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MASTER'S REPORT

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Implementation and Division of Operational Risk in Contracts between a Service Company and Operators – a Case Study

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ABSTRACT

In the recent years in the oil and gas industry, there has been an increased focus on risk management in the wake of accidents and unfortunate events involving material damages and/or personnel injury. The damage potential in the industry is particularly great during offshore operations, but also other stages in field development involve high risk situations which need to be managed and controlled. The stakes are high and the companies performing work in the sector are constantly looking for means of protecting their assets when being exposed to risk.

Offshore projects often demand substantial capital investments, several oil companies in joint ventures and the involvement of numerous service companies, to take the petroleum field from initial discovery to full production. This implies that there is a need for an extensive managing of the existing project interfaces, and to ensure an efficient division of liabilities, responsibilities and risk between the involved companies. The contract agreement between the various parties, with the contracts between the field operator and service companies in the centre of attention, is the foremost and most important tool for declaring the obligations of the parties. As such, it also dictates the risk exposure and the risk division that the respective parties have to relate to.

In this report, two different contracts between a service company ("Service Company") and two of its customers, or field operators ("Company 1" and "Company 2"), will be analysed. The focus will be on how well the contracts implement and divide *operational risk* between the parties. *Operational risk* is understood here as the uncertainty-based risk exposure of an organization or company in its day-to-day activities, as discussed further in the report. The two contracts were chosen from the contract portfolio of the Service Company. Their contents were further analysed and compared with a standardized contract format, namely the NSC 05.

The findings in the analyses suggest that the concept of *operational risk* is not well implemented and shared in the contracts. There is of course an explicitly stated division of liability and responsibility between the parties in the contracts, as one should expect in contracts of this format. However, the lack of an explicit definition and thorough processing of *operational risk* in the provisions of the contracts, render it difficult to say that *operational risk* as a concept is consciously attended to and sufficiently implemented.

It is further recommended, based on this work, to investigate how to best implement *operational risk* in service contracts, to ensure a common understanding of the concept and to aid in an effective management of the risks involved in the contract work.

ABBREVIATIONS AND ACRONYMS

Abbreviations and acronyms used in this report are listed below.

ALARP	As Low As Reasonably Practicable
CAPEX	Capital Expenditure
E&P	Exploration & Production
FMECA	Failure Modes, Effects & Criticality Analysis
GDP	Gross Domestic Product
HAZOP	Hazard And Operability Study
HSE	Health, Safety & Environment
NCS	Norwegian Continental Shelf
NF 07	Norsk Fabrikasjonskontrakt 07 (Norwegian Fabrication Contract 07)
NTK 07	Norsk Totalkontrakt 07 (Norwegian Total Contract 07)
NSC 05	Norwegian Subsea Contract 05
NPD	Norwegian Petroleum Directorate
OPEX	Operating Expenditure
PSA	Petroleum Safety Authority
SWIFT	Structured What-If Technique

TERMINOLOGY

Some of the central terminology used in this report is further described below.

Agent	The party *selling* a service or certain goods in a contractual relationship. Also known as "**contractor**".
ALARP principle	A principle within risk management stating that the risk level should be reduced to a level that is As Low As Reasonably Practicable.
Black swan event	An event, often with major effects, within risk theory that comes as a complete surprise for the affected. Also known as an *unknown unknown*.
Client	The party buying a service or certain goods in a contracting relationship. Also known as the "**principal**" in contract theory.
Company	When written with a capital, *C*, the Company refers to a customer of the Service Company in the contracts analysed in this report. If not, it denotes any company.
Contractor	The party selling a service or certain goods in a contractual relationship. When written with a capital letter, *C*, the Contractor refers to the Service Company in this report.
Field Operator	A company which is responsible for developing and producing petroleum from a reservoir. Often acts as the executive party of a larger *license group*, owning the largest share in a field. Also known as "**operator**".
Principal	The *buyer* of a service or certain goods in a contractual relationship. Also known as "**client**".

Principal-agent problem	Theory within contract management (and in other areas) which states that there are conflicting interests between the principal and agent, due to different motives for going into the contractual relationship.
Service Company	The party *selling* a service or certain goods in a contractual relationship, here, specifically within the oil and gas industry. When written with capital letters, *S* and *C*, the *Service Company*, refers to the actual Service Company in the analyses of this report, otherwise it refers to any service company in the industry.
The Spread	A collective term covering all equipment, consumables, personnel, vessels and barges provided by a service company, or contractor, in connection with the work performed in accordance with a contract.

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PREFACE

This report represents the finishing work of my two-year master's degree programme in industrial economics at the University of Stavanger, where I have specialized in contract administration and risk management. Finding and writing about a topic that embraces both of these fields was a goal for me before starting this work.

Writing a report of this magnitude and delving into such an important contemporary topic, has been a journey that has represented both a major challenge and a great learning opportunity. Through the course of a long education, the most important lesson to be learned appears to be that of our limited knowledge of the phenomena of the Universe. However, each and every day, more light is shed on the parts that, before, were characterized by uncertainty. I am humbly grateful to contribute with my candlelight to this work.

Although this report was written alone, there are a number of people who have helped me along the way and whom deserve credit for their support.

First and foremost, a big thank you to all the people at the Service Company, all of whom have given me guidance and help with getting to where I am, and supported me with this work. For reasons of anonymity, they cannot be divulged here, but I am hopeful that you know who you are.

Also, thank you to my faculty supervisor, professor Petter Osmundsen, for his excellent input and guidance in connection with this work.

Last but not least, thank you to my dear fiancée Martine. I will always cherish your love and support.

Signature:

Svein Arne Amundsen

Stavanger 11th of June, 2015

1. INTRODUCTION

This chapter gives an introduction into the problem formulation of the report and the justification for writing the report. The chapter is divided into several sub-chapters, where the first will be dedicated to background information on the topic of the report. The other sub-chapters highlights information considered to be relevant for the reader in order to obtain a proper perspective on the work behind the report.

1.1 Background

The petroleum industry is a very interesting field of study, as it embraces numerous different disciplines, from advanced technical engineering to intricate business management. It is characterized by capital intensive projects with great significance for both local and national society. In Norway, the petroleum industry employs about 150,000 people, and accounts for 21.5% of the GDP (Ministry of Petroleum and Energy, 2014). The recent fall in the price of Brent crude, where the price fell drastically from US$ 112 (average) in June, 2014, to US$ 48 (average) in January, 2015, has put its toll on the industry, which, just a year ago, was looking to disclaim its outlook as a “sunset” industry in Norway with the discovery of some new exiting prospects in mature areas (Statista, 2015). This, in combination with the increased cost of field development and operation seen in the last decade, will force the industry to turn every stone to change the trend.

In the recent years of petroleum field development, there has been a substantial focus on risk management and compliance with safety standards in the industry (Petroleum Safety Authority Norway, 2014). This development has been driven by an increased awareness of the significance of risk management, and has been further fuelled by the occurrence of tragic events like the Deepwater Horizon accident in the Gulf of Mexico. With international and national legislation as the backdrop, the participants in the industry adhere to industry standards and best practices in the effort to increase the safety level in the industry. There is however difference of opinion of how to achieve this and which methodology to use in the effort. As have been proven time and time again, accidents still occur, although major resources are utilized in increasing the safety level.

The role of operational risk management in securing assets is vital, as the potential for suffering financial and organizational losses is great when dealing with high risk operations involved in offshore field development. The Deepwater Horizon accident manifested the tremendous effects of

such an event, for all concerned parties. While this event was of the extreme type, there are numerous of other occurrences of negative happenings during a contract period, both large and small, that raise the question of where the liability belongs. Most often, the issues of liability are a concern involving the field operator and one or more of the sub-contractors. Widely accepted contract and risk theory prescribe a certain division of these liabilities between the parties, based on different parameters such as the relative sizes of the companies, financial strength, ability to absorb risk, etc. In practice, however, it may not be the case that these theoretical principles are adhered to.

Many different companies contribute with their part in a project, and it has been an increasing trend with outsourcing in the industry in the last decades, where the field operators have been outsourcing more of their former core activities to various service companies (Osmundsen et al., 2010). There is a need for an active coordination effort to ensure compliance with the contractual terms. This puts an emphasis on having a clear division of responsibility between the parties, and to control the so called "grey areas" that one will find in the interfaces of the respective deliveries.

The contract agreement is the single most important measure that regulates the relationship and responsibilities between the contracting parties. As such, it is the leading document for controlling the interfaces that exists in a contractual relation. In this respect, it is of great interest to explore how well operational risk is implemented and shared in the contracts between field operators and service companies.

1.2 Statement of hypothesis

The report is based on the following hypothesis, H_1:

"Operational risk is well implemented and shared between the parties in contracts between the Service Company and its clients."

Given this hypothesis, H_1, the corresponding null hypothesis, H_0, is stated:

"Operational risk is <u>not</u> well implemented and shared between the parties in contracts between the Service Company and its clients".

1.3 Research questions

From the hypotheses stated above, it is evident that there will be difficulties with presenting a satisfyingly clear and objective answer for the hypotheses, as they invite to subjective interpretations of the true meaning of the gradations of "*well implemented"*, and the other element of "*well shared"*. There might also be differences of opinion with regards to the definition of the term *operational risk*, which has to be discussed and clarified in the report.

In order to obtain a satisfying answer and test the validity of the hypotheses stated above, there is a need for a couple of clearly stated research questions, which will be answered in the report. The following questions will aid in clarifying the intent of the hypotheses:

1. What is the understanding of *operational risk*?

2. What is meant by "well implemented and shared"?

1.4 Objective

The objective of this report is to investigate to what degree operational risk is incorporated in contracts between a service company and its clients of petroleum field operators, and to analyse how this risk is divided between the parties. When the division of risk is a concern, it is of interest to find out how the risk is shared and why it is shared in this particular fashion. A selection of two contracts between a contractor, i.e. a service company, and two different petroleum field operator companies will be examined.

1.5 Selection of methods

In order to achieve a satisfactory answer to the hypotheses and fulfilment of the objective stated above, a number of different methods will be utilized. In order to present theory on the topics of contracts and risk, relevant literature will be consulted. The literature is collected both through published books, but also articles, published industry standards and reliable internet sources. For the investigation of the degree of implementation and division of operational risk in the contracts between the Service Company and their clients, a selected amount of contracts will be scrutinized. In

addition to this, personnel involved with contract management at the Service Company will be consulted.

1.6 Scope of the report

The scope of this report is restricted to dealing with the coverage of operational risk in two selected contracts between the Service Company and its clients of field operator companies. It would also be interesting to look into the other types of risk involved and to analyse more contracts, but the limitations in available time and resources would render it difficult. Focusing the report on operational risk will narrow it down to a field within risk management that will keep it interesting, without narrowing it down too much.

1.7 About the author

The following will present relevant information about the author of the report, which will disclose any conflicts of interest and ulterior motives.

1.7.1 Statement of influence

I am employed by the Service Company on a full time basis, and participate in the two-year master's programme of Industrial Economics at the University of Stavanger in my spare time. This may introduce problems related to obtaining a completely unbiased view on the matters at hand. My position within the Service Company is, however, with a different department, and not within the department that forms and manages the contracts being investigated in this report, or any other contracts for that matter. As such, this should provide me with a sufficient amount of objectivity and distance to the case for writing the report.

1.7.2 Author's experience

I have got limited experience with writing case studies, or theses of this magnitude, and no working experience within the fields of contract- or risk management. This may lessen the overall quality of the work.

With regards to insight into the more practical parts of the report, I possess several years of experience from offshore operations, wherein the hands-on focus on risk assessment and risk treatment is used on a daily basis, and before every work task. This may add a valuable dimension to the theory presented in the report.

1.8 About the Service Company

The Service Company is a diversified supplier of equipment and services to the global oil and gas industry, covering a large part of the supply chain in petroleum field development and operations. This includes engineering, production, delivery, and aftermarket services of both upstream and downstream equipment, tools and appliances. The Service Company has got offices, production facilities and workshops in strategic locations all around the globe, and is involved in many projects in different markets.

For reasons of confidentiality and respect of the involved companies' integrity, the identity of the Service Company and its customer relationships will be anonymous in the report.

1.9 Structure of the report

The report is structured on the following basis.

CHAPTER 1 **INTRODUCTION** starts with a presentation of the report, background information and problem formulation. In addition, some information about the Service Company and the author behind the report is included.

CHAPTER 2 **THEORY**, in where relevant contract and risk theory is presented to the reader. The contract theory covers the process from procurement to choosing compensation formats, and the impact this has got on the inherent risk in the contracts. Finally common contract formats in the petroleum industry will be covered. The sub-chapter on risk theory will discuss different perspectives on risk, give some examples of typical risk exposure in the petroleum industry and finally present the concept of operational risk.

CHAPTER 3 **METHOD**, which presents some general theory on research and alternatives for choice of methods, and the reasoning behind the choice of method for the work on this report.

CHAPTER 4 **ANALYSES**, where the analyses of the two contracts are performed and presented. The chapter is further divided into three sub-chapters, one each for the analyses of the contracts and the final one for a comparative analysis of the two contracts.

CHAPTER 5 **DISCUSSION**, in where the findings in the analysis are viewed in light of the hypothesis and the degree of implementation and division of operational risk is presented. The potential weaknesses of the analysis are also highlighted, for the added perspective of the reader.

CHAPTER 6 **CONCLUSION**, which presents the final conclusion of the report and provides suggestions for further studies on the topic.

CHAPTER 7 **REFERENCES**, lists all the references and sources used for collecting the background information for the report.

2. THEORY

In this chapter, an introduction of contract- and risk theory will be presented. The contract theory part will deal with general contract theory, procurement, compensation formats and contract incentives, with a particular focus on the petroleum industry. The sub-chapter on risk theory will be devoted to give an understanding of the term “risk”, which carries a broad base of definitions. Then, some examples of risk exposure in the petroleum industry will be presented. Finally, the concept of operational risk will be processed.

2.1 Contract theory

The field of contract theory is vast and comprised of elements from, but not limited to, judicial-, financial- and organizational theory. This makes the field of study complex and subject to a wide variety of influential aspects. Reflecting on all of these aspects would be outside the scope of this report. Accordingly, this chapter will focus on contracts within the petroleum industry. Contracts are an important measure in regulating the relationship between the trading partners, as they formalize the agreement between the parties and specify the conditions of the contractual relationship. There are usually two main parties to a contract, the principal or client, i.e. the party requesting a certain service, and the agent or contractor, i.e. the party providing that requested service. However, the stakeholders, i.e. the various parties who take interest in the contract, may stretch well beyond the relationship between the client and the contractor. There might be interest from government authorities, afflicted companies in the industry, sub-contractors, employees, unions and other stakeholders in the outcome and formation of the contract. Also, the client and the contractor might not necessarily act on their own, but be part of a joint venture or other types of company cooperatives. This puts an extra emphasis on the process of the formation and management of the contract, and ensuring that this is performed within the boundaries of the ruling laws and regulations. It is a principle in Norwegian law to allow for the contracting parties to formulate the contract as they see fit. However, most contracts follow a certain standard set-up in order to assure predictability and a fair exchange of commerce between the participants in the market.

The following sub-chapters will deal with relevant theory on procurement, which to a great extent lays the foundation of the contractual relationship, then on to theory on different compensation formats, which plays a major part in the risk delegation between the contracting parties. Finally an introduction into contracts within the petroleum industry will be given.

2.1.1. Procurement

The procurement process is simply explained the process of obtaining goods and services from one or several providers. It is initiated from a defined need and supported by a procurement strategy. The overall goal of the procurement process is to obtain high quality goods and services at the lowest price possible, while at the same time, keeping within rules and regulations and assuring a competitive market. This means that there are compromises to be made, and it is essential to keep a high level of efficiency to avoid cost overruns.

The first stage of developing a procurement strategy consists of demand verification, performing relevant analyses and setting a goal for the procurement (Bruvoll, 2014). The demand verification will ensure that the goods or services being procured are actually needed by the procurer, and not just an arbitrary purchase or a need that can be eliminated. At this stage, the level of detail for what needs to be purchased does not have to be too high, as this might put too narrow constraints on the continued process. The essence is in understanding how the need came into existence and how the supplier market can satisfy this need. When performing analyses, the most important gain is to collect valuable information about the supplier market, the associated risks and opportunities with the process, and the main cost drivers of the procurement. Here, risk is to be understood as procurement risk, that is, unpredictable events that may affect the realization of the contract performance (Dimitri et al., 2006). The subject of contract risk will be dealt with in greater detail in the next chapter (see chapter 2.2). The last activity of the first stage is to develop a specification of the delivery and decide which contract model to use. It is important to keep in mind that the level of specification of the delivered product or service will have a great influence on the ability of the contractor to perform in accordance with the contract. In some instances it will be preferable to restrict the creative freedom of the contractor, while in others the opposite might be the case. The level of specification must be decided based on the nature of the delivery (i.e. complexity, cost, strategic importance) the competence of the contractor/ supplier market, the competence of the procurer, past experiences, etc. Over- and under-specification may have adverse effects on the cost of procurement and the cost of performing the contract, and in turn the overall economic results of the project.

The activities described above will serve as the input to the next stage, where the market forces and the strategic importance of the procurement are scrutinized to a greater extent. A much used tool for performing market analyses are Porter's five forces. With this method, the main objective is to evaluate the forces and threats affecting the market or industry where the procurer operates (Bruvoll, 2014). These forces are (see Figure 1 below):

i. Rivalry within the established market

ii. The threat of substitute products or services

iii. The threat of new entrants (i.e. companies entering the market/industry)

iv. Supplier power

v. Customer power

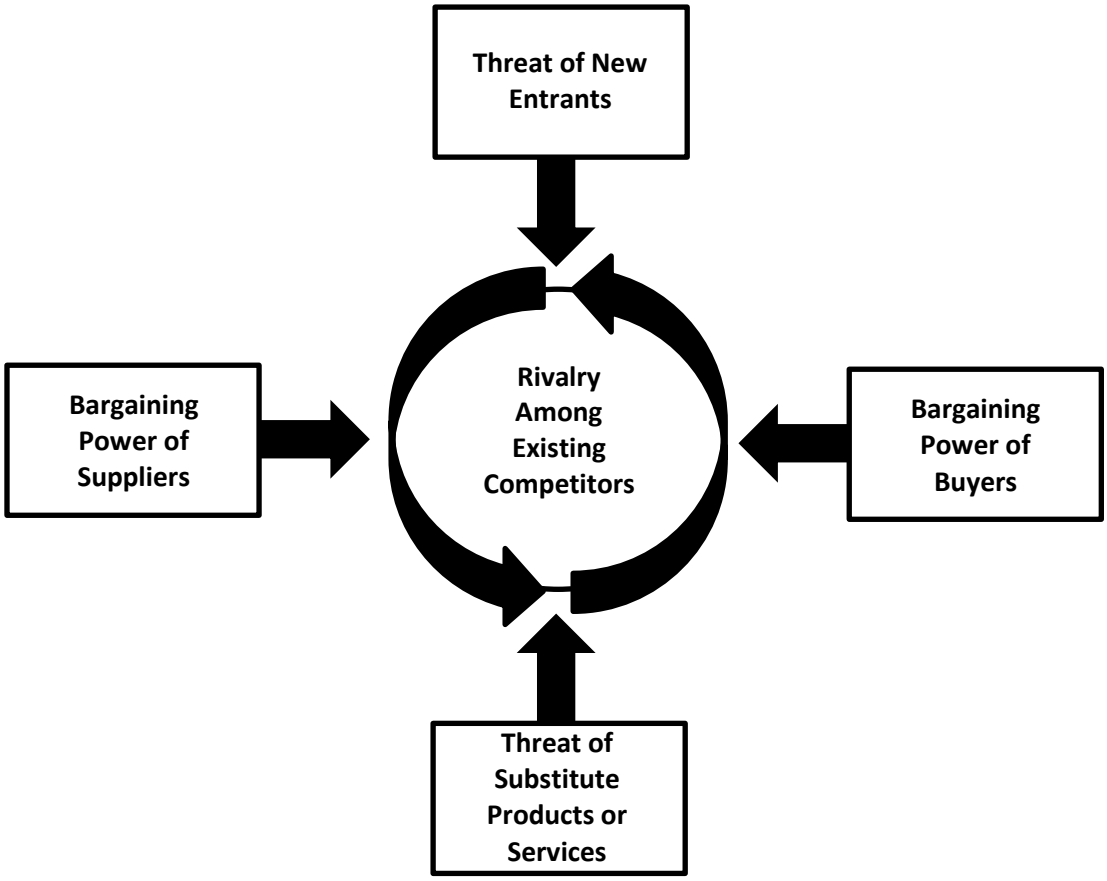


Figure 1: Porter's Five Forces that affect the formation of strategies (Porter, 2008)

A common tool for assessing the strategic importance of the procurement, and how to deal with the suppliers, is Kraljic's portfolio management method (Brynhildsvoll and Abrahamsen, 2002).The method is based on categorizing the procurement along two axes, where the strategic importance of the procurement constitutes one axis, while the complexity, or risk, of the supply constitutes the other axis. This will further assist the procurer in determining a strategic approach to the

procurement. That is, the procurer should trade with its suppliers and the view the procurement differently according to the position along the two axes.

