum (OCIMF) introduced the Tanker Management Self Assessment (TMSA). The TMSA enabled tanker companies to benchmark the qualities of their safety management systems against defined best practices. In these best practices the TMSA suggested that all tanker operators should use formal onboard risk assessments for all non-routine jobs onboard. A few years earlier, the mandatory ISM-code had already stated that all shipping companies should use formal risk assessment for critical routine operations (key shipboard operations) (Hales, 2006).

As we found out, these measures are not sufficient to minimize high risks involved. Our research shows, more effective measures are needed to be incorporated to take effective next step for further prevention of tankers accidents.

Since the early 90s extensive qualitative cross industrial research has been conducted to understand why some companies manage to operate under heavy risk exposure, but still have very good and reliable safety performance. These organizations are called high reliability organizations (HROs), and apply "principles of mindfulness". These principles are well integrated into common practices in Aviation industry (Weick et. al, 1999) and staff is well trained to use them consciously, while in shipping they are not consciously introduced (Soma, 2010). However, there can be initiatives that will start implementing those principles into leadership strategies in shipping.

As Karlsen (2010) referred to Klepper (1992) HSE improvement should be integrated into all company's activities, not only in chosen parts of the processes. An effective and necessary tool to do this is to create a strategy that can help managers to direct employees through the actions for increasing safety awareness in performance of their daily work. As

Soma (2010) in his article "Where do we go from here?" said "There are good reasons to target safety culture as a part of an integrated approach to improve safety performance".

Alternative "translation"' of this Master thesis' problem could have been a study with intention to uncover whether having the principles of mindfulness can contribute to accidents' prevention. However, we intended to keep ourselves within Strategy and Management discipline as much as possible, by working with discipline's literature. Anyway, we could not ignore HSE theories since the strategies we were talking about are going to contribute to safety in shipping, HSE management aspects were overlapping. In fact, we believe, that this opened an opportunity for us to penetrate deeper into the problem rather than if it would have been viewed from the economical and managerial points of view only.

7.0 - Conclusion

As theory identifies, due to human errors 60 – 90 % of accidents occur in tanker operations (Dhillon, 2007; Shappell & Wiegmann, 2004; Soma, 2010). Survey results show that there are gaps in safety culture awareness between managers on shore and crew members onboard. In addition, survey demonstrated that there also exist gaps between manager to manager and crew to crew.

We focused on attitudes towards safety, and found differences from company to company as well as among employees in the same company. Since even an individual can cause a major accident, shipping companies should be aware of these gaps.

In order to reduce the percentage of accidents, leaders can apply certain strategies to assure right actions in hazardous situations. Our findings showed that existing leadership strategies do not work fully and need to be improved in the following areas:

- creating and maintaining philosophy of "mindfulness" in every day practice
- promoting clear communication on all levels of organization
- creating a "learning organization" culture
- learning from earlier errors
- organized experience sharing with each other

There was a common pattern noticed in the findings. Crew members strongly agreed that "shore management has impact on solving the dilemmas", even though "dilemmas will be solved onboard". This is perceived as the indication on lack of leadership influence in certain situations. This indicated the room for strategic leadership improvement.

Unclear company's policies and/or indication on misuse of authority were explored due to explicit disagreements between managers and crew as for who is responsible for solving

some dilemmas. Also disagreement as for relying on SMS rather than one's experience was found.

Findings indicates that cost saving is prioritized before safety in some situations.
It was understood from survey answers that communication between crew and captain needs to be improved. Misinterpretations and misunderstandings should be limited to minimum.

Also, communicating of corporate values need to be more clear from the side of the managers. Neither Captain and crew, nor the leaders onboard should be focused on financial results more than safety.

Findings indicated that "I know best" attitude still exist onboard, and not every crew member's opinion is counted. In addition, some of the crew members are feared to express their opinions, and follow Captain's order even disregarding SMS.

Some recommendations for strategic improvements: leaders should be able to balance financial and HSE values with their strategies; most of the companies should be more occupied with predicting of potential dangers and develop situational awareness, being alert even in quiet periods. Principles of mindfulness should be taken as the arena for general change of mindset in shipping. Culture of learning on a daily basis should contribute to creation of "epistemic networks" that can be activated in emergency situations. Experience sharing should be organized by the company regularly. It does not mean that one with longer career have experienced the same situations as the other one with shorter career.