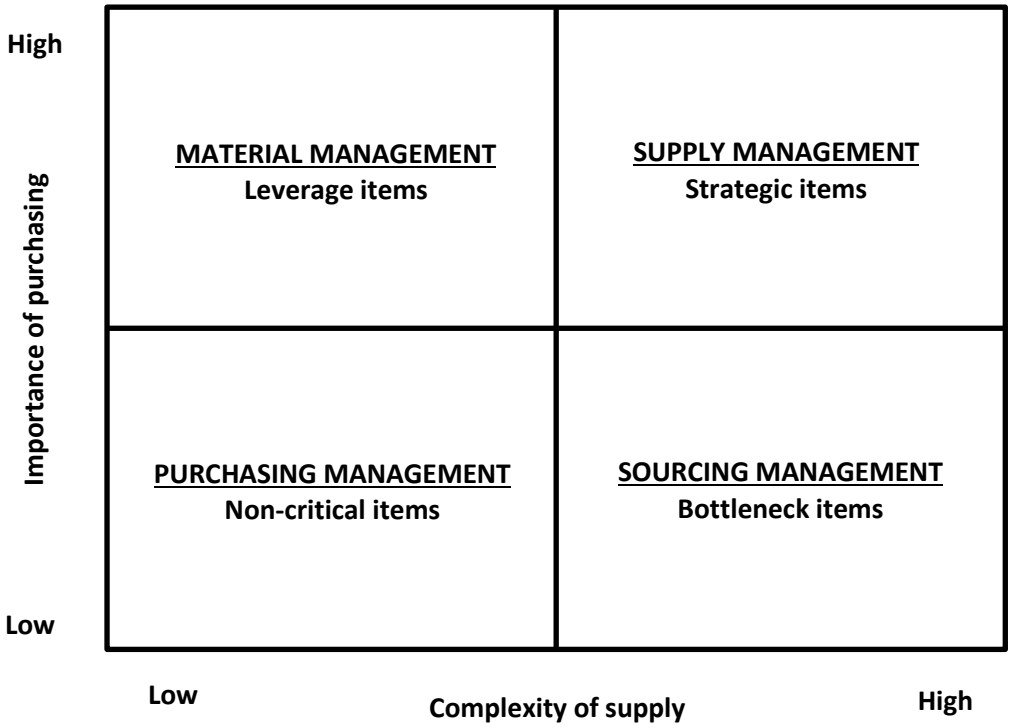


Figure 2: Kraljic's portfolio purchasing model (Bruvoll, 2014)

As seen from Figure 2 above, the items that are non-critical (i.e. low in both complexity of and strategic importance) do not require too much attention, and the best strategy is to press the prices and roam the market for the best deal. The leverage items require some more attention, as they are high in strategic importance, but low in complexity of supply. That implies that the there are plenty of opportunities to obtain the services/ goods in the market, but since the services/goods are of strategic importance to the company, the best purchasing strategy would be to apply buying power and leverage over the suppliers. The strategic items are the ones that are high in both complexity and strategic importance for the company. Here, the best strategy would be a strategic alliance with the supplier, to ensure the stability of supply. Lastly, the bottleneck items are high in complexity of supply, but low in strategic importance. These are services/goods that are rare in the market, and the suppliers might be few in number. Given the low strategic importance of the purchase of these services/ goods, the best strategy would be to secure the supply while actively searching for better options in the market.

The stages described above should serve as the input for identification of the critical factors for the particular procurement. An early identification of the critical factors will contribute to the formation of a strategy that will assist the procurer in navigating in the procurement landscape. Implementation of the procurement strategy within the organization is the final step on the ladder, and one that is often underestimated. Anchoring the strategy and enabling people to work in compliance with the strategy is essential for its fulfilment.

2.1.2. Compensation formats and incentive theory

The choice of compensation format in a contract has an important role in allocating the associated contract risks between the parties. A well prepared remuneration scheme will give incentives for performing in a certain desirable way, and in accordance with the strategy for the project. There are three main categories of contracts, which are tied to different compensation formats (Dimitri et al., 2006):

- Fixed price ("lump sum")
- Cost reimbursement
- Incentive contracts

In addition to these three contract types, a much utilized compensation format is the day rate/ hour rate, where the remuneration is a fixed fee based on days or hours performed in the contract (Osmundsen et al., 2010). In most cases, the compensation format chosen in a contract will carry a varying degree of elements from all the different types, especially as the complexity of the contract or delivery increases.

A contract in which the contractor is remunerated according to an agreed fixed price, will place most of the risk in the hands of the contractor (Dimitri et al., 2006). The contractor will in this case not be awarded any compensation in excess of the agreed lump sum, and will hence carry the risk of any cost overruns in the project. Accordingly, he will also enjoy any cost savings involved. This is a clear advantage for the client, as it removes any uncertainties regarding the cost of the project from their hands. However, there are no obvious incentives for the contractor to focus on the quality of the delivery when being remunerated based on a fixed price. This may especially prove the case where the quality of the delivery is non-verifiable, i.e. where fulfilment of quality standards cannot be

verified objectively by a third party. If the contractor is experiencing negative deviations from the project budget, it is reasonable to assume that the he will try to save on expenditures linked to the cost of quality in the efforts to bring the budget back to balance. This will ultimately lower the quality of the deliverance. The client is then the one who must pay the price for the sub-standard delivery. Another drawback of this compensation format is the lack of flexibility in addressing change orders and variations in the contract deliveries. This may constitute a major cost driver and increase time consumption in projects. A fixed price compensation format is most suitable in contracts where there is little uncertainty associated with the deliverance and the cost of the delivery. It could also be suitable in situations where the client and contractor have a long track-record of past successful exchanges of similar nature. Applying a fixed-price compensation format to a contract that deals with highly complex and costly deliveries, could on this account have adverse effects for both parties.

In cost reimbursement contracts, the contractor is reimbursed for all documented costs associated with the contracted delivery (ibid.). This implies that the contractor is shielded against any cost overruns, as he will enjoy a full remuneration of his expenditures related to the project. The contractor will thus have few incentives for performing cost-reducing activities, and this might serve as a major cost driver in the project. Most often, a ceiling for allowable costs are included in the contract, to ensure that the contractor does not incur any unnecessary costs, which will increase the likelihood of having post contract conflict. A solid contractor that expects to compete for future contracts, and thus have to take care of his reputation, is not likely to abuse the flexibility of the contract format. However, this may not be the case where a contractor is heading for insolvency and ultimately bankruptcy. Cost reimbursable contracts can be thought of as the counterparts of the fixed-price contracts, as they place the risk of budget overruns with the client. The use of this type of compensation format is most suitable in projects where the focus on quality of the delivery trumps the considerations against cost. Since the contractor is reimbursed all associated costs, it is more likely that he will put an extra effort into the quality aspect of the project, as opposed to if he did not see any rewards for such investments. However, the degree of quality is not perfectly correlated against the level of investment in quality measures, as there will always be inefficiencies involved. Also, the contractor may be willing to cut corners and finish the contract early if he is able to go on to the next, more lucrative, future contract. Another situation, in where cost reimbursement may be advantageous, is in projects where there is a great likelihood of experiencing substantial design changes after initiation of the contract activities. Variations and changes in contracts and project scope, especially post contract signing, can be very costly and time consuming. Thus, by eliminating the need for renegotiating the contract, the flexibility of the cost reimbursement contract can aid in minimizing budget and schedule overruns.

While fixed-price contracts and cost reimbursement contracts delegate risk to either the contractor or the client, incentive contracts attempt to provide a more balanced division of contract risk. The size of the remuneration will depend on compliance with a set of pre-determined targets for the contract delivery. The incentives included in the contract can be based on reaching a target cost, or based on key performance indicators (e.g. HSE statistics), quality of deliverance, meeting the schedule, etc. The incentives are most often a measure in a "carrot and stick" policy directed at the contractor. The "carrot" could then include being awarded a share in cost savings, or entitlement to a bonus in the event of a successful delivery according to some pre-set project goals. On the contrary, the "whip" could for example involve fines for schedule overruns (e.g. a fixed fine per day late), a share in cost overruns, a reduction in remuneration due to sub-standard delivered quality, etc. Although it might be tempting to develop a contract that includes many incentives for steering the contractor in the right direction, it is important to consider the transaction costs associated with a complex incentives scheme (ibid.). Controlling the fulfilment of the incentives scheme may be a tedious task for the client, and disagreements between the parties may evolve into an open and damaging conflict. On this account, the design of incentives in a contract must be given careful consideration in forming a contract. The incentives must be measureable, observable by both contracting parties, within the contractor's control sphere and verifiable by third parties outside of the contract agreement (Osmundsen et al., 2010). It is difficult to assign a numerical value to a subjective measure, assuring an objective evaluation of the incentives. Also, in contract agreements, there will most likely be an asymmetric information basis which further hampers the client's ability to control the fulfilment of the contract. The client may not have the time, ability or know-how to verify the degree of compliance with the incentives scheme. Accordingly, incentives must be used with care in contracts.

A much used compensation format in offshore oil service contracts are day rates (ibid.). This involves remuneration based on the number of days of use of a rig, equipment and tools, personnel, etc. As such, this type of compensation format resembles a format somewhere between the cost-reimbursement format and the incentives format described above. The remuneration is fixed on an agreed day-rate, where the actual number of days will vary around a target date or within a set contract period. The incentive element in this compensation format is based on varying the day rate. It is common to differentiate the rate according to operational status, i.e. the day rate will vary depending on whether the rig/equipment/personnel are in modes of active operation, maintenance, stand-by, etc. The day rate could, for example, be divided into (Osmundsen et al., 2005):

- *Operating day rate per day (OR);*

- *Stand-by rate per day = OR x 0.90;*
- *Moving rate per day = OR x 0.80;*
- *Suspension rate per day = OR x 0.5;*
- *Lay-up rate per day = OR x 0.5;*
- *Re-drilling rate per day = OR x 0.25;*
- *No payment rate.*

Altering the day rate compensation according to operational status gives the contractor incentives for keeping the rig/equipment in the operational status that provides the highest possible compensation. Intuitively, this should increase the efficiency in the project by giving the contractor incentives for keeping his rig/equipment in the highest operational state and thereby reach the target of the project. This might however carry negative effects, as the contractor then is more tempted to focus on short term gains, and neglect necessary maintenance, at the expense of more favourable long-term benefits. Such short-term focus may not only prove to be adverse for the contractor, but also for the client, as the risk of failure in the future is increased. Also, designing an incentives scheme that places the risk at the party who is the best suited at controlling the risk, might prove challenging as the risk control interfaces often overlap. In oil service contracts, the projects are most often a collaborative effort between many different service companies offering complementary services in the aid of the overall project (Osmundsen et al., 2010). The drilling of a well, for example, involves the contribution of multiple service companies providing drilling equipment, well logging, completion equipment, logistics, cement, etc. It is given that all of these different service companies have limited control over the overall progress of the drilling program. Hence, an incentive based on the overall target success of the well will not be effective if implemented in contracts for the service companies (ibid.).

As mentioned initially in this sub-chapter, the compensation format in a contract, in addition to the chosen incentive scheme, plays an important role in the division of risk between the contracting parties. However, the considerations on risk sharing in contracts based on the introduction of incentives, present a possible conflict of interest that should be commented on (Osmundsen, 1999). By implementing incentives in a contract, the aim is introduce measures to decrease the impact of the “principal-agent problem”, by shifting some of the risks involved over to the agent to increase

effectiveness, decrease costs, etc. However, most risk theory prescribes that the party that is better suited at absorbing the risk, should be the one exposed to the risk. Usually, this would be the principal (field operator), whom has got a better ability than the agent (service company) to spread the risk through, for example, portfolio management, joint ventures and financial solidity (ibid.).

A simple example of the "principal-agent problem" is the role of a car salesman (agent) and the owner of the car dealership (principal) (Osmundsen, 2015). The car salesman wants to earn as much money for as little effort/work as possible, while the owner of the car dealership wants to sell as many cars as possible for as little man-hours (i.e. wage costs) spent as possible. If the car salesman is paid a fixed wage, he will most likely not bother too much about making an extra car sale, as it does not affect his pay. On the other hand, if his fixed pay is low and he is offered an additional bonus based on the number of cars he sells, he will have incentives for working hard to selling the extra amount of cars. This way, the interests of the car salesman and the owner of the dealership are more aligned. However, with the introduction of a wage based on bonuses, the car salesman is now more exposed to risk than with a fixed wage. Some of these risks, such as market decrease or collapse, increased competition from other car dealerships, etc., are outside of the control sphere of the salesman. In addition, there exists an asymmetry of information. The car salesman possesses valuable knowledge and know-how of selling a car, while he might not see the bigger picture and the larger movements in the market. A couple of questions arise from this:

- Who is the most suited party for carrying this risk?
- Who possesses the best ability of mitigating the risks involved?

The answer to this is not perfectly clear, but it should be noted that most risk theory prescribes that the party that is best suited at absorbing the risk should be the one to carry it, as also stated above. From this, it is evident that the introduction of incentives in a contract does not come without also introducing potential pitfalls.

2.1.3. Contracts in the petroleum industry

Contracts in the petroleum industry are often concerning major projects, with high capital expenditures and risk. As the industry is moving towards more challenging production areas, through deeper waters, harsher climates and more complex wells, the technological frontier is expanding further than ever before. As the type of deliveries and manufactured equipment increase in

complexity, there is an extra emphasis on preparing solid contracts, with a fair risk sharing and clear division of the responsibilities between the involved parties. When new technologies are implemented, there are always inherent uncertainties involved, increasing the risk exposure. At the same time, as the cost component of investments and operations has increased substantially through the last decades on the NCS (Norwegian Petroleum Directorate, 2014), there has been a focus on standardization of equipment and project processes. An example of this is the so-called fast-track approach for marginal subsea fields, i.e. small subsea fields. The contribution from marginal fields is considered to be important for maintaining the production output from the NCS (Statoil, 2015a). The aim of the fast-track philosophy is to cut the lead time from discovery to start-up of production from the fields, in addition to standardizing processes and utilizing best-practices from previous field developments to reduce the necessary investment costs. Standardization and new technology development have traditionally not been considered to complement each other, especially within project management theory (Gardiner, 2005). However, with improved project processes and sound contract management, it is possible to extract the best of both worlds. The cost dimension, in addition to handling the risks involved with the implementation of new technology, will stress the need for having proper contracts between the parties.

There has been a trend in the industry where the oil companies have outsourced more and more of the work associated with developing the fields, which has increased the need for extensive contract management and handling the interfaces between the companies and the sub-contractors (Osmundsen et al., 2005). This has been a major driver for the growth of the oil service companies, who provide services such as drilling, well completions, logging operations, wireline operations, subsea operations, and other related services for field development. The growth of the oil service companies, in combination with the introduction of smaller E&P companies, have to some degree shifted the balance between the oil companies and service companies. The big oil service companies in the industry have expanded their range of services to be able to contribute in a larger part of the supply chain. It has become more usual for the bigger service companies to offer so-called engineering, procurement, construction and installation (EPCI) projects which really involves a full scale of services (Kaasen, 2006). This has also lead to a shift in how the oil companies and service companies interact with each other. There are now examples of oil companies utilizing the “know-how” of the service companies in extracting valuable information from the reservoirs, as opposed to previous common practice, where the oil companies possessed most of this knowledge themselves. Examples of partnerships where the risks, including the possible gains, in trying out new technologies have been shared between an oil company and a service company have also occurred. See (McInnch et al., 2002) for more about such a case.

In practice, the contracting parties can choose to form the contracts between them however they see fit, choosing different contract formats and conditions depending on the complexity and impact of the project to be undertaken. The common practice on the NCS is however to utilize contracts with standardized conditions, such as the Norwegian Fabrication Contract 07 (NF 07 or "Norsk Fabrikasjonskontrakt 07"), Norwegian Total Contract 07 (NTK 07 or "Norsk Totalkontrakt 07") and the Norwegian Subsea Contract 05 (NSC 05) (Kaasen, 2006). The standard conditions of contract are then usually supplemented by more project-specific terms and conditions in various exhibits.

The NSC 05 is especially formed for the purpose of contracts regarding construction and installation of subsea equipment from floating vessels. There are obvious advantages with having standardized terms and conditions in contracts. One of the main advantages is that the foundation in the contract is already in place and that there is little time spent in negotiating on the basics of the contract. Another advantage is how the standardized conditions give predictable and equal terms for all providers, large and small.

The conditions in the standardized contracts of NF 07 and NTK 07, mentioned above, was worked out in a joint effort between the operators Statoil ASA and Norsk Hydro ASA (today a part of Statoil ASA) on the one side, and the employers' organization Teknologibedriftenes Landsforening, now Norsk Industri (Norwegian Industry) on the other. The formation of the standardized contracts of today is part of a work that began already in the 1970s, when large foreign oil companies constituted the majority of operators on the fields of the NCS. At this time the Norwegian petroleum industry, including the sub-contractors, was generally underdeveloped. The oil companies brought with them terms and conditions used in contracts in their other international activities, which were considered unusual, and to some extent unfair, in the eyes of the Norwegian sub-contractors (ibid.). This initiated a need for negotiations between the operators and contractors for drawing up a standardized set of contracts, more suitable for the Norwegian conditions and in coherence with Norwegian law.

The NSC 05, on the other hand, was formed through negotiations between the Norwegian operator, Statoil ASA, on the one side, and the subsea contractors Stolt Offshore (now Acergy), Subsea 7 and Technip Offshore Norge, on the other side (Norsk Olje & Gass, 2005). The NSC 05 is built on much of the same foundation as of that for the NF 07 and NTK 07, but it is adjusted to account for some of the more special features of projects in the subsea environment. Such features include articles regarding downtime due to unfavourable weather, conditions of the soil and seabed, "the Spread", the effect a variation to the work will have on the contractors other contractual obligations, i.e.

regarding other contracts than the one in question, and more detailed terms about cancellation fees in relation to time to mobilization (Kaasen, 2006). “The Spread” is a term covering all the installation vessels and barges, equipment, personnel and consumables provided by the contractor during the performance of the work. The NSC 05 covers both contracts concerning “installation only” and EPCI-type contracts, and the associated risks involved with such subsea projects (Norsk Olje & Gass, 2005). As such its contents are highly relevant for this report.

The articles in the NCS 05 cover the conditions of contract. Article 2 specifies the various exhibits, or project-specific contents, that are a part of the contract. These exhibits are (ibid.):

A. Scope of work

B. Compensation format

C. Contract schedule

D. Administration requirements

E. Company’s documents (specifications)

F. Company’s deliverables

G. Company’s insurances

H. Subcontractors

I. Contractor’s specification

J. Standard forms of guarantees

It is in these exhibits that the contracting parties can form the distinctive terms and conditions relevant for the specific work to be undertaken. The terms of the conditions of contract are general, and merely provide guidance and leeway for the parties to perform further specifications in the exhibits, which otherwise could not be stated in the standard conditions of contract. The contents of the exhibits are often obtained from the tender documents prepared by the Company and the tender prepared by the Contractor. Although the contents of the exhibits are not standardized, such as the *conditions of contract*, a certain re-use of terms in the exhibits has been observed, much due to the

similarities between the field operators, and that the projects to a large degree utilize the same contract administrators (Kaasen, 2006). The articles in the conditions of contract often refer to exhibits, such as Article 7 Subcontractors, which refers to Exhibit H Subcontractors. However, according to Article 2.3, in the event of conflict between the provisions of the contract documents, the conditions of contract shall be given priority above that of the exhibits (Norsk Olje & Gass, 2005).

2.2 Risk theory

This sub-chapter will present relevant risk theory and seek to clarify the nomenclatures given within the field. Risk as a concept is something everyone can relate to, and is ever present in all our dealings, from trivial day-to-day activities to highly complex projects. It is however associated with multiple interpretations of its exact meaning, where a broad base of definitions form the backdrop. In an industry where the standardization of both tool and terminology is highly revered, it is of importance to reach somewhat of a consensus of how to understand the term *risk*. An introduction to the concept of risk will be given in this sub-chapter, in addition to presenting examples of some of the many risks that are present in the petroleum industry. Finally, the field of *operational risk* will be treated.

2.2.1 Introduction to the concept of risk

The concept of *risk* most commonly involves the notion of risk being the product of a probability, or likelihood, and the associated consequences of the occurrence of some future event. The probability is derived from past experience and the collection of data from similar phenomena, and the consequences are constituted from an analysis of the event itself and the likely aftermath of the event. It is common to assign numerical values and probability distributions to the probabilities and consequences of the events when calculating the level of risk. This numerical value of the risk level one is faced with often constitutes an important part of the decision-making when planning projects, forming strategies, performing sourcing, etc. Such a numerical value is used to present the risk level of an activity in a way that shows the relative risk of performing the activity, as compared to other alternative options. This also gives the impression of risk as being of an objective nature, which can be proven to be a gross misconception of the true meaning of the term. It is a view by some risk management professionals that risk can be described by means of objective terms. See for example the article “Why COSO is flawed” (Samad-Khan, 2005), where the author claims the only true way of

handling risk, is by basing risk assessment on analysis of historical data and presenting the conclusions as objective numbers.

There are, however, other risk management professionals who question the existence of such objective risk interpretations. In fact, there are very few presentations of risk stemming from risk analysis that can be characterized as being objective in the sense that (Aven, 2010):

i. The outcome exists independently of the assessors, or

ii. There is a consensus among all stakeholders about the outcome of the analysis

The first condition can surely be met when assessing non-complex events with a low level of uncertainty, here meaning that the consequential aspect is fully known for the assessor. For instance, the toss of a dice is clearly independent of the assessor. However, the second condition is not as easily fulfilled. The rationale behind this claim is evident when one considers risk perception and risk attitude. Risk perception can be thought of as the subjective view of an individual, group or community towards risk. This valuation of risk and risk level is believed to be generated through personal belief or collective communal experience and cultural traditions (ibid.). When assessing risk and determining risk levels when faced with important decision-making, it is of the essence to take into account the perception of risk of those affected by the decision and by those who are responsible of making the decision, as this will most likely ease the implementation of the decision later on in the process. The attitude towards risk by those involved in the risk analysis process is also something that needs to be considered when evaluating the objectivity of the work performed and the results obtained. Risk attitude describes the individual's or group's natural approach to situations or events characterized by uncertain outcomes. An individual's or group's risk attitude is usually separated into three different characterisations (Ross et al., 2011) :

- *Risk averse* – takes a careful approach in uncertain situations and will chose a certain outcome over an uncertain one if found more favourable.

- *Risk neutral* – does not carry any preference and would be just as happy with taking the bet as by choosing the safer option.

- *Risk seeking* – prefers the uncertain outcome over the certain one if there are opportunities of higher gains by taking on the gamble.

A simple example will clarify the differences between the three. You are faced with a choice where there are two alternatives, the first being guaranteed a certain amount of money, say $500, and the second, taking on a gamble where there is a 50% chance of winning $1000 and 50% chance of winning nothing (e.g. by means of a coin toss). The risk-averse person would prefer the first alternative and receive the guaranteed money, as he would dislike being exposed to the risk of winning nothing. The risk-neutral person could choose either alternative, as he would see benefits from both options. The risk-seeking person, however, would go for the alternative where there is an opportunity of a higher price, regardless of the uncertainty involved. Thus, he would most likely go for the second alternative.

Risk and uncertainty are terms that are often considered to be synonyms and used to describe the same phenomena, especially in financial contexts (Aven, 2010). The degree of uncertainty is then reflected around an expected value, derived from probability calculations. However, risk captures a wider dimension than uncertainty, in that uncertainty is more of an element within a risk description, rather than the other way around. On this account, one should tread carefully when choosing terminology. Uncertainty is more related to the variance of a probability, or expected value, and the variance in a population of consequences, whereas risk also takes into account the severity of the consequential aspects (ibid.). As an example, consider the number of fatalities from car accidents in a year. This number is relatively stable from one year to the next, and can be predicted with a relatively high confidence, i.e. the variance and hence uncertainty would be low. There is a great amount of data available, making the statistical interpretations very solid. One would however not deem the risks of driving a car as negligible, as the consequences may be severe. This example shows how the uncertainty associated with a phenomenon can be low, while at the same time having a high risk.

It is acknowledged that risk is something that cannot be totally eliminated, but is something that needs to be controlled and managed (Aven and Vinnem, 2007). Risk is an intrinsic part of all aspects of our actions, and it would thus be practically impossible to design a risk management scheme that leaves no uncertainties of what the future will bring. It is also important to point out that risk is not only connected to the adverse consequences of events, but also the positive opportunities that lie within the uncertain outcome of the same events. After all, undertaking a project also involves reaping the benefits of higher than expected profits. Risk management is a collective term used to describe the measures and activities performed by an organization to control risk. To obtain a more effective treatment of risk within an organization, it is common to distinguish between three different types of risk, that is (Aven, 2008):

- *Strategic risk* – related to factors that are important to an organization's long-term strategy

- *Financial risk* – such as market risk, credit risk and liquidity risk, or risk that is outside of the control sphere of the organization

- *Operational risk* – or risk connected to the organization's normal conduction of activities.

To further understand the risks involved with an operation, it is common to perform a risk analysis. A risk analysis is a process that is integral in the risk management efforts and decision-making situations. In this process, the main objective is to obtain high-quality information about the situation in question, map the associated uncertainties and present the findings in an understandable way to the stakeholders. It is a three-stage process that consists of the following main elements (ibid.):

1. *Planning*

2. *Risk assessment*

3. *Risk treatment*

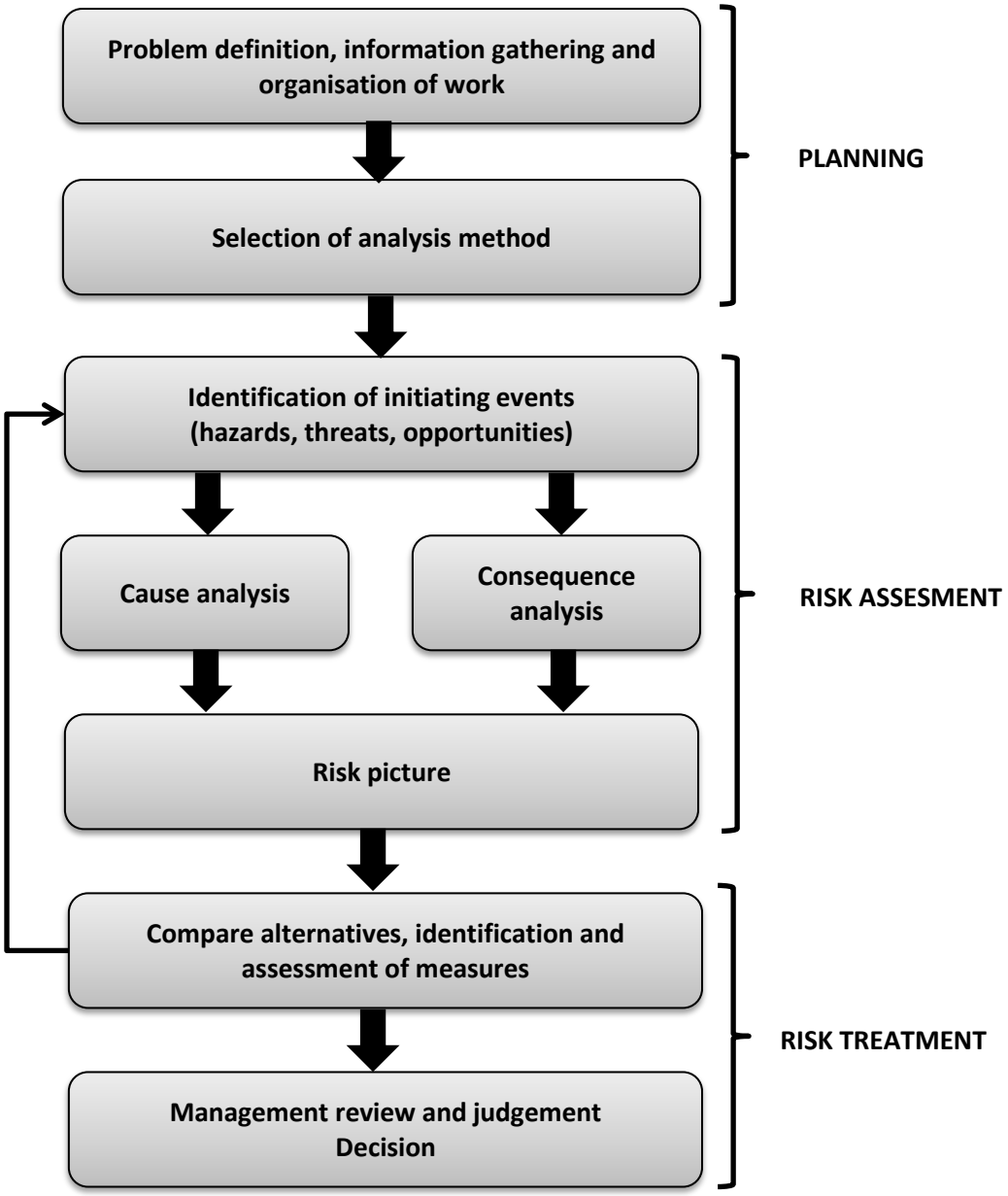


Figure 3: The risk analysis process (Aven, 2008)

As seen from **Error! Reference source not found.** above, the first step in performing a risk analysis is a problem formulation, where the reason for conducting the analysis is described. It involves the gathering of a working group, with knowledge of both the system to be analysed, and also professionals with experience within analysis techniques. A plan is drawn up, where the responsibilities, scope, time limits, milestones and the budget of the analysis is stated. An important activity in this step is the gathering of information about the system to be analysed, and also a presentation of the boundaries of the analysis, and where it is suitable for application. An analysis concerning one situation may not be relevant for the next. It is recommended to identify the

stakeholders at an early stage of the analysis, and the planning process stands out as a good time to do this.

The selection of a suitable analysis method is also a vital part of the planning process. Different systems and problems are not necessarily analysed and solved by the same methodology. In general, there are two main approaches when choosing the appropriate method, that is, *the forward* and the *backward approach* (ibid.). In the forward approach, the risk analysis follows a chronological path, where the initiating events are identified before the consequences are analysed. For example, when analysing a car as our system, we begin by looking at the initiating events, e.g. rupture in the brake fluid hose, and thereafter analyse the possible consequences of this, e.g. loss of brake capacity. In the backward approach, the analysis follows a retrospective path where the consequences are identified before the initiating events. In the example with the car, this would mean moving from identifying *loss of brake capacity* as the consequence, and then analysing this and finding *brake hose rupture* as one initiating event that could lead to this. The forward approach is generally considered to be more time- and resource demanding than the backward approach, as it generates more details. Several initiating events may share the same consequence, e.g. the initiating event of *worn brake pads* shares the consequence of *loss of brake capacity* with the initiating event of *rupture in brake fluid hose*. Thus, moving in a retrospective path as in the backward approach may be more convenient for an overall general analysis of a system. It is important to keep in mind that an extensive amount of detail included in the analysis may hamper the ability of the reader to extract the important points of the analysis.

The second step in performing a risk analysis is the activities included in the risk assessment (Aven, 2008). The first activity is identifying the initiating events of unwanted incidents associated with the system or situation the analysis is focused on. The inputs for this identification work may be past experience with similar situations, extraction of data from databases, use of inspections and assumptions, etc. Common techniques for identifying initiating events are HAZOP (Hazards and Operability study), SWIFT (Structured What-If Technique), FMECA (Failure Mode, Effect and Criticality Analysis), Bayesian networks and others. It is worth to note that these methods have different quantitative and qualitative properties, and that they are often complementary to each other. Therefore, when performing analyses on complex systems, it may be beneficial to use two or more of these methods for extracting different pieces of information concerning the system. Following the identification of the initiating events, the next activities are cause and consequence analyses. In the cause analysis the various conditions for the occurrence of the initiating event are identified, while the consequence analysis looks at the possible aftermath of each initiating event. A helpful tool for

presenting the results from these analyses is the bow-tie diagram (see Figure 4 for an example). This is a good representation which shows the causal links between the cause and the effect of an event. The bow-tie diagram is also widely used in the petroleum industry, with its widespread focus on barrier-thinking in accident prevention.

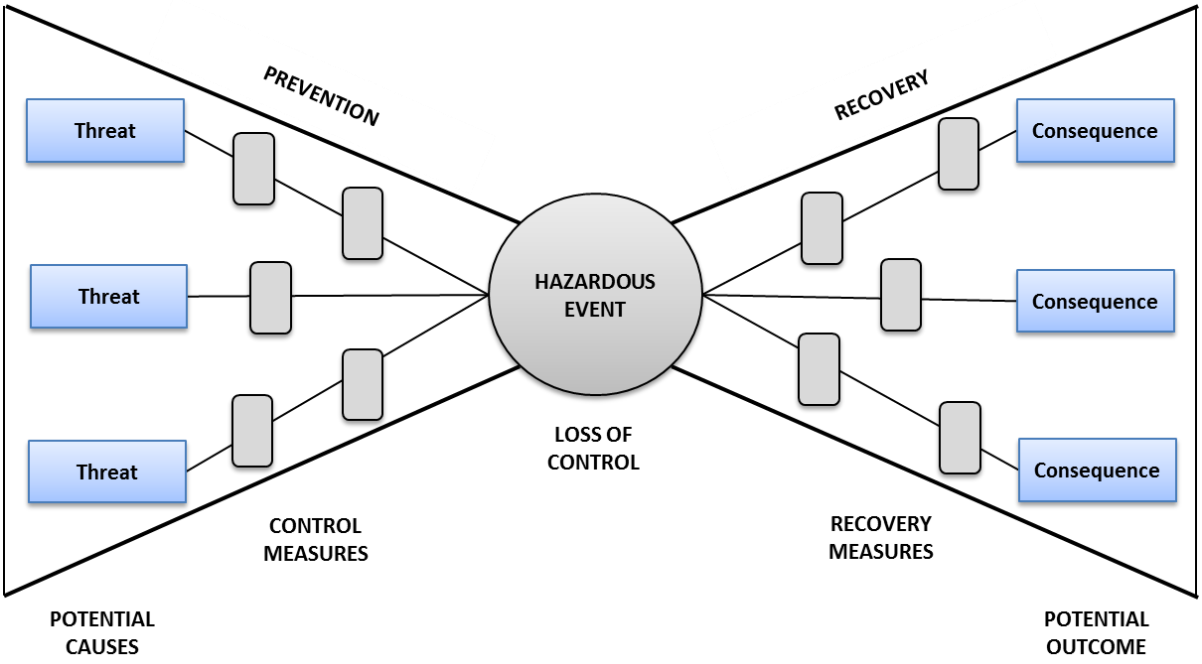


Figure 4: Representation of a bow-tie diagram (ERM Americas Risk Practice, 2014)

The final activity in the risk assessment is the presentation of the risk level through a risk picture, which is based on the previous activities of identifying possible events, their causes and consequences. The risk picture covers all relevant aspects of the risks involved, such as (Aven, 2008):

- Expected values, or predictions, of relevant values connected to the event (e.g. cost or fatalities)
- The associated uncertainties with both the occurrence of the event itself and the consequences the event will generate.
- Probability distributions of the events and outcomes, showing the variance around the expected values.

Using a risk matrix with probability and consequences along the axes, will on a general basis be a good picture of the risks associated with the different identified events. See Figure 5 below for a representation of a typical risk matrix. Often, the matrix is sub-divided into three different zones characterized by different colours, such as green for acceptable risk, orange for risks that should be reduced to as low as reasonably possible (by means of the ALARP-principle) and red for risks that are unacceptable. The distributions of the different colours, i.e. the respective areas they occupy in the matrix, are for example based on risk tolerance, company-internal requirements or government regulations/ requirements. However, a risk matrix is merely a glance at the various risk exposures, and it does not give insight into the background knowledge that constitutes the foundation of the probability distributions. Important information may be hidden behind the colours of the matrix. On this account, the risk matrix should never be presented without also presenting the background information behind the results of the analysis.

CONSEQUENCES / PROBABILITY	Insigni-ficant	Small (non-serious injuries)	Moderate (serious injuries)	Large (serious fatalities, 1-2 fatalities)	Very large (<2 fatalities)
Highly probable (<1 year)					
Probable (1-10 years)					
Low probability (10-50 years)					
Unlikely (50 years or more)					

Figure 5: Example of a typical risk matrix (Aven, 2008)

The final step in the risk analysis process is the risk treatment, that is, the tools and processes used in modifying the risks, comparing alternatives and the management review and judgement (ibid.). When comparing the different alternatives, useful tools are cost-benefit analyses and cost-effectiveness analyses, which compares the cost of modifying a risk with the effect it will have on

reducing the risk exposure. Most risks can be reduced or even eliminated given the right amount of resources, but the cost of doing so may not be possible to pay for the concerned party. Another point here is the difficulty one may encounter in determining the cost of a risk reducing measure. When implementing a risk reduction measure, the effect will not be manifested immediately, but rather in the near or distant future. Estimating the future value of present investments is not an easy task, and the uncertainties will grow ever larger as the time frame is extended. It may also be challenging to assign monetary values to qualitative aspects, e.g. the improved working atmosphere when implementing noise reduction efforts at a workplace. Finally, the work performed in the previous stages of the analysis will be taken into consideration in a management review and used as input in the decision-making. Here, as elsewhere in handling risk, it is important to emphasize that the decision-making should not be an automatic exercise (Ibid.). The risk analysis should not be reduced to a number crunching event, where data is used as input, and a number presenting the risk level of the activities is presented as the output, readily served for the executives to make the final decision. The management needs to take ownership of the risk analysis process and base their decision-making on the whole picture, not just the summary.

When it comes to concluding with a definition of the term *risk*, there has not yet been reached a proper consensus among the professionals and organizations dealing with risk management. According to the ISO 31000:2009 standard for risk management, the definition of risk is (Purdy, 2010):

"[The] effect of uncertainty on objectives."

This definition is very general and open, and may include both positive and negative outcomes of risk. However, as stated above, risk captures a wider phenomenon than that covered by uncertainty. Uncertainty is a key element within risk, but risk is also so much more than uncertainty. A definition which covers most of important aspects of risk is the following (Aven, 2008):

"Risk is equal to the two-dimensional combination of events/consequences and associated uncertainties."

A refinement of this definition follows in Aven's Misconceptions of Risk (Aven, 2010):

"By risk we understand the two-dimensional combination of

i. events A and the consequences of these events C, and

ii. the associated uncertainties U (whether A will occur and what value C will take)."

This definition captures the essentials of risk, in that it represents the following important attributes of risk (ibid.):

- It represents both desirable and undesirable outcomes.
- It handles uncertainties and not mere probabilities and expected values
- It does not attempt to quantify risk and consequences of events

On this account, the definition stated above will be used as how the author understands the term *risk* throughout the report.

2.2.2 Risk in the petroleum industry

The petroleum industry is characterized by high risk offshore operations and large projects with substantial CAPEX and OPEX. Since its early days in the 20th century, the industry has evolved from drilling wells and producing oil and gas from relatively easy accessible fields onshore, to highly complex deepwater drilling and production offshore. In the search for sustained production outputs, the industry is moving towards harsher environments and pushing the boundaries for the existing technology. Parallel to this development, society has become ever more dependent on fossil fuels, driven by an increased standard of living and the industrialization of populous countries such as India and China. Large projects in the petroleum industry often carry substantial significance for national interests, not only due to the importance of securing and extracting energy sources, but also due to the great impact the projects can have on the national economy. This fact has put an additional emphasis on the conduction of safe operations through an increased awareness on risk management.

The risks and uncertainties associated with the petroleum industry are not only restricted to the time before the field is in production, but are present in all aspects of the life of the field, from geological surveys and exploration drilling, to production, intervention operations and finally plugging the wells and abandoning the field. Ideally, the contracts regulating the work performed during the lifespan of a field should be able to treat all possible events and ensure a fair division of the responsibility and risk involved. In practice, however, this would prove to be an impossible task as that would require

contracts with a stupendous amount of detail. Also, the future is difficult to predict, and there will always be a risk of having so-called “black swan” events.

The following are some examples of the typical risks the operators and service companies are exposed to. The list is by no means exhaustive, as it is beyond the scope of this report to go into such detail. It is however important to get an understanding of some of the various aspects of risk that characterize the industry, and form the backdrop when incorporating risk division in the service contracts.

2.2.2.1 Risk in exploration and production

When an exploration- and production (E&P) company sets out to explore for petroleum reservoirs, they embark on a journey filled with uncertainty. Exploration demands the access to areas of interest, usually granted the companies through a licensing round (Statoil, 2015b). Being in a position to obtain a license for E&P is vital for a company. Often the petroleum fields are shared between several different companies in a license group. This implies that the obligations, expenditures and income derived from the activities in E&P from the field are shared between the participants of the licence group. Risk sharing in such a fashion is a door opener for smaller E&P companies, whom would otherwise struggle to obtain the financing required for developing the field. It also acts as a facilitator for a portfolio strategy, wherein the licensees can be partially involved in various different fields and thereby spread their risk exposure. In addition, it allows the companies to position themselves in strategic moves towards increased knowledge on certain types of fields, e.g. deepwater fields, by enabling them a buy-in without having to carry the full investment.

The potential for hydrocarbon contents and the reservoir characteristics, i.e. the geological properties of the reservoir such as the porosity (volume between sand grains – space for oil) and permeability (the conduit between the pores in the reservoir stone), is the typical centre of the risk assessments performed by the E&P companies (Allan, 2014). The rationale behind this is fairly easy to understand when looking at all the uncertainty involved in the stages from obtaining a license until a field is in full production. When a discovery is made through a geological survey (collection and interpretation of seismic data), there are large uncertainties associated with both the size and the contents of the reservoir. The next steps for proving the discovery is by hiring a drilling unit, such as a drilling rig or drill ship, and perform drilling down to the assumed petroleum reservoir. Drilling down to the reservoir is the only reliable mean of proving the contents of the reservoir, as the maps

obtained from the seismic survey will only present an interpretable image of the underground formation and the existence of an oil trap, or reservoir play. Once the reservoir is confirmed to contain oil, gas, condensate or other commercially valuable resources, further wells, so-called appraisal wells, need to be drilled in order to determine the extent of the reservoir. Before this, there is no certain way of estimating the real volumes of the reservoir. The uncertainties associated with hiring and operating a drilling rig for the period of developing the field, will also expose the operator and license group to risk. In times when the rig market is tight, i.e. the availability of rigs are low, the rig owners can negotiate good terms for both rates and how much incentives for risk exposure they will accept in the contract, which of course leads to a negative exposure on behalf of the operator and the licence group. Unavailability of rigs, and especially rigs capable of operating in deeper waters, has been considered to be a great bottleneck in the further exploration of the NCS. This has driven the rig hire rates to record high levels, and has in combination with a lower level of efficiency lead to a substantially high cost level for drilling on the NCS. See (Osmundsen et al., 2008) and (Osmundsen et al., 2005) for further discussions on this issue.

Another factor introducing uncertainty in this estimate is the amount of recoverable oil or gas from the reservoir. No reservoir will have a perfect (100%) drainage, and there will always be residue amounts of oil and gas left behind due to the fluid dynamic properties between the reservoir rock and the produced liquid (Norwegian Petroleum Directorate, 2009). In fact, the average recovery rate on the NCS is around 46 percent, ranging from 20 percent to 60 percent depending on the type of field (higher recovery rates from wells on fixed platforms than for subsea fields), reservoir characteristics (porosity and permeability) and liquid characteristics (heavy oil, light oil, gas, condensate etc.) (Norsk Olje og Gass, 2012). Increased recovery rates from the fields on the NCS is a major focus for both the Norwegian government and the field operators, as the use of existing infrastructure to produce greater amounts from the reservoirs will generate billions in additional revenue. However, the uncertainty associated with the estimates of the amount of recoverable reserves, provides the licensees with difficulties in estimating how much potential value they can actually realize from the field.

The oil price is also a large contributor of uncertainty, and a direct element in the income from the produced resources. Historically the oil price has fluctuated in accordance with supply and demand, but isolated events like war outbreaks and economic recessions, have also contributed to the rise and fall of the oil price (WTRG Economics, 2011). The oil companies will usually have difficulties with insuring themselves from fluctuations in the oil price, and it is a risk that is outside of their control sphere.

2.2.2.2 Blow-out

A blow-out is an event where there is an uncontrolled flow of reservoir fluids into the well. A blow-out may be both underground and over ground, i.e. where the well fluids reach the surface (Schlumberger, 2015). Once on the surface, there is a large risk of ignition of the gases erupting from the well, with a resulting explosion and fire. A major surface blow-out is by far the most devastating event that can take place during offshore drilling. It is an event where the consequences are enormous, ranging from massive material damages, injuries and loss of lives, environmental damages and financial impacts. The Deepwater Horizon accident in the Gulf of Mexico in 2010 is a reminder of these mentioned effects. As a singular event, a blow-out stands out as the biggest threat to offshore well operations, and the companies and personnel involved in the operation. Accordingly, the drilling and production procedures, and safety regime offshore, are primarily formed in the purpose of keeping control of the well, and secondarily reduce the consequences if the well control is lost.

The oil industry in Norway is working in accordance with a double barrier philosophy. This means that there should be a minimum of two barriers against the uncontrolled flow of reservoir fluids (i.e. oil and gas) at all times when performing drilling, well completions, interventions in the well (e.g. maintenance and repair in the well) or when abandoning the well (Norsk Olje og Gass, 2008). Although the consequential aspects of the occurrence of a blow-out are severe, and hence leading to an increase in the overall risk level of performing well operations, the likelihood of experiencing a blow-out is not very high (International Association of Oil and Gas Producers, 2010). However, this likelihood is rested on the foundation of the barrier system in place for keeping the well integrity. This barrier system is to a large degree dependent on human interaction and human decision-making, and at times performed under stressful conditions for the decision-makers, entailing that the system is vulnerable against human error. The phenomena leading to situations where a blow-out could occur are not considered to be associated with a lot of scientific uncertainty, that is, there is a direct logical understanding of the underlying causes of a blow-out. Also, the mitigating measures and efforts undertaken by the companies to avoid blow-out situations contribute to minimizing the risks of having a blow-out. These measures include the use of a blow-out preventer (BOP) during the drilling of a well, safety valves in the well and on the rig/production platform, heavy drilling and completion fluid used to exceed the formation pressure and control the well fluids, use of explosion preventing equipment (*Ex-equipment*) and the emergency preparedness procedures. The measures include both pro-active and re-active measures, but their combinatory usage will lead to a reduction in the risk level. The case of treating the risks associated with a blow-out is a typical example of application of the ALARP-principle, in where the risks are to be reduced to a level that is as low as reasonably possible (Aven and Vinnem, 2007). This principle is often used when treating risks that

are considered to be acceptable, given the prerequisite that there are ways of reducing the risk level without incurring a cost that is disproportional to the effectiveness of the introduced measure. Hence, with the use of the ALARP-principle and the barrier system in place, the well operations are considered to be at an acceptable risk level. This risk level is of course also weighed up against the obvious benefits of performing the well operations, that is, increased revenue for the involved companies and the government.