These and other activities should be organized in an action plan by the leaders and directed to eliminate gaps between the companies, and within each company between managers and crew. As discussed, these actions can bring positive contribution to accident prevention, and represent "improved leadership strategies" (Figure 18, Appendix E).

7.1 - Contribution

This study intended to contribute to both research and practice.

First of all, our study developed Principal - Agent model and applied it in a new way. We modified and adjusted the model for shipping industry, and found out that the way it was presented in traditional theory did not suffice; more "ingredients" were needed to explain and solve challenges between Principal and Agent in shipping tanker operations. Therefore, we assembled a new model with the help of several disciplines mentioned in literature review and the findings received.

Secondly, the study intended to contribute to practice. Since this research analyzed both primary and secondary data, and explored existing areas of leadership strategies that require immediate improvements this research contributes to both leaders on shore, crew on board, and the oil company which outsourced its shipping services to the selected shipping companies.

To summarize, this research aimed to give insight into the safety culture awareness in shipping industry and explore the gaps which can be reasons of accidents. Elimination of these gaps will contribute to accidents prevention, and if leaders take necessary actions it will positively influence employees' work environment and improve safety culture.

7.2 - Suggestions for further research and limitations of the study

We identified and discussed how leadership strategies can be improved to prevent major accidents. Scope of the study has been fairly broad, so further research can be focused on in-depth research of the findings presented by this paper.

Even though the conceptual model was explained explicitly and demonstrated visually step by step along with the theoretical framework development, studying correlation of the variables with each other can be done in further research. Safety culture awareness could be a dependent variable, and asymmetric information, control and monitoring, financial incentives, employment contract, motivation, risk and safety awareness, training, learning on errors, communication, HSE focus could be independent ones.

Also further work can come with the suggestion on how to implement those changes to improve leadership strategies, create action plan for strategic improvements. It could be valuable to organize implementations into projects and apply Project Management theories and models. More research on what can prevent major accidents in shipping tanker operations is needed to understand the reality on board and reasons leading to human errors. This study has included and raised many issues.

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1.Fatal accident due to using a disconnected gangway	A crew member stepped on a disconnected gangway because there were weak or no stop signal; Ladder was not removed; the gangway rotated because it was not secured; the gangway was not fully retracted; 30% of the gangway was left unsupported over the water; the crew member was unfamiliar with the gangway construction and misjudged the risk of using the gangway while disconnected.	Communicate information to ships and terminals as for the technical and operational integrity of terminal gangways; Near miss reporting should also be considered as a way to train the crew to observe potentially dangerous situations themselves. It is important that near miss reporting is not feared due to negative career consequences. Thus near miss reporting from the crew should be encouraged with positive feedback; Training and familiarization of procedures;
2. Fall of substructure (a serious near miss during upending the substructure)	Important information not communicated and/or misunderstood; Procedures incomplete and/or not suitable for the marine operations planned; Inadequate control of operational activities; Inadequate transfer of knowledge of substructure behaviour during upending to all personnel involved; misunderstanding of substructure behaviour during upending operation; Upending was not identified as a hazardous operation; Unplanned activities carried out without management control and monitoring; not all safety criteria were addressed;	Review communication of the overall risks; using sufficient time to communicate the risk picture; being preoccupied with potential errors; review working processes; presentation of investigation report on workshops; learning from errors; enhance monitoring and control of unplanned activities;

3. Collision	Severe weather condition and unexpected change of weather; sandy sea bottom; failed to follow the procedures; lack of knowledge and lack of situational awareness, not quick enough reaction; lack of training; not clearly communicated assignment and responsibilities;	Leadership training; update training of senior management; training in needs analysis; improve communication skills (Orders will contain definite sentences complying with company procedures to officer, for ex., instead for "Call the master, if weather gets stronger"; should be told: "Call the Master, if the weather force reaches to 6 beau fort"); During anchor watch all officers and lookouts do not become busy with any job, which can obstruct them"
4. Collision of 2 vessels with leakage	The Master had exceeded the optimum work and rest hour guidelines; poor leadership; wrong maneuvering the vessel	The importance of planning and where appropriate satisfying work and rest hours guidelines should be promoted; addressing the issues on the seminars; promoting good leadership;
6. Oil spill	Inferior communication with external parties involved; There was still some pressure on the line, and a limited quantity of sludge oil was spilled on the deck and in the dock water; Not updated check list led to not checking this.	Clear and vigilant communication with all external parties involved in the shipboard operations must be maintained; verification that hoses used for cargo and sludge operations are depressurized before disconnection; Update the checklist; enhance control;