2.2.2.3 Personnel injuries and fatalities

Injuries and fatalities for the personnel working offshore is a constant threat. The working environment and type of work performed on mobile drilling and production units offshore is considered to be particularly hazardous. The mobile offshore drilling- and production units are constantly moving, due to the prevailing wave and wind conditions. This hostile environment makes many activities very challenging, and a major source of risk for the involved personnel. There are not only risks involved with drilling for, and production of, highly ignitable reservoir fluids (e.g. risk of blow-outs, ref. chapter 0), but also other hazards such as:

- Handling of heavy equipment, both manually and by use of automated machinery
- On-loading and offloading equipment (cargo containers) from- and onto platform supply vessels (PSV) with deck cranes
- Working in heights
- Work on high-voltage electrical equipment
- Working with toxic chemicals
- Work with high-pressure systems
- Working in cold and windy conditions
- Transport to and from the offshore installations (primarily by helicopter)

There has been a significant change in both the philosophy and execution of safety related work offshore, since the start-up of the industry in the late 1960s. At the time, there was no common tool for describing or managing the risks involved (Aven and Vinnem, 2007). The government stated requirements for how to perform the activities within a satisfactory safety level, but these requirements were on detailed functional level, and probably not fit for purpose for raising the level of safety to the standard we expect today. The precautionary principle, which states that, when facing scientific uncertainty on the possible consequences of an activity, the activity should not be performed, was not a prevailing principle in the early days of the industry (see (Aven, 2008) and (Aven and Vinnem, 2007)). Due to the obvious large gains in increased welfare for the society as a whole, the benefits where considered to exceed the possible negative outcomes. It is difficult to rule the decisions made back then as careless, due to the fact that the knowledge, perspectives and decision criterion where different. However, it is reasonable to believe that many of the decisions and activities performed at that time would have taken a different form today. The case involving the North Sea pioneer divers is a good example of this (Government.no, 2014). The pioneer divers in the North Sea were an instrumental part in the development of many fields, before they were eventually relieved by remotely operated vehicles (ROVs) in more recent years. At the time, there was limited knowledge with regards to the safety issues with deep sea diving, and the long-term effects it had on the divers' physical and mental health (Aven and Vinnem, 2007). In other words, there were large scientific uncertainties involved in the operations, which, by the precautionary principle, should imply that the activities should not be performed. However, due to the underlying economic incentives and the industry's dependence on the contribution from the divers, the activities proceeded. The long-term effects of the diving operations, did, by natural reasons, not manifest themselves until years after the diving operations started.

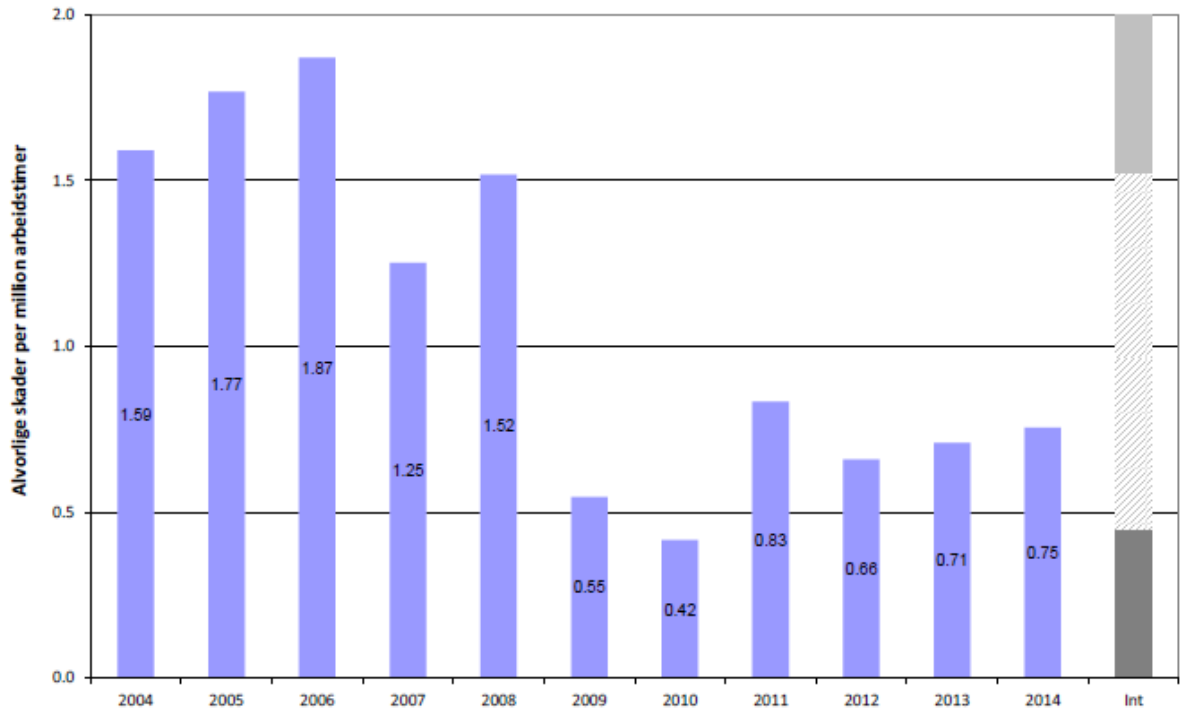
Every year since 2001, the Norwegian Petroleum Safety Authority (PSA) has published a report on the risk level connected with the total activity level on the NCS. The objective of the report is to (Petroleum Safety Authority Norway, 2013):

- *"Measure the effect of the HSE-work in the industry*

- *Contribute in identifying critical areas for HSE and where additional efforts need prioritization in order to prevent undesirable incidents and accidents*

- *Increase the insight into possible causes of accidents and their relative significance for the risk picture, among other reasons to provide the industry and authorities with a better basis for decision making regarding preventive safety and emergency planning."*

The background for publishing such a report was a discrepancy between the labour organizations and the oil companies on the true safety level of the operations performed (Aven and Vinnem, 2007). This necessitated the aid of an unbiased organization, a role which the PSA has taken. With regards to personnel injuries, the reports are showing an overall decreasing trend in serious injuries leading to medical treatment, absence from work into the next working shift, and fatalities from the years 2002 – 2014. See Figure 6 below, which shows the number of serious personnel injuries per million worked hours on mobile offshore units between 2004 and 2014 on the NCS. The events reported include everything from small cuts needing stiches, to major accidents involving fatalities. Hence, the span of the different risk levels associated with the causes and consequences related to the reported events is rather wide. However, the graph is a decent manifestation of the development of the overall risk level exposure on the NCS.



Figur 110 Alvorlige personskader per million arbeidstimer, flyttbare innretninger

Figure 6: Serious personnel injuries per million worked hours from 2002 - 2014 (Petroleum Safety Authority Norway, 2014)

2.2.2.4 Equipment damage and failure

In offshore operations, the equipment and tools needed to perform the different jobs are often highly specialized and unique for the task at hand. There are not many "off-the-shelf"- types of equipment, which increases the criticality of the role in performing as intended throughout the operation period. Damages to the equipment and subsequent equipment failure may not only have substantial economic consequences, but may also lead to injuries to personnel, environmental damages in the form of spills, and damages and failures to other affected equipment. The cost of equipment failure is usually not isolated to the cost of repair associated with bringing back the failed equipment to its functional state, but might also include costs associated with downtime on the rig, loss of production, damage repairs, fines, etc. It is evident that the consequential aspects of equipment failure cannot be viewed in isolation, and that they may carry negative outcomes that are unaccounted for. The causes of equipment damage may vary from improper use, e.g. exposing the equipment for overloads and not following procedure, to uncontrollable *force majeure* events.

In the case of failure of critical equipment installed in a well, or on the sea bottom as with subsea installations, the costs involved with equipment retrieval, repair and re-installation may amount to tens of millions of dollars, and be extremely costly (Fanailoo and Andreassen, 2008). Not only will it hamper the production from the field, but it also necessitates the need of hiring an intervention vessel, e.g. a specialized intervention ship, or, if the job involves heavy intervention, a drilling rig. The capacity and availability of intervention vessels may not always be sufficient for the task, and the time frame of the downtime of production is further increased. An intervention operation also requires substantial planning efforts and is usually best performed during the summer months, due to the weather limitations of the operations.

It is evident that increasing the equipment reliability is of the essence in reducing the risks of equipment failure. A method of improving the reliability, and upholding the functionality of the installed equipment and the tools used offshore, is by implementing maintenance strategies. There are in general four different strategies to choose from (Salim, 2012):

- *Corrective maintenance*: A maintenance philosophy in where the equipment is only maintained post failure. The costs associated with having downtime due to failure is considered to be lower than the costs associated with performing preventive maintenance.

- *Preventive maintenance*: Here, the company follows a fixed maintenance program according to certain time-intervals or according to other relevant criteria, such as time in

operation. The aim is to keep the functionality of the equipment at such a level that the risk of errors and faults are reduced. There is a balance to be struck between the cost of the maintenance program and the cost of downtime due to failure.

- *Condition-based maintenance:* Bases itself on monitoring and registering the performance of the equipment or system, and prescribes the necessary maintenance based on the actual condition of the equipment. Different parameters of interest must be singled out and measured with the use of sensors. This philosophy ensures that no time is wasted on maintaining fully functional equipment, by registering an incipient fault before it actually occurs. It is important to keep in mind that the sensors and signal processing from the condition monitoring itself may induce uncertainty, as this equipment in itself do not possess 100% reliability.

- *Reliability centred maintenance:* This maintenance strategy is based on the criticality of the equipment and the performance data. The criticality of the equipment may be identified through an FMECA. The aim of the strategy is to increase the overall performance of the equipment or system.

A reliability analysis is an important tool for identifying and preparing strategies for the necessary maintenance and ensuring the functionality of the equipment and providing a solid basis for prioritizing between the different alternative solutions and actions. The petroleum industry has realized the importance of reliability analysis, and has made great development in the field over the years (Aven, 2006). Focus on reduced maintenance cost and increased efficiency has been one of the main drivers for this development.

2.2.3 Operational risk

Within the field of risk theory, where the realm of the risk concept is commonly divided into three separate types, operational risk is the part covering an organization's risk exposure in the day-to-day operations (see chapter 2.2.1). As such, it covers a broad spectrum of situations, including (Aven, 2008):

- *"Accidental events, including failures and defects, quality deviations and natural disasters;*

- *Intentional acts – sabotage by disgruntled employees, fraud, and so on;*

- *Loss of competence, loss of key personnel;*

- *Legal dispute associated with for instance defective contracts and third party claims"*

It is given that companies and organizations need to have proper risk management tools and procedures in place to mitigate the various risks they are exposed to in their daily operations. Within the different threats that fall into the categorization of operational risk, there are types of risk that are more or less controllable than others, i.e., they fall outside of the control sphere of the company. The essence of managing risk, and specifically with regards to operational risk, must on any account be focused on the robustness of the organization and its ability to handle the associated risks. According to DNV GL, the main purpose of managing operational risk is to (DNV GL, 2009):

"…identify and understand potential risks, prevent loss, increase the ability of detecting signals that a risky and unwanted event or situation is about to occur, in addition to establishing measures for handling the potential consequences of such events."

In this statement, there are elements of both preventive and corrective nature, as the focus is both on the causal and consequential aspects of risk, in accordance with other views on risk management (see chapter 2.2.1). It is evident that possessing an understanding of the various conditions affecting the performance of the operations is vital for any organization. Reducing the scientific uncertainties and increasing the knowledge of the threats and opportunities of the operations, in correspondence with use of the ALARP-principle, appear to be a proper mean of reducing operational risk. Well implemented internal operating procedures and thorough risk analyses processes are tools that will contribute to this matter.

There are a number of different definitions of operational risk, many of whom are constructed for use in financial contexts. However, the ruling principle and meaning of the definitions can be related to other aspects as well, such as the general conditions listed above. The methodology of an investment bank for handling operational risk may not be too different from that of an oil- or service company.

It is a common misunderstanding that operational risk is to be understood as a concept, or term, covering the types of risks that do not fall within the other main categories of financial- or strategic risk. In other words, operational risk is commonly seen as some sort of residue risk. However, operational risk should not be reduced to some concept that falls between the chairs of seemingly more important types of risk. Operational risk is elevated to a higher level of abstraction, by including

risks that are difficult to substantiate by mere quantitative efforts, such as intentional acts, loss of competence and quality deviations (ibid.).

The Bank for International Settlements (BIS), which is a financial organization where over 60 central banks from all over the world are members, organizes the Basel Committee on Banking Supervision (BCBS), which is a forum for establishing global standards and regulations for banks, with the intention of ensuring financial stability and reducing risk exposure (Bank for International Settlements, 2015). The BCBS, through its Basel II accord, defines *operational risk* in the following manner (Basel Committee on Banking Supervision, 2001):

"The risk of direct or indirect loss resulting from inadequate or failed internal processes, people and systems or from external events."

It is further stated that strategic- and reputational risk is not included in the definition. This definition of operational risk touches base with some relevant aspects of the term, but it has got some weak spots. The use of the word *"risk"* in the definition can be considered to be problematic, as the definition then becomes somewhat of a circular definition. If the aim is to define the term *"operational risk"*, there should be a clear statement in the definition of what is meant by the term "*risk"*, as this is also a concept which carries various interpretations. *Operational risk* is an under-grouping of the wider term *risk*, and a definition of the former cannot be meaningful without also declaring the definition of the latter. Another weakness of the definition is its perceived attempt at quantifying risk, i.e. assigning objective characteristics to risk (DNV GL, 2009). This specifically refers to the losses, direct or indirect, resulting from *"…inadequate or failed internal processes, people and systems or from external events".* For instance, it is often challenging to quantify the losses related to human error and inadequacies. Such quantifications would inherently be characterised by substantial uncertainties that are not captured by the definition as it is formed. At last, the definition fails to treat the intrinsic positive value of risk, which is opportunity (Aven, 2008). Opportunity is here understood as the flexibility offered by different alternatives, through a range of consequences following an event. Within many definitions of risk, where uncertainty forms the main component, the opportunity dimension is usually included, see (Aven, 2010). The rationale behind this is that when being exposed to risk, through the performance of an activity, there is always an element of opportunity, i.e. positive outcome, included in the range of consequential aspects of the activity. That is, after all, the whole reason for wanting to perform the activity in the first place.

The lack of a proper treatment of uncertainty in the definition of *operational risk* from the BCBS, in addition to the other objections stated above, renders it inadequate for use in a context for managing operational risk in offshore service contracts. There will not be any attempts of forming a definition of the term *operational risk* in this report. However, the term is to be understood as a sub-category of the wider term *risk*, concerning uncertainty-based risk exposure in the day-to-day activities, operations and performance of an organization or business. Here, the term *risk* is defined and understood as stated earlier in this chapter, i.e. (Aven, 2010):

"By risk we understand the two-dimensional combination of

i. events A and the consequences of these events C, and

ii. the associated uncertainties U (whether A will occur and what value C will take)."

This definition incorporates both the causal and the consequential aspects of risk, in addition to including the associated uncertainties, which are prevalent in all manners where risk is present.

3 METHOD

When conducting a research or illuminating a topic of interest the choice of method is utterly important. Presenting the chosen method will also make sure that the reader can verify the findings of the report and attempt to reproduce the results. Choosing a method is much like selecting tools when performing a job, and making the right selection of tools will ensure that the job is performed in the most efficient and safe manner. This chapter will present the choice of method for this report, and why this method was chosen. Some general entries on methods will also be presented.

3.1 Research strategy

There are several means of conducting research, and the methods available can often be complementary to each other. It is a common misconception that there is but one methodology that is the correct one for each individual research, and that all other methods must then be put aside (Yin, 2003). Rather, the different research methods have their strengths and weaknesses which may be combined and exploited in order to obtain the goals of the research. According to Yin (2003), the selection of research strategies are:

Strategy	Form of Research Question	Requires Control of Behavioural Events?	Focuses on Contemporary Events?
Experiment	How, why?	Yes	Yes
Survey	Who, what, where, how many, how much?	No	Yes
Archival analysis	Who, what, where, how many, how much?	No	Yes/No
History	How, why?	No	No
Case Study	How, why?	No	Yes

Table 1: Properties of the different research strategies (Yin, 2003)

When choosing the method for this report, the most appropriate choice seemed to be a case study. The hypothesis and following research questions stated in chapter 1, carry more emphasis towards "How" and "Why" than the other key words such as "How much" and "How many". The essence of the report is investigating *how* well operational risk is implemented and shared in contracts between the Service Company and its clients. It is thus more suitable for a qualitative approach. Although the research questions stated in chapter 1 are of the "what"-type, they are merely supportive and provide a backdrop for understanding the main hypothesis. There are generally two types of "What"-questions, the first type is more exploratory and fit for any of the five strategies, while the second is more about prevalence and favourable in research of archival records and surveys (ibid.). In the case of this report, the "what"-nature of the research questions are clearly more exploratory than prevalent.

There are obvious limitations to the possible control that can be exerted over the behavioural events. The centre of attention will be the written contracts between the Service Company and its clients, and these are firmly fixed and out of reach for manipulation. This excludes the experiment as a relevant strategy for the chosen method. The case study and the history strategy share many attributes, but the case study adds two more sources of evidence which may not always be included in the latter strategy. These sources are direct observation of the events, or situation being studied, and interviews of persons who were, or are, involved in the events (ibid.). The ability of the case study to handle contemporary events, and utilize supporting material such as documents, interviews and observations makes it the most fitting strategy for this report. For this report, both direct observations, interviews with relevant personnel and access to contracts are possible.

According to Yin (2003), the definition of a case study is two-folded, where the first part describes the scope of a case study, and the second describes the characteristics of a case study. The case study is accordingly defined as:

1. *"A case study is an empirical inquiry that*
    - *investigates a contemporary phenomenon within its real-life context, especially when*
    - *the boundaries between phenomenon and context are not clearly evident.*
2. *The case study enquiry*

- *copes with the technically distinctive situation in which there will be many more variables of interest than data points, and as one result*

- *relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and as another result*

- *benefits from the prior development of theoretical propositions to guide data collection and analysis."*

The case study has received criticism for being the weaker method in some scientific communities. The critics regard the case study to be imprecise and only appropriate in the initial exploratory phases of a research and not as a stand-alone strategy (ibid.). However, the case study is also a widely accepted method for situations such as the one applying for this report. There are certainly drawbacks with performing qualitative scientific research, but they may be avoided with the proper set-up. A proper evaluation and presentation of the available information, and keeping within the frames of the relevant theory, will ensure a thorough investigation of the hypothesis.

3.2 Research design

The research design is, in general terms, *"a logical plan for getting from here to there"* (Yin, 2003). In other words, it is the way of getting from an initial set of questions, or hypothesis and research questions in the case of this report, to some sort of conclusion. The important part in the middle, from raising the question to drawing the conclusion, is collection and analysis of relevant information and data. The documentation of the work performed and the various sources collected is vital for the transparency of the analysis, and the enablement of reproduction of the case study. According to Yin (2003), there are mainly four types of design that can be chosen. The different types of design may be incorporated into a 2x2 matrix. See Figure 7 below for an overview. The main distinction is between choosing a single- or a multiple-case design. The conditions for choosing the former, is when the case represents (ibid.):

- *"A critical test of existing theory;*

- *A rare or unique circumstance;*

- *A representative or typical case, or when the case serves a;*

- *Revelatory, or;*
- *Longitudinal purpose."*

A single-case design, may also incorporate several analyses. These added analyses may shed valuable light on the case study, but the question of relevance must be taken into consideration. If the other analyses are of a slightly different nature, then the whole research may drift off its intended course. The multiple-case design is more time-consuming and demands more experience with performing case studies. One must be able to replicate the conditions underlying each case study, and each case must therefore be carefully selected. However, when given the choice and opportunity, the multiple-case design should be preferred to the single-case design. The multiple-case design is generally considered more robust, as the design enables the investigator to conduct research and collect information from more sources than with single-case design (ibid.).

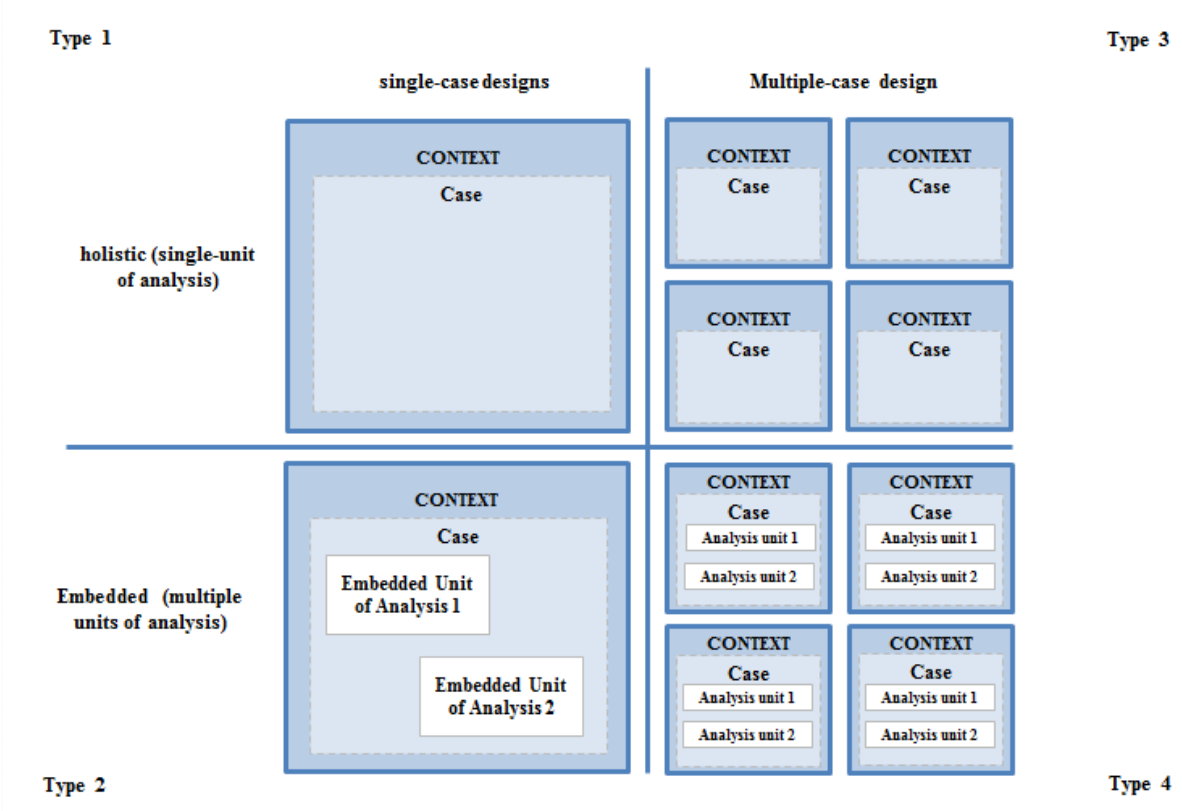


Figure 7: Four different design types for case studies (Yin, 2003)

Given the lack of time and resources for conducting multiple-case studies, the choice of design for this report is a single-case design. However, to increase the amount of data and the significance of

the findings, analyses of two different contracts will be conducted, i.e. two analyses in one case-design. As such, the choice of case design will be of Type 2. This should give the report a sufficient amount of background knowledge for presenting a conclusion to the hypothesis, although additional analyses would be more preferable.

3.3 The Case

The case in this report is based on investigating how *operational risk* is implemented and shared in contracts between the Service Company and its clients. That implies that two contracts will be investigated, to give the case a more solid foundation than if only a single contract was being analysed.

The Service Company has granted access to the full portfolio of contracts, and there are but few limitations to which contracts that are available for scrutiny. Such limitations are applicable in contracts where the Service Company and the client are in dispute, and thus require discretion. This implies that the contract is off limit for third party insight. There are however still numerous of other contracts that are applicable for selection, which should give the case study enough material.

The chosen contracts will be carefully analysed in a qualitative manner, and their implementation of, or lack of, *operational risk* will be highlighted. The contents of *operational risk* in the contracts will then be tied to the presented theory in this report. This work will be supported by the report supervisor, and other resources and personnel working at the Service Company, so that any vagueness in the contracts or questions arising during the performance of the analyses can be clarified.

According to Yin (2003), there are six sources of evidence when working on a case study. See Table 2 below for strengths and weaknesses of the six different sources.

Source of Evidence	Strengths	Weaknesses
Documentation	• Stable – can be reviewed repeatedly • Unobtrusive – not created as a result of the case study • Broad coverage – long span of time, many events, and many settings	• Retrievability – can be low • Biased selectivity, if collection is incomplete • Reporting bias – reflects (unknown) bias of authority • Access – may be deliberately blocked
Archival Records	• [*same as above for documentation*] • Precise and quantitative	• [*same as above for documentation*] • Accessibility due to privacy reasons
Interviews	• Targeted – focuses directly on case study topic • Insightful – provided perceived casual inferences	• Bias due to poorly constructed questions • Response bias • Inaccuracies due to poor recall • Reflexivity – interviewee gives what interviewer wants to hear
Direct Observations	• Reality – covers events in real time • Contextual – covers context of event	• Time-consuming • Selectivity – unless broad coverage • Reflexivity – event may proceed differently because it is being observed • Cost-hours needed by human observers

Participant Observations	• [*same as above for direct observation*] • Insightful into interpersonal behaviour and motives	• [*same as above for direct observations*] • Bias due to investigator's manipulation of events
Physical Artifacts	• Insightful into cultural features • Insightful into technical operations	• Selectivity • Availability

Table 2: Strengths and weaknesses of different sources of case study evidence (Yin, 2003)

The sources of evidence that are available for the case study performed in this report are documentation, in the form of the written contracts, and interviews of key personnel involved in the contract management at the Service Company. Note that performing interviews will merely be an optional choice, should the interpretation of the contracts need further emphasis. The primary source of evidence will be the written contracts. Documentation as a source of evidence may have a weakness in that it may be altered in retrospect of its creation, or created for a time and audience that do not serve the purpose of enlightening the case study (ibid.). However, this is not the case here. The written contracts in question here, are assumed to be in their original state, as agreed by the two parties. And except for later added amendments to the contracts, they are unaltered. Any amendments to the contracts are also available for analysis.

3.4 Evaluation of the documentation

In case studies, it is a great advantage to be able to use multiple sources of evidence, as this will strengthen any findings in the study. However, in this report, the contracts are but the only source of evidence available for investigating their contents with regards to *operational risk*. As mentioned, there are opportunities to perform interviews with contract management personnel, but that might introduce additional subjectivity into the interpretations of the contents of the contract. The interviews, as an option, will however function as a supplementary source of evidence, should that be needed. In the following sub-chapters, the issues of reliability and validity of the documentation will be dealt with.

3.4.1 Reliability

Reliability is a matter of being able to produce the same results from the same material, by different investigators. This means that if one investigator, following the same procedures as the one before him, conducted the same case study, should get to the same conclusions to the same initial questions (Yin, 2003). That implies that in order for the case study to be reliable, the applied methods, theory and procedures, in addition to the evidence, must be declared in the background material.

In this qualitative case study, the biggest problem encountered will be that of subjective interpretations of the contents and formulation of the contracts. This is something that is difficult to overcome, and it certainly adds an extra emphasis on having a proper methodology of the work. Also, a clear statement of the investigator's interpretation of keywords in both the report and the contract is necessary. Due to considerations of discretion and privacy, the participants in the examined contracts need to be anonymous, and the contents of the contracts must be carefully mediated so as not to reveal any confidential information, explicitly or "in between the lines". Although this may form a somewhat obscured image of the evidence, it is still possible to extract valuable information and use that in the study, as the essential keywords are, to a high degree, generic and not contract- or company-specific.

The contracts made available for the investigator, i.e. the author of this report, are by reasons stated above, not available for the general public or third party review, without granted consent. This affects the reliability of the case study in a negative way, as the reader may not possess or have access to the background material, but it is unfortunately the only means of performing the work. Another element that should be mentioned, that could have potential effect on the reliability of the study, is the author's connection with the Service Company. Being fully employed by the Service Company may alter the author's motives and challenge the objectivity needed. There is a risk of giving an ill-founded weight to positive findings in the analysis, and vice versa, to not sufficiently document negative findings. However, the author's position is within a different department than the one dealing with contract management and the ties with that department has been established in connection with the report only. On this account, the author should have a sufficient distance to obtain the needed objectivity. It is however important to disclose these issues here.

3.4.2 Validity

Validity in this context is a question of relevance, that is, how relevant the collected information is for the purpose of reaching a conclusion to the stated hypothesis. Yin (2003) distinguishes between *internal* and *external* validity. *Internal* validity is understood as the causal relationships created between factors in a study, that is, the underlying causes leading to the observed consequences. However, internal validity is only relevant for *explanatory* studies. *External* validity, on the other hand, is understood as the relevance of the findings in the isolated study, to the general domain of which the object of interest belongs to. The external validity of the case study in this report is very important. The question is: can the findings in this report be generalized and relevant for other contractual relationships as well? The answer to that is a conditional *yes*. Conditional in the sense that the other contracts are in the same standardized format as the contracts investigated in this report. In most cases they will be. However, the contracting parties may choose to include exhibits where particularities are stated, in which case the external validity of the report would be undermined. The reader should be aware of this.

4. ANALYSIS

The following chapter will present two different contracts between the Service Company and two different customers, or petroleum field operators. The contents of the contracts, which are considered relevant for the topic of this report, are included and commented upon. The two contracts are presented in two separate sub-chapters, and are denoted as Contract 1 and Contract 2 for purpose of anonymity.

To ensure a common reference and tool for the analysis work on the two contracts, they are interpreted in the light of the standard contract formats, such as the mentioned NSC 05, NTK 07 and NF 07. These formats include a standard formulation of the conditions of contract, and given that they are developed in joint effort by various service- and operator companies, they are assumed to ensure a fair division of obligations and responsibilities, and to be in compliance with Norwegian laws and regulations. The contract exhibits, which are specific for the respective contracts, are presented by their own account.

Throughout the analysis of the contracts, the findings will be reflected in the light of relevant and presented theory.

4.1 Analysis of Contract 1

In the following, Contract 1 is presented and analysed. The contract is a frame agreement between the Service Company and a field operator, regarding delivery of a subsea system for a particular field on the NCS. The field operator is a major company, and is involved in a great amount of fields on the NCS, both as operator and partner in various license groups. The parties also co-operate on other projects, making the frame agreement one of several other contracts between the two. The contract, or frame agreement, was formed in the beginning of the 2000s.

For the sake of simplicity, “the Contractor” is to be understood as “the Service Company” and “the Company” is to be understood as “the field operator”, or “customer” of the Service Company, in the following text, in accordance with the terminology in Contract 1. The chapter is further divided into two sub-chapters, the first (chapter 4.1.1) concentrating on contents of operational risk within the *conditions of contract* in Contract 1, and the second (chapter 4.1.2) dedicated to searching for contents of operational risk within the various *exhibits* in Contract 1.

It is natural to begin by comparing the main parts of the three standard contract formats of NTK 07, NF 07 and NSC 05 with that of Contract 1. As can be seen from Table 3 below, the standard contract formats share, for the most part, the same main contents. This is not surprising, as the contract formats are developed in the same time period, and by many of the same participants. As Contract 1 is also formed within the same time period, it is only natural that this also follows the same build-up.

Part	NTK 07	NF 07	NSC 05	Contract 1
I	General provisions	General provisions	General provisions	General provisions
II	Performance of the work	Performance of the work	Performance of the work	Performance of the work
III	Progress of the work	Progress of the work	Progress of the work	Progress of the work
IV	Variations, cancellation and suspension	Variations, cancellation and suspension	Variations and cancellation	Variations and cancellation
V	Delivery and payment	Delivery and payment	Delivery and payment	Delivery and payment
VI	Breach of contract	Breach of contract	Breach of contract	Breach of contract
VII	Force majeure	Force majeure	Force majeure	Force majeure
VIII	Liability and insurances	Liability and insurances	Liability and insurances	Liability and insurances
IX	Limitation and exclusion of liability	Limitation and exclusion of liability	Proprietary rights, etc.	Proprietary rights, etc.
X	Proprietary rights etc.	Proprietary rights etc.	Other provisions	Other provisions
XI	Other provisions	Other provisions		

Table 3: Comparison of the main parts of Contract 1 with the main parts of the standard contract formats (Norsk Industri, 2007b), (Norsk Industri, 2007a) and (Norsk Olje & Gass, 2005)

Contract 1 appears to follow the same structure as that of NSC 05, as it structures the main parts in the very same way. Also, since the contract is concerning a subsea field development, it would be natural to turn to NSC 05 as the reference contract format. However, when looking more closely into the articles included in NSC 05 and Contract 1, there are differences between them. See Table 4 below for a comparison of the main parts and articles of NSC 05 and Contract 1.

Part	NSC 05	Part	Contract 1
I	GENERAL PROVISIONS	I	GENERAL PROVISIONS
Art.1	Definitions	Art.1	Definitions
Art.2	Contract documents – interpretation	Art.2	Contract documents – interpretation
Art.3	Representatives of the parties	Art.3	Terms and intention of the Contract
II	PERFORMANCE OF THE WORK	Art.4	Work Order
Art.4	Obligations of Contractor and Company – main rules	Art.5	Representatives of the parties
Art.5	Authority requirements – permits	II	PERFORMANCE OF THE WORK
Art.6	Drawings and specifications – Company Provided Items	Art.6	Obligations of Contractor – main rules
Art.7	Subcontracts	Art.7	Subcontracts
Art.8	Contractor Personnel	Art.8	Personnel
Art.9	The Spread	Art.9	Quality assurance
Art.10	Quality assurance and health, safety and environment	Art.10	Safety, health and working environment
III	PROGRESS OF THE WORK	III	PROGRESS OF THE WORK
Art.11	Contract Schedule – delayed progress	Art.11	Contract Schedule – delayed progress
IV	VARIATIONS AND CANCELLATION	IV	VARIATIONS AND CANCELLATION
Art.12	Right to vary the Work	Art.12	Right to vary the Work
Art.13	Effects of Variation to the Work	Art.13	Effects of Variation to the Work
Art.14	Issue of Variation Orders	Art.14	Issue of Variation Orders
Art.15	Consequences of variation orders – disputes about consequences	Art.15	Consequences of variation orders – disputes about consequences
Art.16	Dispute as to whether a variation to the work exists – disputed variation order	Art.16	Dispute as to whether a variation to the work exists – disputed variation order
Art.17	Cancellation	Art.17	Cancellation
Art.18	Company's right to temporarily suspend the Work.	Art.18	Company's right to temporarily suspend the Work.
V	DELIVERY AND PAYMENT	V	DELIVERY AND PAYMENT
Art.19	Delivery and Completion of the Work	Art.19	Delivery and Completion of the Work
Art.20	Payment, invoicing and audit	Art.20	Payment, invoicing and audit
Art.21	Security for Company's claims	Art.21	Security for Company's claims
Art.22	Title – right to demand delivery	Art.22	Title

Art.23	Contractor's guarantee – acceptance certificate	Art.23	Contractor guarantee
VI	BREACH OF CONTRACT	VI	BREACH OF CONTRACT
Art.24	Contractor's delay	Art.24	Default and delay
Art.25	Contractor's defects and guarantee liability	Art.25	Contractor's defects and guarantee liability
Art.26	Termination due to Contractor's breach of Contract	Art.26	Suspension or termination due to Contractor's breach of Contract
Art.27	Company's breach of Contract	Art.27	Company's breach of Contract
VII	FORCE MAJEURE	VII	FORCE MAJEURE
Art.28	Effects of Force Majeure	Art.28	Effects of Force Majeure
VIII	LIABILITY AND INSURANCES	VIII	LIABILITY AND INSURANCES
Art.29	Loss or damage to the Contract Object or Company Provided Items	Art.29	Loss of or damage to Company Provided Items
Art.30	Exclusion of liability – indemnification	Art.30	Liability – Indemnification
Art.31	Insurance	Art.31	Insurances
IX	PROPRIETARY RIGHTS, ETC.	IX	PROPRIETARY RIGHTS, ETC.
Art.32	Rights to information, technology and inventions	Art.32	Rights to documents and computer programs
Art.33	Confidential information	Art.33	Inventions
X	OTHER PROVISIONS	Art.34	Confidential Information
Art.34	Limitation and exclusion of liability	X	OTHER PROVISIONS
Art.35	Assignment – mortgage	Art.35	Assignment of the Contract, etc.
Art.36	Notices	Art.36	Notices
Art.37	Norwegian law and disputes	Art.37	Norwegian law and disputes

Table 4: Comparison of the main parts and the articles of Contract 1 and NSC 05 (Norsk Olje & Gass, 2005)

As can be seen from Table 4, there are some differences between the contents of the standard NSC 05 and Contract 1, although Contract 1 is largely built on the foundations laid by the standard format. Some terms that are found in one article in NSC 05, may be found in a different article (under a different heading) in Contract 1. On this account, one must take care when comparing the articles against each other.

4.1.1 Comparison between Contract 1 and NSC 05

Similarities and differences between the conditions of contract in NSC 05 and Contract 1, found in the respective articles, are listed below. The similarities and differences stated may carry a degree of importance which may vary from little to highly relevant for the topic of this report, i.e. division and implementation of operational risk. The less relevant findings are stated for the curiosity of, and, added perspective for the reader. On the other hand, the more relevant findings are supplemented with and followed by a comment, to highlight and tie the findings to the presented theory.

- Both NSC 05 and Contract 1 contain the same exhibits, apart from Contract 1 not including Exhibit I – Company's Insurances.

Comment: This leaves out the Company's obligations towards the Contractor under the Contract to ensure that sufficient insurances are obtained in relation to the project. Contrary, the Contractor is obliged to obtain insurances under article 31. This represents an imbalance in the requirements for the parties.

- Contract 1 prescribes a different order of prioritization than NSC 05, should the contents of the contract documents be in conflict with each other. Contract 1 prioritizes in the following order:

    a. *Specific part of Conditions of Contract (Appendix CoC1),*

    b. *these Conditions of Contract*

    c. *specific Work Orders,*

    d. *all Exhibits, except Exhibit D, in the order they are listed as aforementioned in Art.2.1,*

    e. *Exhibit D.*

    The specific Work Orders refer to projects that are issued as a part of the frame agreement.

- *Article 6 – Obligations of Contractor – main rules* in Contract 1, fails to also include the obligations of the Company, as it is done in *Article 4 – Obligations of Contractor and Company – main rules* in NSC 05.

Comment: This might seem like a trivial omission, but it leaves an impression of being a contract that is one sided, as opposed to being bilateral.

- There are no instructions as to what the Company is obliged to do in the event where "errors" are found in the Company Provided Items (see Art.6.7 in Contract 1), as stated in Art.6.4 in NSC 05.

Comment: This may lead to unnecessary time delays and incurred costs in correcting the errors and delegating the responsibilities for performing the corrections. The Company is the best suited at controlling the risk of errors in the Company Provided Items, and it should be stated as such in the contract, as it is in NSC 05.

- *Article 7 – Subcontracts* is almost formulated the same way in both Contract 1 and NSC 05, where the Contractor needs to obtain the permission of the Company in order to acquire the services of a subcontractor. It is further stated in Article 7.2 that the Contractor is responsible for the fulfilment of any Subcontracts in accordance with the Contract.

Comment: Assignment of subcontracts of parts of the Work induces the risk of interface management problems, which are not very well described in Contract 1, nor in NSC 05. Complex deliveries, such as a subsea system, will most likely involve the contribution of several sub-contractors. Some sort of declaration of the division of responsibilities and liabilities between the various sub-contractors involved in the Work is missing here.

- *Article 8– Personnel* in Contract 1, contains formulations regarding the Company's rights to approve personnel performing Work under the Contract. It states that the Company reserves the right to approve all personnel performing Work under the Contract, and also the right to replace previously approved personnel. Also, the Contractor is, upon the Company's request, obliged to provide details regarding the qualifications of its personnel provided to Company for performance of the Work. This formulation is not included in the NSC 05, nor the NF 07 or NTK 07.

Comment: This may be considered to be somewhat of an overstepping of the boundaries between the two contracting parties, as the Company appears not to fully entrust the Contractor to ensure the quality and competence of its own personnel. However, it is understandable, at least from the Company's point of view that they want to retain some control over the key personnel involved in the project under the Contract. Loss of key personnel is an essential operational risk, a risk that appears to be sufficiently addressed in article 8 in Contract 1.

- The Spread is not mentioned in Contract 1, as in NSC 05.

Comment: The Spread is an essential part of the items provided by the Contractor, and as discussed in chapter 2.2.2.4, equipment damage and failures constitute a significant contribution to the overall level of operational risk in the performance of the Work in accordance with the Contract. As such, provisions regarding the Spread should be granted attention in Contract 1, as it is in NSC 05.

- Art.13.1 in NSC 05 states:

  "All obligations under the Contract apply to Variations to the Work, unless otherwise agreed."

  This is term is formulated differently in Contract 1, where it is stated:

  "All Contractor's obligations under the Contract/Work Order also apply to variation work, unless otherwise agreed."

Comment: This specification and explicit mentioning of one of the parties, i.e. the Contractor, highlights a weighing of obligations against the Contractor. Nothing is mentioned of the Company's obligations under the Contract/Work Order when Variations to Work are issued. This asymmetry might be considered trivial, but may gain importance should conflict arise between the parties.

- *Art.17 – Cancellation* is stricter on the Company in NSC 05 than in Contract 1. In addition to remuneration of work already performed and expenses incurred with purchases of relevant material, the Contractor is entitled to a certain cancellation fee according to Art.17.3 in NSC 05. The Contractor is also entitled to compensation according to a percentage of the unearned portion of the Contract Price should the Contract be cancelled within 180 days prior to planned Mobilization. This is not included in Art.17 in Contract 1.

  It is worth noting that the further treatment of the Contract Object, materials and other important terms related to cancelling the Contract are not mentioned in Contract 1, as in NSC 05.

Comment: This increases the risk of conflict between the parties, should a cancellation occur. The risk of cancellation is particularly present in long-term frame agreements such as this.

- In Contract 1, there are no time limitations for the Company to dispute the proposal for the final account for the Work Order, as there is in Art.20.4 in NSC 05, where the Company is given 90 days to dispute the proposal.

- Art.20.4 in Contract 1 does not give the right of the Contractor to get an audit from a neutral third party, as it is given in Art.20.5 of the NSC 05.

- According to *Article 21 – Security for Company's claims* in Contract 1, the guarantee after issuance of the Completion Certificate is only at 30% of the initial guarantee amount, as opposed to a required 50% in the NSC 05 (see Art.21.2).

Comment: This holds the Contractor liable for a much smaller amount during the guarantee period, and must be said to be fair in favour of the Contractor. Upon issuance of the Completion Certificate, and at the start of the Guarantee Period, the Company is the party that is the better suited at controlling the risk of the Contract Object, as the Company then takes the Contract Object into use. However, it is important that the Contractor is able to answer to the performance of the Contract Object during the guarantee period, and if not, that it is able to guarantee the Company compensation.

- *Art.23 - Contractor Guarantee* is in line in both Contract 1 and NSC 05.

- *Art.24 – Contractor's Delay* in NSC 05, states the Company's right of having the Contract Object handed over for completion by another contractor. *Art.24 - Default and delay* in Contract 1 does not include such a clause.

- *Art.25 – Contractor's Defects and Guarantee Liability* in Contract 1 does not include the Company's obligations of swift notification to the Contractor should a defect exists. In *Art.25 – Contractor's Defects and Guarantee Liability* in NSC 05, the Contractor is liable for defects only if the Company has given notice of the defect, without undue delay after having discovered the defect, or after having ought to discovered the defect.

Comment: Such a formulation (as stated in Art. 25 in NSC 05) is common in trading legislation, and clearly states the buyer's, i.e. Company's, responsibility of testing and examining the Contract Object upon deliverance, when the risk of the Contract Object is transferred to the Company.

Also, in Contract 1, there is a clause saying that if the Company decides that the rectification work for a defect discovered during the Guarantee Period cannot be performed during the Guarantee Period, then the Contractor's obligation to remedy the defect shall apply for a period of 3 years from the issuance of the Completion Certificate. In such event, the Contractor shall not be responsible for any additional cost occurring as a consequence of expansion of the defect due to the delayed rectification.