7. Injury	2nd Engineer grabbed the protection cover including V-belts while they were still turning; not being fully focused on the job; He was not aware of the dangers he was exposed to while removing the V-belt cover at the moment the V-belts are still rotating Being not completely familiar yet with all systems onboard; the damper was not closed in advance; He was not concentrated on the performing operation;	Promote and communicate safety routines by signs, hang notes at the operation places, safety bulletins; Review of company Emergency Communication plan; Provide better training to new members on board; Promote safety constantly.
8. Collision	An error of judgment led to collision A crew member failed to maintain a safe lookout by all available means during at least part of the 30 minutes or so prior to the collision; He did not alert the Master when he believed the visibility to be restricted; he failed to sound the appropriate signals on the ships whistle;	Revisionary training is needed; Re consider and rewrite of their standing orders; promotion of safety culture, being pre occupied with potential errors.
9. Personal safety risk and possible fatal accident	Lack of internal procedures as for securing the crew while performing certain operations; lack of practice as for when the crew members must have securing clothing and tools with them; design error which was known but not corrected on the ship; not secured in a proper way; Working at height standard rule was not followed;	Security equipment should be provided and its use should be promoted, clear communication as for instructions when and how to use it; learning, training; Reconsider working routines, control and monitor safe performance; Strengthen reporting procedures; increase risk awareness of "not reported errors"

12. Grounding due to poor decisions	The ship was kept on automatic steering at its top speed of nearly sixteen knots. Furthermore, the captain had been advised to change course both by his third officer and by signals from a lightship, but had refused. When he finally decided to change the steering system to manual, it was too late. Captain was informed as for the decreasing tides at the entrance to the terminal, and that they had to wait until the next high tide (could have been 5 days), it was decided to keep the schedule in order to keep up the vanity of his ship; they could have performed the transfer underway, but might spill a little of oil on the decks and come into port with a "sloopy" ship. Instead, it was decided to rush into the schedule and increased the pressure; the route was changed and instead of sailing around islands and maneuver ,they decided to sail through; equipment design, where the steering selector switch was in the wrong position: it had been left on autopilot, which was unknown to captain	Safety promotion; risk awareness should be increased; preoccupation of errors, working in a team, while everyone can contribute to risk identification; safety should be higher prioritized than economic benefits; Captain should consider his crew's notifications; take weak signals as novel and serious;
13. Grounding	Misinterpretation the configuration of the running lights on the "neighbor vessel", and thus its size and heading. Being not well aware of the situation, failure to evaluate risks; Crew realized that captain ordered a strange turn; they failed to question him or to inform him about a possibility of error. They figured that their Captain had had a good perception and must have had a reason to order that turn.	Improve communication; training ; Increase risk awareness by demonstrating errors occurred earlier; crew must be aware that their contribution is expected and appreciated and be strongly motivated in risks mitigation; perceive signals more seriously;

| 14. Physical injury | The deck crew were not made aware by duty officer that extra caution should be taken with the large drilling tubular, which were not tied "in odd number" for loading operation. Duty officer did not recognize risk possibility, and importance of him notifying the crew. Not following the procedures according to UKOOA. Being not able to foresee incident even after the perceived risk by the crew. Breakdown in communication; | Improve communication; Extra caution is to be taken with irregular bundles and these are to be highlighted on loading plan and made known to bridge, where necessary; provide training of similar situation; following the routines more accurately; |

APPENDIX B - **Invitation to participate in the survey**

Hello!

You have received this e-mail as a part of a Student Master Thesis related to safety culture awareness.

As a part of Statoil Shipping's Working Safely with Suppliers program your participation has been agreed with SC1 (SC 2, SC 3) AS Management.

Information will be confidential and anonymous, so it will not be possible to identify each participant.

Further information will be given during the survey.

A swift response will be much appreciated.

Introduction to the survey

We are two students at University of Stavanger, faculty of Business Administration, writing our Master Thesis within Strategy and Management.

As a part of our research we are studying how focus on safety culture awareness in shipping companies can prevent accidents in shipping tanker operations.