In NSC 05, there is an upper limit of the Contractor's liabilities of rectification work and for damages according to Art.25.4 of up to 15% of the Contract Price. No such upper limit is mentioned in Art.25 in Contract 1. There, the Contractor is, however, not liable for costs related to *"…extra costs associated with Guarantee Work performed below the water line exceeding NOK 1.000.000 per Work Order."*

Comment: Such a limitation to work performed below the water line presents a very important shield for the Contractor, as the risk of equipment failure and damage, pollution, etc., is then to a large extent carried by the Company. Being fully liable for rectification work below the water line would constitute a major contribution to the overall operational risk level carried by the Contractor, and by the introduction of an upper limit, the Company absorbs a fair part of this risk.

- *Art.26 – Termination due to Contractor's Breach of Contract* in NSC 05 puts a lot of attention to the performance of the Spread (i.e. vessels, barges, equipment and personnel involved in performing the Work), whereas Contract 1 does not mention the Spread at all. This gives Art.26 in Contract 1 a somewhat different content than that in NSC 05. However, the message is the same.

Comment: As stated before, the lack of implementation of the Spread in Contract 1, could prove to be problematic, as the performance of the Spread is an essential part of the Work.

An important clause is added in Contract 1, stating that the total liability under each Work Order shall be limited to 100% of the Compensation under the respective Work Order. This is in favour of the Contractor, as the potential damages and costs involved with a Contract Termination may be substantial for both parties.

- In *Art.27 – Company's Breach of Contract*, the right of the Contractor to suspend the Work or terminate the Contract due to the Company's substantial breach of its payment obligations is *not* included in Contract 1, as in NSC 05.

Comment: This presents a disadvantage for the Contractor, as he does not possess the option of suspending or terminating the Work, or parts thereof, a privilege that is solely the Company's. This asymmetry must be considered to be unfair, although one must assume that the Contractor is protected by the ruling legislation ("*Avtaleloven*"), should the Company be substantial breach of the terms of the Contract.

- In *Art.28 – Effects of Force Majeure* in Contract 1, both parties have the right to cancel the Contract or the respective Work Order if the Force Majeure situation lasts without interruption for 60 days or more. In Art.28 of NSC 05, the Contractor must wait 180 days for this right, while the Company has the right after 60 days.

Comment: This presents a potentially valuable option (which in itself carries a value) for both the Contractor and the Company.

- *Art.29 – Loss of or damage to Company Provided Items*, states that the Contractor is obliged to carry out measures to complete the Work in accordance with the Contract, even if loss or damage to Company Provided Items situated under Contractor Group's safekeeping and control is caused by negligence shown by the Company Group. The same term is stated in *Art.29 – Loss or damage to Contract Object or Company Provided Items* in NSC 05.

Comment: This provision is included to ensure the continuity of the Work, and to avoid hindrance of the Work due to time consuming and costly disputes between the contracting parties.

- *Art.30 – Liability – Indemnification* in Contract 1 states that the Contractor shall indemnify the Company Group from any claims concerning loss or damage suffered by anyone other than Contractor Group or Company Group (e.g. third party companies, government, etc.). The same obligation applies for the Company, i.e. the Company shall indemnify the Contractor against claims concerning loss or damage suffered by a third party.

  The Contractor's liability, in cases where a third party has suffered a loss and claim compensation for damages is however limited to NOK 5.000.000 in both NSC 05 and Contract 1. The limitations applying for the Company is not stated, if any exists at all.

Comment: This limitation of liability is important for the Contractor, as it reduces the uncertainty related to the Contractor's obligations towards compensation for third party claims. As mentioned before, offshore operations involve numerous of sub-contractors and stakeholders (i.e. *third parties*), and the potential for conflict in the wake of accidents is always present.

- *Art.31 – Insurances* in Contract 1 does not mention any demands towards the insurances the Company must provide and maintain, as it does in NSC 05, where the Company is obliged to have a construction all risk-, transport and liability-insurance (up to NOK 500 million). Nor does it specify which types of insurances are needed by the Contractor, other than that the Contractor shall insure its liability under the Contract. Such specifications are included in NSC 05.

Art.31 in Contract 1 also includes a clause stating that the insurance policy shall be taken out with first class insurers and according to the best insurance terms available in the market. The NSC 05 does not dictate such a principle.

Comment: Again, this presents a provision which is only applicable for one of the parties, i.e. the Contractor.

- The parties' indemnification of each other with regard to *indirect losses*, are not included in Contract 1, as in *Art.34 – Limitation and exclusion of liability* in NSC 05.

Comment: Such indirect losses include loss of profit and or earnings, loss due to pollution and loss of production, which in the case of offshore production, may be sizeable. The division of the risk for suffering indirect losses are therefore appears to be an unsolved matter in Contract 1. However, *Art. 30 – Liability - indemnification* in Contract 1 indemnifies the parties of *all consequential losses* suffered by each other. This may be interpreted to cover indirect losses as well.

Art.34 in NSC 05 also states the maximum total liability of the Contractor's Breach of Contract, which amounts to 25% of the Contract Price. Such a limitation is not stated in Contract 1, other than the limitation stated in *Art.26 – Suspension or termination due to Contractor's breach of Contract*. Here the Contractor's total liability under each Work Order is limited to 100% of the Compensation under the respective Work Order.

Comment: Although there is a significant difference between being liable for 25% of the Contract Price (according to NSC 05) and 100% of the compensation under each Work Order (according to Contract 1), one should keep in mind that a full contract will most often carry a lot more value than a single work order. Hence, the total liability of the Contractor may actually be less under Contract 1 than under NSC 05.

- Both Contract 1 and NSC 05 are governed by and interpreted in accordance with Norwegian law, and any court proceedings shall be brought before the district court in Stavanger.

4.1.2 Contents of Operational Risk in the exhibits of Contract 1

This following section is dedicated to highlighting how the exhibits of Contract 1 implement operational risk, and subsequently how the responsibility for this type of risk is divided between the parties. "*Operational risk"* is not mentioned explicitly in Contract 1. On this account, there is a need for searching for related terminology, such as (but not limited to):

- *Risk;*
- *Liability;*
- *Responsibility;*
- *Damage;*
- *Injury;*
- *Death;*
- *Loss;*
- *Accident;*
- *Safety*

and any form thereof. This will of course lead to a broad search, with a varying degree of relevance to the aim of the analysis. It is however necessary to read "between the lines" to be able to extract the information, if any is found. The following sub-chapters will present the findings of the above-mentioned terminology, and any related provisions, which carry relevance in the search for contents of *operational risk* in the exhibits of Contract 1.

4.1.2.1 Exhibit A – Scope of Work

This exhibit describes the provisions for the scope of work after the delivery of the Contract Object(s). Since Contract 1 is a frame agreement, the level of detail in this chapter is fairly low, as more detailed descriptions of the scope of work is reserved for the various work packages released in conjunction with the frame agreement.

- It is stated in the exhibit, that the *"Contractor shall plan and execute the Work with particular emphasis on safety, working environment, schedule and cost such that the Work can be completed safely on schedule and according to the agreed price ."*

Comment: This is a very general statement, which, as interpreted, comply the Contractor to perform the Work according to widely accepted industry practice.

- There is a specification of the division of responsibility between the various sub-contractors of the Company performing the Work and contributing to the performance of the Work. This states that the Company's other contractor(s) will have the operational responsibility for all surface handling and installation/retrieval operations of the equipment, and that the Contractor shall supervise this work, and only be responsible for the operation of the equipment delivered.

Comment: Such a clear statement of the division of responsibility between the various sub-contractors to the Company is highly important to avoid misunderstandings and conflicts arising from interface management. It also assigns risk handling to the party which is best suited at controlling the risk in a most efficient manner, that is, the party which has got the risk within its controls sphere. This is in compliance with acknowledged risk management theory.

- The Contractor is contractually obligated to ensure continuity in the personnel working on the Project, with special attention on offshore working personnel.

Comment: This highlights the risk of loss of personnel and competence. It is important to note that the risk of losing so-called key personnel can be difficult to calculate, as this risk depends on many intangible factors, such as working environment, internal company matters, external matters, etc. Losing key personnel in a project may lead to severe set-backs, causing both reputational and economic harm. As such, it represents a significant operational risk.

- There are quite detailed requirements to the Contractor's facilities, in where the Work will be performed, and the Contract Object(s) stored and maintained. This includes requirements of HSE-equipment such as safety-, first aid-, and firefighting equipment. There are also requirements of the Contractor's organization to include and implemented quality assurance- and HSE-systems.

Comment: Such requirements manifest the Contractor's responsibility in providing a safe workplace for both the equipment and personnel involved with the Work. This addresses the risk of having an unsafe working environment.

4.1.2.2 Exhibit B – Compensation

This exhibit, in addition to the appendices with the applicable rates, gives the details regarding the compensation to the Contractor for its services, and the prices and rates of equipment and personnel needed for performing the Work. The compensation scheme chosen in this agreement include lump sums, unit rates, daily rates and reimbursement. That is, the compensation depends on the nature of the service, i.e. whether the compensation covers personnel, produced equipment, rental equipment, etc.

It is further stated in the exhibit, that the choice of compensation method is solely the Company's prerogative, for whole work packages or parts thereof. It is stated that the Company reserves the right of paying the sums that should be compensated by lump sum or unit rates on a provisional sum basis. That means that the Contractor is deprived of the privilege of influencing the compensation format, which, as discussed in the theory-chapter, may present a significant part in the division of risk between the parties.

In addition, it states the various situations for which the Contractor is not remunerated, such as when being on standby-time or downtime. The Contractor is not reimbursed when the Contractor, the equipment or any other event considered under the Contractor's control under the Contract, is the cause of the standby-time. Standby-time is understood as lost productive time while performing work offshore, otherwise also known as downtime. In situations where the cause of the standby-time is outside of the Contractor's control, such as when the weather conditions are unfavourable for performing the intended work, the Contractor is remunerated according to the applicable day-rate. As such, the contract terms are in accordance with contract theory, where the parties are equally liable for, and compensated accordingly, for the risks that fall within their respective control spheres.

The Company also has the right to retain any payment of up to 10% of each monthly invoiced value, should the Contractor be found not to be in compliance with the Contract after implementation reviews, quality assurance audits or engineering technical audits within agreed due dates. This presents a powerful mean of the Company to ensure the Contractor complies with the Contract, and contrary, a substantial risk for the Contractor to always ensure that he is aligned with the terms and

conditions of the Contract. This represents an active use of incentives, and is in line with presented incentives theory.

In long-lasting contracts and frame agreements, the variance in prices and costs due to factors outside of either party's control, can pose a significant risk for the involved companies. These variances may be caused by, for example, inflation, changes in government tax regimes, interest rates, and or fluctuations in important commodities, such as the oil price. To mitigate this risk, Contract 1 has included escalation formulae, which are based on relevant published indexes from organizations such as BEAMA and the Norwegian Central Bureau of Statistics. The formulae use a benchmark value as a reference, e.g. the value of a certain index at the time of entering into the Contract, and apply changes to the day rates, lump sums and other agreed prices according to updated movements of that index at given time intervals. An important condition is included in the chapter on escalation in Contract 1. This condition states that the price after performing the escalation cannot, under no circumstances, be lower than the price before escalation. This effectively shields the Contractor from having to charge lower prices than initially agreed, and ensures that the Contractor is remunerated on a fair basis. For the Company, however, this clause prevents it from getting the Work performed at lower rates in times of recession.

4.1.2.3 Exhibit C – Contract schedule

This exhibit contains the provisions for the milestones and schedule for the progress of the Work within the frame agreement. Since the details of the respective work orders issued in the future are not revealed yet, this exhibit only states general provisions of administrative and operational milestones.

The exhibit also states the amount of liquidated damages in the event of breach of milestones. This is set to NOK 10,000 per day, however, limited to 10% of the total Work Order compensation, according to article 24.2 in Contract 1. This is in line with the incentives theory presented in chapter 2.1.2.

4.1.2.4 Exhibit D – Administration requirements

Exhibit D states the administrative requirements of the Contractor, and lays the foundation of important formalities such as means of communication and organization of the Work. It also states that the Contractor is obliged to be in compliance with the ISO 9000-family of quality assurance standards. There are no provisions saying that the Contractor is obliged to follow any of standards within the ISO 9000 specifically, other than being *"familiar with the ISO 9000 family"*. This standard is not aimed at providing guidelines for *risk management*, per se, as this is covered by the ISO 31000 Risk Management standard. However, there are no provisions in Contract 1 stating that this particular family of risk management standards (the ISO 31000) must be followed.

According to the exhibit, the Contractor must have documented HSE-systems, and conduct its activities so that the Work is performed without injury, loss of life or any other damages. It does not state how this HSE-system shall be formed, or the contents thereof, other than that it must comply with the Company's requirements for the management, supervision and monitoring of HSE.

Uncertainty is to be managed actively by the Contractor, according to the provisions of the exhibit. This goes for uncertainty of both negative and positive nature. It is stated:

"Uncertainty elements shall be handled systematically and include analysis of probability and consequence to risk areas representing loss potentials, and upside potentials representing possibilities for improvements."

Further, it states:

"Risk exposure and upside potentials shall focus on uncertainties related to contract cost, execution time and major milestones, as well as other technical/ financial areas which are of relevance in terms of LCC (Life Cycle Cost)."

It is not specified in the text how the term *risk* is to be understood, but it is fair to interpret that *uncertainty* is a central part of the definition according to Contract 1. Also, in line with the theory presented in this report, the concept captures the *upside* potentials involved with uncertain, or risky, events.

There is an appendix included in Contract 1, containing specific rules and regulations with regards to managing HSE in the frame agreement, attached to the exhibit. This prescribes the International Safety Management Code (ISM code) as a normative HSE Management System reference. Further, it

gives seven main HSE management activities, acknowledged as appropriate to follow in compliance with the agreement. These activities are:

1. Leadership and commitment;
2. Policy and strategic objectives;
3. Organization, resources and documentation;
4. Evaluation and risk management – identification and evaluation of HSE risks in relation to activities and focus on risk-reduction measures;
5. Planning and procedures;
6. Implementation and monitoring;
7. Auditing and reviewing.

There is also an inclusion of a set of definitions of important terminology, e.g. *incident, accident*, *loss potential, etc.,* however still no proper explicit definition of *risk* is included. It is further stated that:

"Contractor shall apply suitable and generally recognized methods for the identification, assessment, control and recovery of hazards and effects. These methods shall be documented."

It is not specified which methods that are considered *generally recognized*, but one must assume that there is a portfolio of widely used methodology for managing hazards and risks, such as hazards and operability study (HAZOP), failure-mode, effect and criticality analysis (FMECA), fault tree analysis (FTA), and others.

Under this exhibit, in the appendix *HES requirements* [sic], there is a special focus on the Contractor's responsibilities with regards to managing physical, chemical, ergonomic and psychosocial/organisational concerns in relation to performing the Work at the Contractor's premises. The Contractor is further obliged to follow the Company's proceedings and HSE-philosophy, in addition to any government issued laws and regulations relevant for the Work. However, there is no mentioning of the Company's obligations in facilitating these requirements while the Contractor is working on the Company's or its sub-contractor's facility, i.e. on the offshore vessel or other facilities provided by the Company. Parts of the Work, for example the installation work, are performed on premises that are not controlled by the Contractor. That leaves the Contractor in the hands of the goodwill of the Company, when it comes to facilitating the Work

according to the requirements laid down for HSE-management as described in the appendix. The Company will of course be bound by government laws and regulations to ensure a satisfactory regime and conditions for HSE, but as for the relationship between the Contractor and the Company, the Company carries no obligations towards the Contractor according to Contract 1.

The subsequent exhibits E (Specifications), F (Drawings), G (Company Provided Items), H (Subcontractors), J (Standard Bank Guarantee), K (Contractor's Proprietary Information) and L (Standard Parent Company Guarantee) do not contain any noteworthy formulations with regards to operational risk or any related matters. On this account, they have not been included for commenting in this analysis.

4.2 Analysis of Contract 2

In the following, a contract between the Service Company and a field operator (different than the one in Contract 1) will be analysed. The purpose of the contract is to regulate work in connection with aftermarket services for a subsea field on the NCS for a period of five years. The field operator, or Company, was relatively new on the NCS at the time of entering into the contract agreement, and did not have much experience as a field operator on the NCS. The Company has focused its core strategy in other parts of the World, but does also take part as a licensee in other fields on the NCS. The Contract is the only one between the parties, at least for work on the NCS, and it includes options of extension upon agreement between the parties.

The contract of interest is further denoted as "Contract 2" in the analysis. Also, for the sake of simplicity, "the Contractor" is to be understood as "the Service Company" and "the Company" is to be understood as "the field operator", or "the customer" of the Service Company, in the following text, in accordance with the terminology of Contract 2.

As performed on the previous analysis of Contract 1, a natural starting point is to compare the main parts of the various standard contract formats to that of Contract 2. See Table 5 below for an overview of the main parts of the standard contract formats and Contract 2.

Part	NTK 07	NF 07	NSC 05	Contract 2
I	General provisions	General provisions	General provisions	General provisions
II	Performance of the work	Performance of the work	Performance of the work	Performance of the work
III	Progress of the work	Progress of the work	Progress of the work	Progress of the work
IV	Variations, cancellation and suspension	Variations, cancellation and suspension	Variations and cancellation	Variations and cancellation
V	Delivery and payment	Delivery and payment	Delivery and payment	Completion and payment
VI	Breach of contract	Breach of contract	Breach of contract	Breach of contract
VII	Force majeure	Force majeure	Force majeure	Force majeure
VIII	Liability and insurances	Liability and insurances	Liability and insurances	Liability and insurances
IX	Limitation and exclusion of liability	Limitation and exclusion of liability	Proprietary rights, etc.	Other provisions
X	Proprietary rights etc.	Proprietary rights etc.	Other provisions	
XI	Other provisions	Other provisions		

Table 5: Comparison of the main parts in Contract 2 to the main parts of the standard contract formats (Norsk Industri, 2007b), (Norsk Industri, 2007a) and (Norsk Olje & Gass, 2005).

As can be seen from the table above, Contract 2 includes almost all of the main parts as the standard contract formats, and is close to NSC 05 in terms of main contents, with the exception of Contract 2 lacking part IX on proprietary rights. However, when looking more closely into the articles included in Contract 2, it is evident that the articles under part IX in NSC 05 are in place in Contract 2 after all. See Table 6 below for an overview of the main parts and articles of NSC 05 and Contract 2.

Part	NSC 05	Part	CONTRACT 2
I	GENERAL PROVISIONS	I	GENERAL PROVISIONS
Art.1	Definitions	Art.1	Definitions
Art.2	Contract documents – interpretation	Art.2	Contract documents – interpretation
Art.3	Representatives of the parties	Art.3	Representatives of the parties
II	PERFORMANCE OF THE WORK	II	PERFORMANCE OF THE WORK

Art.4	Obligations of Contractor and Company – main rules	Art.4	Obligations of Contractor – main rules
Art.5	Authority requirements – permits	Art.5	Authority requirements – permits
Art.6	Drawings and specifications – Company Provided Items	Art.6	Company provided documents
Art.7	Subcontracts	Art.7	Contractor provided documents
Art.8	Contractor Personnel	Art.8	Subcontracts
Art.9	The Spread	Art.9	The Site
Art.10	Quality assurance and health, safety and environment	Art.10	Personnel for the Work, trade union activities
III	PROGRESS OF THE WORK	III	PROGRESS OF THE WORK
Art.11	Contract Schedule – delayed progress	Art.11	Contract Schedule – delayed progress
IV	VARIATIONS AND CANCELLATION	IV	VARIATIONS AND CANCELLATION
Art.12	Right to vary the Work	Art.12	Right to vary the Work
Art.13	Effects of Variation to the Work	Art.13	*Not in use*
Art.14	Issue of Variation Orders	Art.14	Issue of Variation Orders
Art.15	Consequences of variation orders – disputes about consequences	Art.15	Consequences of variation orders – disputes about consequences
Art.16	Dispute as to whether a variation to the work exists – disputed variation order	Art.16	Dispute as to whether a variation to the work exists – disputed variation order
Art.17	Cancellation	Art.17	Cancellation
Art.18	Company's right to temporarily suspend the Work.	Art.18	Company's right to temporarily suspend the Work.
V	DELIVERY AND PAYMENT	V	COMPLETION AND PAYMENT
Art.19	Delivery and Completion of the Work	Art.19	Delivery and Completion of the Work
Art.20	Payment, invoicing and audit	Art.20	Payment of the Contract Price – invoicing and audit
Art.21	Security for Company's claims	Art.21	Security for Company's claims
Art.22	Title – right to demand delivery	Art.22	Title to the Contract Object; right to demand delivery
Art.23	Contractor's guarantee – acceptance certificate	Art.23	Contractor guarantee – acceptance certificate
VI	BREACH OF CONTRACT	VI	BREACH OF CONTRACT
Art.24	Contractor's delay	Art.24	Contractor's delay

Art.25	Contractor's defects and guarantee liability	Art.25	Contractor's defects and guarantee liability
Art.26	Termination due to Contractor's breach of Contract	Art.26	Termination due to Contractor's breach of Contract
Art.27	Company's breach of Contract	Art.27	Company's breach of Contract
VII	FORCE MAJEURE	VII	FORCE MAJEURE
Art.28	Effects of Force Majeure	Art.28	Effects of Force Majeure
VIII	LIABILITY AND INSURANCES	VIII	LIABILITY AND INSURANCES
Art.29	Loss or damage to the Contract Object or Company Provided Items	Art.29	Loss of or damage to the Contract Object or Company Provided Items
Art.30	Exclusion of liability – indemnification	Art.30	Exclusion of liability. Indemnification
Art.31	Insurance	Art.31	Insurances
IX	PROPRIETARY RIGHTS, ETC.	Art.32	Limitation and exclusion of liability
Art.32	Rights to information, technology and inventions	Art.33	Rights to information, technology and inventions
Art.33	Confidential information	Art.34	Confidential Information
X	OTHER PROVISIONS	X	OTHER PROVISIONS
Art.34	Limitation and exclusion of liability	Art.35	Assignment of the Contract, etc.
Art.35	Assignment – mortgage	Art.36	Applicable laws and disputes
Art.36	Notices	Art.37	Care of Company owned equipment and/or materials
Art.37	Norwegian law and disputes	Art.38	Governing language
		Art.39	Non-waiver default
		Art.40	Conflict of interest
		Art.41	Tax

Table 6: Comparison of the main parts and articles of Contract 2 and NSC 05 (Norsk Olje & Gass, 2005)

As can be seen from the table above, there are some differences in the contents of Contract 2 and the standard format of NSC 05, where some articles are omitted while others are added. However, for the main parts, it seems to be following the same structure. And since Contract 2 is concerning aftermarket services involving a subsea field, the NSC 05 standard format is the best choice of reference.

In the following sub-chapter, the provisions in the articles of Contract 2 will be compared with the contents in the articles of NSC 05.

4.2.1 Comparison between Contract 2 and NSC 05

Important similarities and differences between the conditions of contract in NSC 05 and Contract 1 are listed below. The findings may be of a more or less relevant nature to the topic of this report. The less relevant findings are included for the curiosity and added perspective of the reader, while the more relevant findings are included and followed by a comment. The intention is to find out how the terms and conditions in Contract 2 are in comparison with the reference, which is the standard format of NSC 05.

- Contract 2 only utilizes the exhibits A (Scope of Work), B (Compensation), C (Contract Schedule), D (Administration Requirements) and F (HSE). The other exhibits usually included are not in use in Contract 2.

Comment: By leaving out the other important exhibits, such as exhibit G – Company Provided Items, exhibit H – Subcontractors, exhibit I – Company's Insurances, etc., the contracting parties leave a lot of useful information in the dark. Also, a lot of provisions on division of liability may be unresolved. This can potentially cause problems during the contract period.

- *Article 4 – Obligations of Contractor – main rules*, is generally more specific in Contract 2 than in NSC 05. In addition to the provisions stated in NSC 05, the article in Contract 2 includes statements on the role of a third party, or an Affiliated Company, i.e. a company that the Contractor controls 20% or more of the share capital in, or vice versa. Also worth mentioning, is the fact that there are no statements of the obligations of the Company given in the article. Art. 4 in NSC 05 also include the obligations of the Company.

  Where NSC 05 includes the rights of remuneration and adjustments in Contract Schedule for the Contractor in case of prevention of the Work due to weather downtime (Art. 4.7), Contract 2 gives no such considerations in the above-mentioned article.

Comment: Not including the obligations of the Company under the main rules, presents an unfair balance in the Contract. Also, downtime due to unfavourable weather conditions is very common in the North Sea, and the provisions concerning this event should be included in the Contract, as it is in NSC 05.

- *In Article 5 – Authority requirements – permits*, Contract 2 includes the parties indemnification of each other in the event where either party fails to maintain or obtain required approvals, licenses, authorizations and permits, and costs and/or payments are incurred on this account. This is not included in article 5 in NSC 05.

Comment: This statement of indemnification may prove to be useful in the event where one party is not able to maintain the necessary approvals, licenses, etc. Thus, it presents a shield against this risk for the affected party, whose ability of controlling this risk is very limited, if possible to control at all.

- *Article 6 – Company Provided Documents*, differs between NSC 05 and Contract 2. In NSC 05, the article is regarding Company Provided *Items*, i.e. all documents and equipment provided by the Company, whereas article 6 in Contract 2 is regarding Company Provided *Documents*, i.e. only the documentation in relation to the Work. Article 7 in Contract 2 is about the *Contractor* Provided Documents.

  Article 6 in Contract 2 states the Contractor's entitlement to adjustments in the Contract Price and/or Contract Schedule in the event where defects, conflicts, omissions, errors and inconsistencies are discovered in the Company Provided Documents, and when they are presented to the Company without unreasonable delay. Such a statement is not included in article 6 in NSC 05, with the exemption of adjustments to the Contract Price and/or Contract Schedule as a compensation for delays or costs incurred as a result of soil and seabed conditions at the installation site. Soil and seabed conditions are not a part of the provisions in Contract 2.

  Should the Contractor fail to give notice to the Company, or fail to discover defects which ought to have been discovered, and this incurs a direct extra cost for the Company, which is not covered by insurance, then the Contractor is obliged to carry all such costs.

Comment: This presents a significant risk for the Contractor. For example, if the Company has provided the Contractor with operational procedures for some equipment, and this contains errors which were not, but ought to have been, discovered by the Contractor before use, and this leads to equipment damage, the Contractor is liable for any extra costs incurred for the damages caused by the misuse. This emphasizes the importance for the Contractor to go through all Company Provided Documents to mitigate this risk.

- *Art.7 – Contractor Provided Documents* in Contract 2 states that the Contractor has got a *"…full responsibility for Contractor Provided Documents."* An interesting thing to notice here

is that while the *Contractor* is responsible for discovering and notifying the Company of any findings of errors in the *Company Provided Documents*, no such obligations are applicable for the Company when it comes to discovering errors in the *Contractor Provided Documents*.

Comment: This presents an unfair division of responsibility on behalf of the Contractor. Both parties should be equally responsible for discovering and notifying each other of faults in their respectively provided documents.

- Contract 2 includes a separate article (article 9) regarding the Site where the Work is being performed. Parts of what is included in this article is found elsewhere, under slightly different, however not significant, formulations in the NSC 05.

- *Article 10 – Personnel for the Work, trade union activities* in Contract 2 prescribes a penalty for the Contractor in such cases where personnel considered as *key personnel* are withdrawn from their positions without the Company's prior approval. Such a penalty is not included in NSC 05. In NSC 05, there is a clause in article 8 – Contractor's personnel, stating that the Contractor must obtain the Company's approval before appointing, transferring or replacing key personnel.

Comment: This highlights the risk of losing important personnel in the duration of a project. The loss of key personnel may have adverse effects on the progress and performance of the project, which in turn induces a cost element. Mitigation of this risk includes proper documentation and communication within the project team, and ensuring a well-prepared transfer of competence should personnel be removed from the project.

- *Article 9 – the Spread* in NSC 05 is not included in Contract 2, nor mentioned in any other relevant article in the conditions of contract. This article presents the requirements for the Spread to be used in connection with the Work.

Comment: The Spread is an integral part in the performance of the Work, and as discussed earlier, the risks involved with having equipment failure and/or damage, is always present. When provisions concerning the Spread are not implemented in Contract 2, it fails to address this risk.

- The provisions given in *article 10 – Quality assurance and health, safety and environment* in NSC 05 are included in *article 4 – Obligations of Contractor – main rules* in Contract 2.

- *Article 13 – Effects of Variation to the Work* in Contract 2, resembles to a large degree article 13 in NF 07, more than article 13 in NSC 05. Article 13 in Contract 2 and NF 07, includes a

condition in where the Contractor Price is increased by 6% on the difference between the new and original Contract Price, should the Contract Price be reduced to below the original Contract Price as a consequence of accumulated Variation to the Work.

Comment: This clause shields the Contractor, to some degree, against the consequences of deflating the value of the Contract Price due to variations to the Work. However, the clause is conditional on that the Contractor is not able to utilize his freed workforce (due to less work related to the Contract) elsewhere.

- *Article 15 – Consequences of Variation Orders – disputes about consequences* in Contract 2, fails to state the claimant party's right of being paid interest rates on the differential amount between the provisional payment (upon initiation of dispute) and the final payment (after solving the dispute), according to "Forsinkelsesrenteloven" (Interest on Overdue Payment) in Norwegian legislation. This is explicitly stated in NSC 05.

Comment: The interest rate may be a substantial amount of money. However, one must assume that the legislation in "Forsinkelsesrenteloven" is applicable, even though the term is not explicitly stated in Contract 2.

- *Article 17 – Cancellation* in Contract 2, includes a clause which states that the cancellation fees entitled to the Contractor, shall only apply if the value of the cancellation in total exceeds 20% of the original Contract Value. Such a clause is not included in NSC 05.

  Also, NSC 05 includes cancellation fees based on time to mobilization, where the cancellation fee is increased in percentage of the Contract Price as the time to mobilization is approached. This is not included in Contract 2.

Comment: This implies that the Contractor must carry much of the fees involved with cancellation of the Work in relation to the Contract. This threshold percentage value enables the parties to share more of the costs involved with a contract cancellation. It should be noted however, that the Company is either way responsible for compensating the Contractor for Work performed up until the cancellation, and for any Materials purchased in connection with the Work, before cancellation took place.

- *Article 18 – Company's right to temporarily suspend the Work* in Contract 2, adds the right of the Contractor to cancel the Contract should the Work or parts thereof be suspended continuously for a period exceeding 120 days, by giving the Company 14-day notice. Such an

option is not given to the Contractor in article 18 of NSC 05. However, under article 18 in NSC 05, the Contractor is given the right to demobilize the Spread to fulfil other commitments, e.g. to service other contracts, should the Work be suspended in exceedance of 10 days.

Comment: The possibility of cancelling the Contract after a period of suspension provides a valuable option for the Contractor, as he is then free to pursue other, more fruitful contracts. This evens out the Company's and Contractor's rights of suspending or cancelling the Work, should the other party not fulfil its obligations.

- *Article 20 – Payment of the Contract Price – invoicing and audit* in Contract 2, states the right of the infringed party to be paid interest according to "Forsinkelsesrenteloven" (Interest on Overdue Payment) in Norwegian legislation, should the other party not be able to pay for its obligations in accordance with the Contract. This condition is not explicitly included in NSC 05.

Comment: As mentioned earlier, one must assume that the "Forsinkelsesrenteloven" is applicable anyway, although the terms are not explicitly stated in the NSC 05.

- The maximum liability under the Bank Guarantee is amounted to 10% of the Contract Price, according to article 21 in Contract 2. This coincides with the amount in NSC 05.

- The maximum amount of accumulated liquidated damages is limited to 10% of the Contract Price, according to *article 24 – Contractor's delay* in Contract 2. This is also stated in NSC 05.

Comment: Such a clause shields the Contractor against the risk of having to pay a substantial amount of money in liquidated damages to the Company. It is assumed that the clause is included to avoid having a situation where the Contractor is fined to a degree where the option of walking away from the Project is actually better than finishing it. It is very costly for both parties to abandon the Contract in mid-term, and hence it should be in the interest of both parties to finish the Work. This coincides with incentives theory, in that placing too much weight on incentives (i.e. increasing the risk for the Contractor), could prove to damage the intention of the incentives scheme.

- According to article 25.4 in NSC 05, the Contractor's liability for rectification work after the issue of the Completion Certificate and for damages under article 25.3, is limited to 15% of the Contract Price. Such a limitation is not included in Contract 2.

  Contract 2 includes a clause in article 25, which indemnifies the Contractor from any extra costs associated with rectification work below the water line. This clause is not included in NSC 05.

Comment: The costs associated with such rectification work could prove to be substantial, and the risk for the Contractor would consequentially be high. However, by introducing a shield from any extra costs associated with rectification work below the water line, the Company is most likely more suited at carrying the costs and absorbing the risks involved with such work. This is also in line with presented theory.

- *Article 26 – Termination due to Contractor's Breach of Contract* in NSC 05, includes clauses regarding termination due to the Spread not performing as intended or within the provisions of the Contract. As mentioned, the Spread is not included in any termination clauses in Contract 2, nor in any other articles for that matter.

  According to Contract 2, if the Contract is terminated, the Company is entitled to use the *Contractor's Site*, equipment, tools, drawings, etc., as necessary to complete the Contract Object, at the Company's cost. Such work can also be performed by a Third Party appointed by the Company. Such a clause is not included in NSC 05, other than the Company's entitlement to take over from the Contractor, the Contract Object, Subcontracts, Company Provided Items, Materials and other relevant documents. However, the Company is not entitled to use the Contractor's Site for this work according to NSC 05.

Comment: Further provisions on division of responsibilities and liabilities regarding the Company's or any Third Party's work on the Contractor's Site, without the Contractor's involvement, are not included in Contract 2, other than that the Contractor shall not be liable for any Work performed by others or providing a guarantee for such work. It is stated that this option is only applicable for a limited time period and that any business secrets or know-how acquired during such work shall only be used for the completion of the Contract Object.

  Also, article 26 in Contract 2 specifies the maximum liability of the Contractor for consequences arising due to termination of the Contract, due to the Contractor's breach of contract. This is set to 10% total and aggregate of the part of the work terminated. In any event, the Contractor's total accumulated liability in Contract 2 is limited to 100% of the Purchase Order price. This is not specified in article 26 in NSC 05.

Comment: A total accumulated liability of 100% of the Purchase Order Price presents a great liability for the Contractor, but at the same time shields against the indirect costs which may arise from a contract cancellation, and which are fully carried by the Company.

- *Article 27 – Company's Breach of Contract* in NSC 05, specifies the Company's obligations of paying interest to the Contractor in accordance with "Forsinkelsesrenteloven" (Interest on Overdue Payment) in Norwegian legislation, should it be late with payments that are due to the Contractor according to the Contract.

  Also, the article gives the Contractor the right of suspending the Work or terminating the Contract in the event where the Company is in substantial breach of its payment obligations.

  Neither of the above-mentioned clauses are included in Contract 2, omitting an important contractual option, i.e. suspension or termination of the Contract, for the Contractor.

Comment: As mentioned before, one must assume that the ruling legislation is applicable in situations such as these, and that while Contract 2 does not explicitly state the obligations of the Company, it is still liable by law.

- *Article 28 – Force Majeure* in Contract 2, presents a rather detailed overview of situations which may be characterized as being caused by *force majeure*, in addition to situations which are *not* considered to be caused by *force majeure.* Such a detailed description is not included in NSC 05.

  In NSC 05, the Company is given the right to cancel the Contract if a *force majeure* situation lasts without interruption for 60 days or more, while the Contractor is given the same right after 180 days. In Contract 2, both parties are given the right to cancel the Contract after 180 days or more of an uninterrupted *force majeure* situation.

Comment: *Force majeure* situations are, by definition, outside of the control sphere of either involved party. Hence, it is only fair and logical that each party shall reserve the same rights of contract cancellation if a *force majeure* situation should be prevailing. In this instance, Contract 2 must be considered to be fairer than NSC 05.

- According to *article 29 – Loss of or damage to the Contract Object or Company Provided Items* in Contract 2, the Contractor is responsible for any loss or damage to Company Group's property, while all such property is in Contractor Group's (including any Subcontractors) care, custody and control. This liability is limited to $250,000 for any one occurrence for the Contractor. In article 29 in NSC 05, the Contractor is indemnified from this liability when the loss or damage is caused by the Company Group, or when the loss or damage is due to war or nuclear damage.

Comment: Having the Contractor liable for loss or damage to the Contract Object or Company Provided Items is fair according to risk theory, as the Contractor is then the party better suited at controlling the risk. Also, including a cost limit to the damages incurred provides the Contractor with an important shield against damages that are disproportionally large.

- *Article 30 – Exclusion of liability – indemnification* in Contract 2, limits the Contractor's liability for loss or damage arising out of each accident to $2 million, while NSC 05 operates with a $5 million limit with the same terms.

  In NSC 05, article 30 states that the Company *"shall indemnify the Contractor Group against all claims and losses which arise out of or in any way relate directly and/or indirectly to performance of the Work or is caused by the Contract Object in its lifetime and resulting from one or more of the following:*

  a) Reservoir seepage or pollution originating underground

  b) Fire, explosion or blow-out of any well or reservoir

  c) *Escape of product from any facility, including pipeline or other subsea or surface facility, at any offshore and/or onshore Site."*

  In Contract 2, the above-mentioned indemnification is not mentioned. However, in Contract 2, the Company is obliged to reimburse the Contractor for loss of or damage to property, materials or equipment of Contractor Group, which occurs while in-hole (i.e. when performing work in the well) or below the rotary table (i.e. drill floor on a drilling rig or ship), unless caused by defective equipment or by Contractor's negligence. Also, the Company takes the responsibility of fishing for in-hole equipment of the Contractor Group while in-hole or below the rotary table.

Comment: Such operations, normally performed by means of wireline work in the well, can be very costly, and involves the work of other sub-contractors to the Company. On this account, the Contractor is shielded from a potentially high-cost and high-risk operation in Contract 2. This must be considered to be in line with risk theory, as the Contractor is then shielded against risk that is to a large degree outside of his control sphere.

- *Article 31 – Insurances* in Contract 2 does not specify that the P&I insurance (Protection & Indemnity insurance) needs to be effected with a member of the International Group of P&I Clubs, or comparable insurers, as it is specified in article 31 in NSC 05.

- *Article 32 – Limitation and exclusion of liability* in Contract 2 (corresponds to article 34 by the same name in NSC 05), states that the Contractor's total liability in case of Breach of Contract is limited to 100% of the Purchase Order Value (i.e. the contract value). In NSC 05, this limit is set to 25% of the Contract Price.

  In addition, each party agree to indemnify each other for any indirect losses, such as loss of earnings, loss of profit, loss due to pollution and loss of production. This applies regardless of any liability, whether strict or by negligence of either party.

Comment: Being liable for a maximum amount of 100% of the Purchase Order Value (contract price) in Contract 2, as opposed to being liable for 25% of the Contract Price in NSC 05, substantially increases the risk exposure of the Contractor in Contract 2, compared to in NSC 05.

When it comes to the provisions on indirect losses, such losses may prove to become substantial, but may, due to their nature, be very difficult to tie to the events leading to the loss in the first place. By avoiding disputes concerning indirect losses at all, the parties mitigate potentially time-consuming and costly court proceedings, should a conflict between the parties be escalated.

- *Article 37 – Care of Company owned equipment and/or materials* in Contract 2, is not included as a separate article in NSC 05. This states the Contractor's responsibility for the Company owned equipment and the Contractor's obligations of making good any loss or damage. This is also partly covered by article 29 – Loss of or damage to the Contract Object or Company Provided Items, where also an upper limit of liability of $250,000 is included.

Comment: The risk of damage and failure of equipment and tools used offshore is always present. The Contractor is usually responsible for operating and maintaining this equipment, due to the knowledge and know-how the Contractor possesses on the equipment. Being responsible for any damages and failure of the equipment is therefore just and in accordance with presented theory, as it falls within the Contractor's control sphere. Also, by introducing an upper limit of liability in this matter, the Contractor is shielded against the events where equipment failure induces abnormally high costs.

- Contract 2 has included a clause regarding conflict of interest in *Article 40 – Conflict of interest*, which is not included in NSC 05.

Comment: This clause is most likely included to emphasize the importance of avoiding bribery, corruption and other dealings that would cause harm to the intentions in the Contract, and the

parties involved therein. The risk of damage to reputation and business caused by bribery and corruption is especially high for international companies involved in contracts in countries and regions where such conduct is more prevalent.

- Contract 2 also includes an article regarding government tax payments, the provisions thereof and its impact on the relationship between the Contractor and the Company. Such provisions are not included in NSC 05, as this, on all accounts, is mainly a matter between the Norwegian state and the respective parties.

Comment: This article is perhaps included anyhow, to stress the Company's exclusion from any taxation disputes that the Contractor, or its Subcontractors, might have with the authorities. As such, the risk of being entangled into a potentially damaging tax dispute is clearly addressed in the Contract.

4.2.2 Contents of Operational Risk in the exhibits of Contract 2

This following section is dedicated to highlighting how the exhibits included in Contract 2 implements operational risk, and subsequently how the responsibility for this type of risk is divided between the parties. As in Contract 1, *Operational risk* is not mentioned explicitly in any parts of Contract 2. On this account, there is a need for searching for related terminology, such as:

- *Risk;*
- *Liability;*
- *Responsibility;*
- *Damage;*
- *Injury;*
- *Death;*
- *Loss;*
- *Accident;*
- *Safety*

and any form thereof. This will of course lead to a broad search, with a varying degree of relevance to the aim of the analysis. It is however necessary to read "between the lines" to be able to extract the information, if any are found. The following sub-chapters will present the findings of the above-mentioned terminology, and any related provisions, which carry relevance in the search for contents of *operational risk* in the exhibits of Contract 2. As in the previous text, findings which require special attention are commented on within the text.

4.2.2.1 Exhibit A – Scope of Work

This exhibit describes all the types of Work included within the provisions of the Contract, including a high-level description of the deliverables and services to be supplied by the Contractor. More detailed descriptions of the Scope of Work are reserved for the Purchase Orders issued before the various service works to be performed as part of the Contract.

- There is no explicit mentioning of *operational risk*, *hazards*, *risk*, *probability/consequence* or any other risk-related terms in the exhibit. However, it is stated that the Contractor obliges to plan and execute the Work with a high focus on the working environment, schedule, cost and safety. Also, the Contractor must ensure that the Work is performed in accordance with good practice, and by qualified and competent personnel.

Comment: These provisions are highly general and do not provide any specific restrictions or guidelines for the Contractor to relate to.

- There is no mentioning in this exhibit of any safety standards, risk standards, quality management standards, or any other industry standards, that the Contractor must be in compliance with, in connection with the Work within the frames of Contract. There is a requirement for the Contractor to have in place a Quality Management System and to participate in safety activities and administration within the frames of the Contract, but there are no further details or descriptions on the form this shall take.

Comment: This lack of reference to a common standard to follow in connection with the work might prove challenging, and induce subjectivity into the valuation of the performance of the Work.

- The Contractor is obliged to provide an organization with the professional qualifications necessary to conduct the offshore operations and onshore maintenance work. There is no further description of what these qualifications shall be.

Comment: By not specifying the various qualifications required for the performance of the Work, the Company entrusts the Contractor into delegating the required qualified personnel to conduct the Work in accordance with the provisions of the Contract.

- The facilities of the Contractor, where the Work, or parts of the Work is taking place, is required to be maintained in a clean, safe and tidy condition.

- The Company is appointed and responsible for handling the interfaces between the various subcontractors of the Company, who are involved in performing the Work.

Comment: This statement is important, as there is a need for a high-level coordination of the interfaces that exist in connection with performing the Work, especially in offshore operations. The Company is a natural choice for such a role, as it is the Company's subcontractors that are performing the Work. This is also in line with accepted risk theory.

- It is stated that the Contractor is responsible for *"management of Contractor health and safety and protection of the environment"*. It is not specified how this is to be managed, or to what standard the HSE-program shall be.

- The Company shall approve the personnel who are to perform the Work during offshore operations. This approval shall not be unreasonably withheld. The requirements of the offshore personnel is that they have the necessary certifications (courses and health certificate), and a proven ability to perform the work in a safe manner, to protect the environment, the health and safety of the Company's and Contractor's personnel, their families and the public.

Comment: Human error is a constant risk in any operation, and the consequences thereof may be severe when performing offshore operations. On this account, ensuring the competence and proper qualification of the offshore personnel becomes an important mitigating factor of this operational risk.

4.2.2.2 Exhibit B - Compensation

This exhibit provides the information on the provisions regarding the compensation from the Company to the Contractor, with applicable rates, sums and prices for equipment and personnel. In addition, the delivery terms for the equipment to be used in connection with the Work is presented.

- The prices assigned in the Contract are subject to adjustment according to a formula. The input into the formula is the original rates at contract reward and labour wage index movements, published by the Norwegian Central Bureau of Statistics. It is important to note that following adjustment, the rates and fees can be adjusted both upwards and downwards.