You will be given 12 situations. Imagine these are real and please express your opinion about the decisions taken in the described dilemma by giving the score on the scale from strongly disagrees to strongly agree. The questionnaire will take you approximately 10-15 minutes.

The Working Safely with Suppliers (WSWS) initiative in Statoil Shipping is a mentor for the program, and your participation has been agreed between Statoil Shipping and your Company.

Information will be confidential and anonymous, so it will not be possible to identify each participant.

If you have any questions, please, feel free to contact us by telephone 45 78 11 86 or email n.nedopokina@stud.uis.no. You can also take contact with our supervisor at the university Terje I. Vaaland by telephone 90 98 12 56.

 Thank you for your contribution!

APPENDIX C – **Survey Text**

1. Imagine the following situation and evaluate it according to the scales provided. Even though the captain was advised from the 2nd Officer to change to manual steering while sailing through a narrow channel, he proceeded with the vessel in autopilot. He thought he was well aware of situation himself, and would not consider advice from his colleague.

2. Imagine the following situation and evaluate it according to the scales provided. A vessel is expected to arrive the discharge terminal today. There is a falling tide at the approach to the terminal and the next high tide is in 5 hours. The UKC (Under Keel Clearance) is absolutely the minimum level, and the officers also know that the draught on the chart is uncertain for this terminal. This interruption will cause further delay for 2 days due to the loss of the slot at the terminal. To justify continuing the Master/officers filled in a risk assessment form where the uncertainties were ignored.

3. Imagine the following situation and evaluate it according to the scales provided. During transit visibility was limited due to fog. However, ice was observed in the water ahead. Instead of sailing with reduced speed through the ice, it was decided to slightly alter the course and sail around on full speed to maintain schedule.

4. Imagine the following situation and evaluate it according to the scales provided. A deck officers and crew are fatigued due to busy work load over the last few days. But if the crew is to rest, they will not make it in time for their laycan at the oil terminal, which will be noticed. Furthermore, missing laycan will in turn result in further delays making them also unable to make their next planned voyage. It was decided to continue without rest.

5. Imagine the following situation and evaluate it according to the scales provided. A junior officer made a mistake that he knows he should report to the Master. But

the mistake had no consequences and nobody observed it, so he decided it was unnecessary to report.

6. Imagine the following situation and evaluate it according to the scales provided. A critical maintenance job needs to be completed for the vessel to continue the voyage. The experienced chief engineer is expected to be in charge of the bunkering operation; therefore the junior engineer is assigned to the critical maintenance job.

7. Imagine the following situation and evaluate it according to the scales provided. The gangway on the moored vessel was disconnected, but not fully pulled in. The Officer on duty therefore supervised the suspended gangway to ensure that it was not used in this position. But due to an urgent request he had to leave the post unattended for 10 minutes.

8. Imagine the following situation and evaluate it according to the scales provided. During adverse weather an officer believed that according to Standing Order he was not allowed to work outside on deck. However, Captain asked him to complete a job which could have easily been postponed. Crew member followed his request.

9. Imagine the following situation and evaluate it according to the scales provided. Captain was navigating the vessel in transit. The ship received a phone call from the local VTS (Vessel Traffic Service) informing that they had to alter the course away from shallow waters. This would result in significant delays. Captain decided to follow the initial course relying on his experience.

10. What is your position?

11. How long have you been working at this position?

12. How long have you been working in shipping?

Thank you

APPENDIX D – **Scales to the survey**

The scales will be evaluated from 1 to 7 from strongly disagree to strongly agree

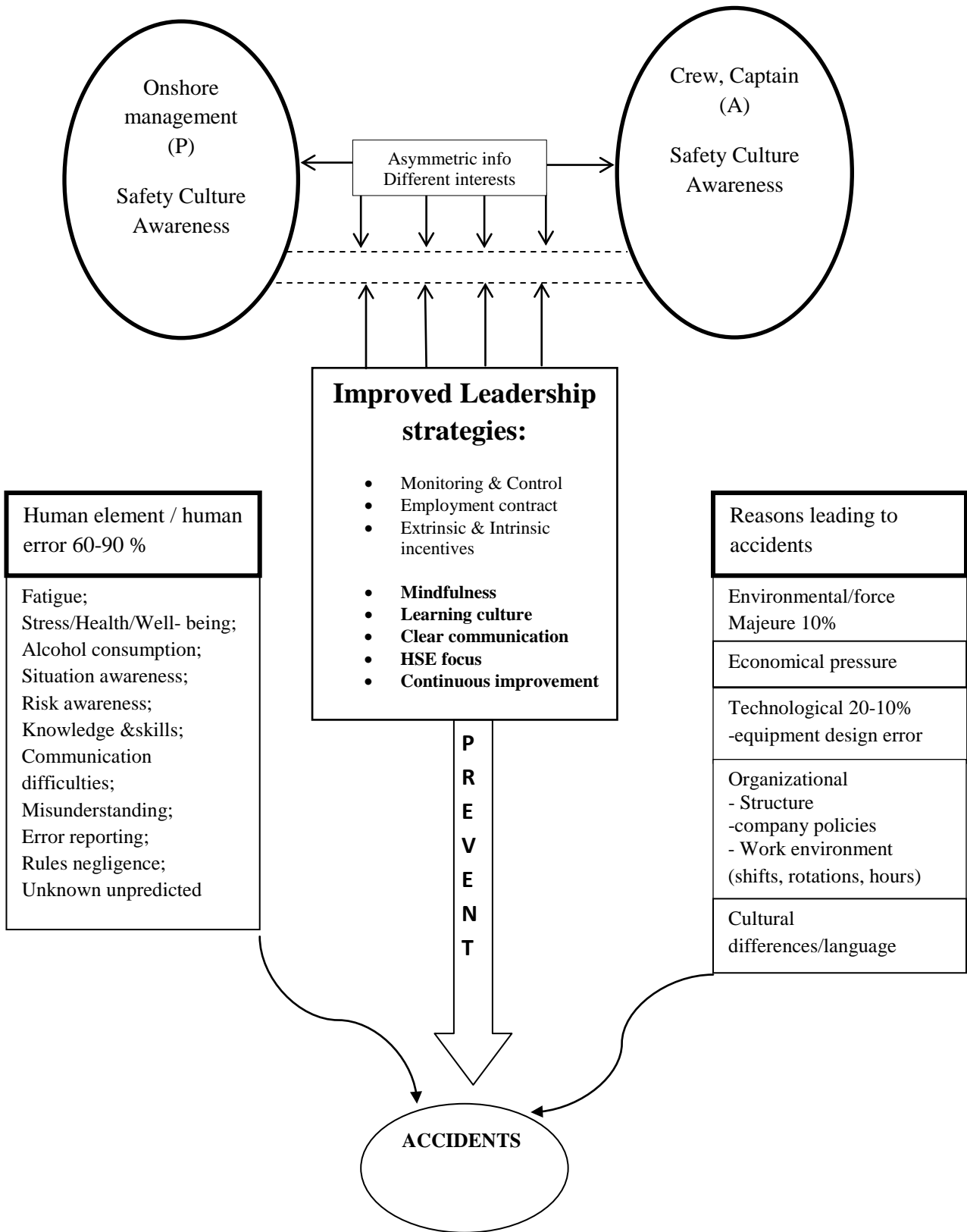Given situation is relevant for your company

Described decision contributes to increased safety

Shore management has no impact on solving this dilemma

This dilemma should be solved by captain/crew on board

I believe this case should be solved following the company's ship management system rather than one's experience

APPENDIX E – **final suggested model, Figure 18**

Onshore management (P)

Safety Culture Awareness

Asymmetric info
Different interests

Crew, Captain (A)

Safety Culture Awareness

Improved Leadership strategies:

- Monitoring & Control
- Employment contract
- Extrinsic & Intrinsic incentives

- **Mindfulness**
- **Learning culture**
- **Clear communication**
- **HSE focus**
- **Continuous improvement**

Human element / human error 60-90 %

Fatigue;
Stress/Health/Well- being;
Alcohol consumption;
Situation awareness;
Risk awareness;
Knowledge &skills;
Communication difficulties;
Misunderstanding;
Error reporting;
Rules negligence;
Unknown unpredicted

Reasons leading to accidents

Environmental/force Majeure 10%

Economical pressure

Technological 20-10%
-equipment design error

Organizational
- Structure
-company policies
- Work environment
(shifts, rotations, hours)

Cultural differences/language

P R E V E N T

ACCIDENTS

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