Comment: This induces uncertainty for both the Contractor and the Company, and would thus intuitively be considered to be fairly divided. However, the respective parties' ability to absorb changes in rates may be substantially different, and beyond the vision of this report. The question of a fair division of this risk must on this account remain unsolved in this report.

- The Company is responsible for and will be fully charged for any loss or damage beyond repair of rental equipment used in performing the Work. This also applies for replacement of seals and, of damaged, or non-reusable parts.

Comment: As discussed previously, the risk of having equipment failure and damage during operations are always present, and may constitute a major risk as well, in that third party equipment may also be affected, in addition to injury to personnel. By taking on this responsibility, the Company shields the Contractor from this risk. There is however a question if rather the Contractor should carry some of this risk, as he is usually the operator of the rental equipment, and thus the closest party to controlling the risk.

- The Company is also obliged to compensate the Contractor in the event where rental of equipment is cancelled by the Company and the reasons for doing so is outside the Contractor's control sphere.

Comment: This is a fair clause, and by compensating the Contractor for its losses due to a cancelled equipment rental, the Company shields the Contractor from risks that are outside of the Contractor's control sphere.

4.2.2.3 Exhibit C – Contract Schedule

The Contract Schedule will be included in each applicable Purchase Order. There is no high-level schedule for the whole duration of the Contract. On this account, there are no findings worth mentioning in this exhibit.

4.2.2.4 Exhibit D – Administration requirements

This exhibit presents the Company's requirements for the administrative work and conditions in connection with the Contract. It is stated in the exhibit that it is desired from the Company that the Contractor utilizes his own internal system, methods and procedures, and that the provisions of the exhibit are merely a guide to ensure that the required quality, safety level and control over the Work is accomplished.

- The Contractor is obliged to operate a documented quality system in conformance with the ISO 9000 series, or equivalent.

Comment: The ISO 9000-series is concerning quality management.

- It is stated that non-conformance handling shall be in compliance with ISO 9001:2000, clause 8.3, regarding non-conforming products.

- Quality plans for the Work shall be in accordance with the requirements laid down in ISO 9004, section 5.3.3, or similar. ISO 9004, section 5.3.3 presents guidelines on deploying strategies and policies.

- The Contractor is obliged under the Contract to have a corporate HSE policy document. The Company reserves the right to audit the Contractor's HSE system and its implementation. This audit will be performed by using recognized standards.

Comment: It is not further stated what these standards might be, or who will be the responsible party for recognizing these standards (the Company or any Third Party). This induces uncertainty for the Contractor, as it is not clear from the statements in the Contract whether his HSE policy document is in line with the Company's expectations or not.

- The Contractor's nominated personnel for performing the Work shall be responsible for the performance of the Work, progress control, planning, cost control, interface work and reporting. The Company is to be notified when significant changes are made to the organization or personnel.

Comment: Again, this highlights the awareness of the operational risk of losing key personnel in a project.

- With regards to risk, the Contractor is obliged to implement a Risk Management System which describes how the identified risks are mitigated and controlled. According to the

exhibit, the Contractor shall register the *ten* most important risks, and the corresponding descriptions of risk-reducing actions, for tools and equipment that are constructed and delivered as part of the Contract.

Comment: The exhibit does not present any provisions with regards to any *risk management standards* the Contractor must adhere to, such as ISO 31000. Nor does it state the rationale behind why the *ten* most important risks must be registered (why not, say, *eleven*?).

- The Contractor is responsible for ensuring that all transportation and lifting appliances provided by the Contractor for storage and transportation are inspected, testes and approved according to the regulations from the Directorate of Labour Inspection ("Arbeidstilsynet"). With regards to transportation of equipment and tools related to the performance of the Work, the Contractor is responsible for transportation between the Contractor's base and the Company's onshore base, or nominated heliport.

Comment: Damages and mishandling of equipment and tools during transportation and handling, both offshore and onshore presents a significant risk (see chapter 2.2.2.4). The Contractor is however best suited at controlling this risk, as the Contractor in most cases, ensure the packing and preservation of equipment to be used in the Work, before being transported between the various locations. As such, this statement is in line with presented theory.

- In addition to the requirements mentioned above, which are mainly directed at the Contractor, the exhibit also presents a number of obligations of the Company. This includes:
    - Helicopter transportation for personnel to and from the offshore Worksite.
    - First aid and medical services at the offshore Worksite, in addition to provision of rescue and survival equipment.
    - Containers for disposal of chemicals, contaminated material and any toxic or hazardous substances originating from the Work performed offshore, and the disposal of such material.
    - Cranes for lifting the equipment and tools at the supply base and at the offshore Worksite.
    - Provision of special personal protective equipment (PPE) at the offshore Worksite.

Comment: The list of Company obligations presented above, include some operations involving significant risks and hazards for the project personnel, such as helicopter transportation. Specifying the Company's responsibility of handling the risks involved with this, presents an important division of liability, as it is the Company who is the most suited party at controlling this risk.

- The Contractor Group has the right to remove all or some of its personnel from the Company worksite, should the personnel, in the Contractor Group's reasonable opinion, be imperilled by a lack of security, safety concerns, local conditions, terrorist acts and threats. The Company is obliged to assist in any evacuation of Contractor Group's personnel, and the situation shall be considered as a Force Majeure situation.

  In addition to the contents stated above, the exhibit contains the following attachments:

  - Document Handling Instruction
  - Specification for Data Transfer to Operations
  - Requirements for DFO – Documents for Operations
  - MC/Commissioning Procedure

  However, none of the above-mentioned attachments contain any matters relevant for the topic of this report.

Comment: This option provides a valuable opportunity for the Contractor in situations where there is a difference of opinion with regards to the view of the security level at the worksite, e.g. in situations where the Company might compromise the safety of the Contractor personnel.

4.2.2.5 Exhibit F – HSE

This exhibit presents the requirements of the Contractor with regards to health, safety and environment.

- The Contractor and its Sub-Contractor(s) oblige to pursue the highest standards of HSE performance. There is however no reference to which standard this should be (ISO-standards or equivalent), other than *"relevant HSE regulations"*.

Comment: This lack of specification of a safety standard to adhere to, might present the parties with challenges as the Work is performed and conflict with regards to the safety level arise.

- The Contractor shall ensure that its employees understand and are aware of any specific risks involved with performing the Work, and how these risks are managed. The Contractor is also responsible for the competence of the provided personnel to the Work, and to ensure that they possess the necessary technical and vocational training.

Comment: No explicit or implicit definitions of *risk* are included. Nor does the text make any suggestions for tools to be used in the risk management efforts.

- The Contractor shall also comply with and ensure that its own HSE Management System is compatible, as far as reasonably practicable, with the Company's HSE Management System.

Comment: Reaching a common understanding of risk and risk management between the contracting parties is important in the efforts to reduce the risk level connected with the work.

- Material safety data sheets for chemicals and substances must meet the requirements of the authorities.

- The Contractor is responsible for providing its own personnel with PPE suitable for the working environment and the risks the personnel are exposed to.

- The Contractor is also required to co-operate with the Company in managing the environmental effects arising from the Work and operations, including minimizing the impact of the operation on the environment, both onshore and offshore. Further, the Contractor is obliged to notify the Company if any routine or non-routine emissions and discharges are made in connection with the Work.

Comment: This highlights the parties' joint responsibility in minimizing the environmental impact of the operations in connection with the Work.

- All incidents and near-misses, that is, events that would become accidents under different circumstances, shall be reported to the Company. The Contractor is required to co-operate with the Company during investigations of said incidents, and to implement any corrective and preventive measures identified.

- It is a requirement for the Contractor to measure and monitor the HSE performance when the Work is being performed. Should emergencies occur, the Contractor is obliged to provide an appropriate response and to facilitate support capabilities for emergency response in co-operation with the Company.

Comment: Joint effort of risk mitigation and prevention in the aftermath of near-misses and occurred accidents presents an important measure to reduce the overall risk level. It is vital that this work involves both parties, as then both parties' views and expertise on the matter are recorded.

4.3 Comparative analysis between Contract 1 and Contract 2

In the following text, a comparative analysis between Contract 1 and Contract 2 will be performed. This is of interest in order to see how the two different contracts with two different field operators and the same service company differ in its build-up and ruling principles, and to present some context to the interpretation of the contents of the two contracts. To separate the two customers involved in Contract 1 and Contract 2, they are further denoted as Company 1 for the company in Contract 1, and Company 2 for the company in Contract 2.

When it comes to comparing different contracts with each other, there are some dimensions and features that are particularly interesting to look for. These features may have an impact on the important functions of the contracts, e.g. the division of liability and risk within the contractual relationship. The particularities in the two contracts which are the most interesting in this perspective include:

- The difference in strength and size between the contracting parties in the contracts (financial, organizational, experience, etc.)
- The relations between the contracting parties (former transactions, strategic positioning in the market, etc.)
- The difference of nature of the contract object or delivery in the contracts (complexity, size, quantity, uniqueness, etc.)
- The intrinsic differences in the terms and conditions of the contracts (chosen compensation format, weighing of liabilities in a particular direction, risk sharing, duration of contract, etc.)

While Company 1 is a large player on the NCS, Company 2 carries less weight and experience in the same geographical area. This should emphasize the benefits of using standard contract formats, such as the NSC 05, to ensure that new entrants into the NCS can better implement and understand the

contracting traditions and practices in the area. It could also be assumed that Company 2, being strategically focused in other parts of the World, can introduce positive impulses to the Norwegian contracting traditions as well. This exchange can prove to be fruitful for all parties involved. It is however from the analyses, difficult to see any clear path of difference in the weighing of the contracts in a certain direction, as a consequence of the sizes and experience of the two different companies. The NSC 05 is to a large extent followed in both contracts, which makes them very aligned in the important matters concerning division of liabilities and risk.

When it comes to difference in the relational factors in the two contracts, one should possibly expect a manifestation of some sort of evidence of a long-lasting relationship between the Service Company and Company 1 in Contract 1, and likewise signs of a new relationship between the parties in Contract 2. This could for instance be revealed by the level of detail in general provisions, which should be low in cases where the two contracting parties have encountered in several previous contracts with each other. However, no such indications could be found. The reason for this can, by all accounts, be assigned to the sheer complexity of the task and the values at stake, which requires a certain level of detail in the contracts anyhow.

While Contract 1 is a frame agreement, with unknown length of time, Contract 2 is a service agreement with a time limitation of five (5) years. It must be assumed that the length of the frame agreement regulated by Contract 1 is limited to four (4) years, in accordance with *"Forskrift om Offentlige Anskaffelser*" (Regulations on Public Procurement) in Norwegian legislation. This makes them essentially like, in that both contracts present rather general provisions on the respective deliveries, while facilitating for more specific terms with the release of purchase and/or work orders. Also, both contracts concern the delivery of subsea systems, and while the system technology delivered in Contract 1 can be considered to be more novel than the one delivered for Contract 2, both contracts involve rather complex deliveries which require detailed regulation. Hence, there are no traces in any of the two contracts that might differentiate them on account on the nature of the respective deliveries they are concerning.

The compensation formats chosen in Contract 1 differ from lump sum (fixed price) to day rates, unit rates and cost reimbursable, depending on what the compensation is concerning, i.e. equipment purchase, tool rental, use of onshore and offshore personnel, etc. The compensation formats in Contract 2 vary from day rates for rental equipment (tools) and personnel, to fixed unit rates for mobilization/ demobilization of equipment. Contract 2 also follows a cost reimbursement format for Third Party Services. That means that both contracts include a wide range of compensation formats,

and thus an effective spread of the risk between the parties, tied to the choice of compensation format (refer to discussion in chapter 2.1.2). However, Contract 1 includes a clause in which Company 1 reserves the privilege of deciding to compensate on a provisional sum basis, the rates and compensation which would otherwise be remunerated by unit rate or lump sum. Such a clause is not included in Contract 2. It is difficult to measure the effect that such a clause, tied to the choice of compensation format, will have on the distribution of risk between the parties. One can however assume that it will shift the weight in favour of Company 1, as the Service Company has got no say in this matter.

To conclude, the two different contracts analysed in this report, are to a large degree very similar to each other. The fact that they are both based on, and, to a great extent follow the very same standard contract format, that is the NSC 05, supports this observation. There are no findings in any of the contracts which radicalize them in any way in relation to the NSC 05. However, there are of course some differences found in the details between the contracts.

5. DISCUSSION

In the following chapter, the findings in the analysis chapter will be discussed. First, the implementation of operational risk in the contracts will be addressed, then the division of this risk between the parties. Finally, the potential weaknesses with the analyses will be presented to the reader, in order to shed some light on the methodology and findings leading to the results in this report.

5.1 Implementation of operational risk in the contracts

As stated in the analysis of both Contract 1 and Contract 2, *operational risk* is not explicitly mentioned in either of the two contracts. However, this may not necessarily be tantamount to operational risk *not* being addressed in the contracts at all. As mentioned in chapter 2.2.3, the concept of operational risk is usually applied more often in contexts of financial risk, and the definitions therein are hence not sufficiently, nor frequently, utilized in contracts of this particular type. This does not mean, however, that the *concept* is not taken care of and implemented to some degree in the contracts. Operational risk, as it is defined and understood within the boundaries of this report, is ever present in all accounts of the work that is regulated by the contracts. Hence, it is meaningful and necessary to include and implement some provisions regarding the concept of operational risk in the contracts.

Both contracts are built on the foundations laid down by the standard contract formats, and most notably resemble the standard conditions provided by the NSC 05. The NSC 05 standard conditions of contract does not contain any explicit mentioning of the term *operational risk* either, but the same rationale as stated above could be applied for this. A finding that is worth noting is the fact that there are no references, in the two contracts, of the obligations of any of the parties of being in adherence with any risk management standard, such as the ISO 31000 Risk Management standard. There are no references of any standards (ISO or similar) in the NSC 05 either, but this is more understandable on account of NSC 05 being a set of more general terms and conditions. Referring to a standard in the NSC 05, could compromise its ability of being applicable for contracts regulating work in areas outside of the NCS as well, where other standards may be the norm. However, in a time when the focus on standardization and alignment of procedures and practices are prevalent, it is interesting that there are no references to a common standard in either of the contracts (Contract 1 and Contract 2).

In both contracts, there are provisions stating that the Contractor is obliged to align his HSE management system in accordance with that of the Company (Company 1 and Company 2 in the respective contracts), but the form and content of this system is not further specified. Risk management theory prescribes an alignment of strategies and the active use of risk management tools in the process of mitigating and reducing risk levels (see chapter 2.2.1). This certainly applies for the risk management work internally within an organization, but should also be transferred to the domain regulating the inter-organizational risk management aspects as well, such as in contracts that are governing matters between two companies. Settling and agreeing on the use of a common standard could aid in aligning the HSE systems, and hence contribute to an efficient risk management approach, of the two contracting parties.

Reference to common risk management standards or not, there are findings of the two contracts treating situations characterized by risk and uncertainty. Examples of this include:

- Loss of key personnel in the project
- Equipment damages and failures
- Third-party losses and indirect losses of the parties involved in the contract
- Force majeure situations
- Blow-outs and well problems
- Injury to personnel

The imperative with including provisions regarding such situations as listed above appears, above all, to be for declaring the liability and responsibility of the respective parties in the contract, not for prescribing any measures in mitigating these risks. It should be noted that is also the primary target of the contracts, that is, the primary purpose of a contract is to regulate the working relationship between the parties, and to allocate and make clear the division of responsibilities between them. However, it is difficult to say how the parties shall be able to adhere to the provisions of the contract and perform an active risk management, without also sharing a common and fundamental understanding of such essential terminology as *risk.* Hence, the lack of a common standard, and the lack of a proper definition of *risk* in the contracts, can cause problems in situations when the parties are in conflict over the degree of fulfilment of the contractual terms. As stated in the theory chapter,

operational risk is such a major presence in all operations involved in the work performed during the duration of the contract, and it should be addressed, treated and implemented accordingly.

5.2 Division of operational risk in the contracts

When it comes to the division of operational risk in the contracts analysed in this report, one has to base it on the actual contents of this type of risk found in the contracts. As discussed above, the term *operational risk* is not explicitly stated in either of the two contracts, so the focus here will be around how the contracts allocate responsibilities and liabilities that are fundamentally characterized by uncertainty and risk, interpreted in a broader sense. Using the NSC 05 as a reference, and working under the assumption that this standard set of conditions of contract represent a fair division of liabilities, it is clear from the findings in the analyses that the contracts are *mostly* in line with the standard format. However, there are also findings of instances in the contracts where there are deviations from the principles laid down in the NSC 05, and where the terms and conditions favour the benefits of one of the parties. Examples of these findings from the analysis of Contract 1 are discussed below. As in chapter 4.3, the Company in Contract 1 is denoted Company 1, and likewise, the Company in Contract 2 is denoted as Company 2.

- Under the part where the articles concerning performance of the Work are listed (part II), only the obligations of the Contractor are listed, and not the obligations of Company 1, which is the case in the same articles in the NSC 05, where both parties' obligations are listed. This is also the case under the article concerning effects of the variations to the work (article 13), where it is stated that the *Contractor's* obligations under the Contract also apply for variation work, and statements of Company 1*'s* obligations are omitted again. This may not have a great significance in practical terms, as Company 1 is liable in many other instances in other articles throughout Contract 1, but it leaves the impression that the contract is more one-sided rather than bilateral.

- Company 1 reserves the right of approving the Contractor personnel performing the Work under the Contract. As discussed previously, this addresses Company 1's desire of controlling the risks involved with key personnel in the project, but may also be viewed as an attempt at exerting influence in an area that is well within the Contractor's own control sphere. It is an accepted view in risk theory, that the risk (in this case the risk involving key personnel)

should be handled by the party that is best able to mitigate this risk. In this case that would be the Contractor.

- In *article 27 – Company's Breach of Contract* in NSC 05, the Contractor is given the option of suspending or terminating the Contract should Company 1 be in substantial breach of the Contract. Such an option is not given the Contractor under Contract 1. This should be in accordance with commonly accepted contract principles, and both parties should be given the equal opportunity of terminating or suspending the contract in the event where the other is in substantial breach of the contract.

- Company 1 reserves the right of choosing to compensate the Contractor on a provisional sum basis, for remunerations that would otherwise be compensated by lump sum or by unit rates. According to contract theory, presented in chapter 2.1.2, the selection of compensation format presents a significant influence on the division of risk between the contracting parties. As such, being deprived of the privilege of having a say on the chosen form of compensation format, the Contractor loses some of his ability to influence his risk exposure in the Contract.

It is difficult to speculate on how this imbalance in the contractual terms might influence the practical work and the day-to-day dealings of the two parties, and how this might manifest itself in times of conflict. However, Contract 1 also presents some important shields for the Contractor, e.g. in the event of blow-outs, well problems, damage to third party equipment, injury and death of personnel, etc. The Contractor is also shielded against the risk of decreasing rates, after altering contract rates through the use of escalation formulae. The limitations and shields are manifested by monetary terms, expressed as percentages of the contract value. With the introduction of such limitations of liability, the total risk exposure of the Contractor is capped to a level which is thought to be well within the capabilities of the Contractor's risk absorption abilities. As presented in the chapter on risk theory, the Company is the better party at diversifying the bigger parts of the risk exposure in a project, not only because of its greater abilities of spreading the risk on a larger project portfolio and in joint ventures, but also on account of their normally more solid financial position. This principle is most definitely attended to here.

In the analysis of Contract 2, many of the similar findings as in Contract 1, was observed. In addition, the following findings are worth noting:

- Under *Article 6 – Company Provided Documents*, the Contractor is obliged to swiftly (without undue delay) notify the Company of any errors in the Company Provided Documents. Should the Contractor fail to find any errors in these documents, and this incurs direct extra costs for the Company in connection with the Work, then all such costs shall be borne by the Contractor. The same rule and obligation does not apply for Company 2 with regards to the *Contractor Provided Documents* under article 7 in Contract 2. This liability should be mutual.

- Under *Article 32 – Limitation and exclusion of liability* in Contract 2, the total liability for the Contractor in case of Breach of Contract is limited to 100% of the Purchase Order Value (i.e. Contract Price), as opposed to 25% of the Contract Price in NSC 05 (Article 34.2). This presents a significant added percentage amount for the Contractor in Contract 2, and increases the risk exposure of the Contractor.

- The Contractor is responsible, under *Article 37 – Care of Company owned equipment and/or materials* in Contract 2, for ensuring the safekeeping of, and making good any damages or losses, to Company owned equipment and materials. As discussed in chapter 2.2.2.4, the risk of damage and loss of equipment is present in many stages of the operations where the equipment is utilized (transport, rig handling, during equipment operations, etc.). As the Contractor is usually the one responsible for operating this equipment and handling the material, he is the party closest to controlling this risk. As such, this presents a fair division of the risk of equipment failure. An upper limit of liability of $250,000 is included for any occurrence. This shields the Contractor against the most severe cases of equipment and material damages.

In Contract 1, there is a clause stating that the rates after escalation shall in no circumstances be less than before escalation. Such a clause is not included in Contract 2. Hence, the prices charged for the services of the Contractor may be lower after escalation in Contract 2. This means that the Contractor and Company 2 share the risk of price volatility, which is based on factors that are, to a large extent, outside of the control spheres of both parties. As such, it presents a fair division of risk, and acts in accordance with presented risk theory. It could, however, also be argued that the Company is the party that is better suited at absorbing the risk of price volatility, due to its normally better financial solidity and abilities of diversifying risk. On the other hand, the Contractor, who reaps the benefits of higher rates in times of growth, should also be positioned to handle the risks of falling prices in times of decline.

To conclude, it is difficult to say that there are findings in the analyses where the contracts prescribe a disproportional amount of risk exposure for any of the parties. For the most parts, the contracts are in line with the provisions of NSC 05, but there are findings which could support a view that the companies (Company 1 and Company 2) are slightly more favoured than the Contractor under the contracts than they would be under NSC 05.

5.3 Potential weaknesses in the analysis

When conducting analyses, there will always be inherent weaknesses which need to be addressed. The cause and nature of the weaknesses may be different from one analysis to the other, and it is important to acknowledge that no analysis is a perfect rendition of the true state of the subject that is being analysed. All results need to be interpreted in light of context, and scrutinized closely by the reader. As with determining risk levels, the search for true objectivity will in most cases not be fruitful. On this account, there is a need for presenting the potential weaknesses and factors which might be undermining the results of the analysis for the reader. Some important factors which may impact the interpretation of the results in the analyses in this report are reflected upon below.

In the analyses, the NSC 05 was used as a reference for interpreting and comparing the contents of the two contracts. It was assumed that the terms and conditions of the NSC 05, being formed in joint effort between representatives of both field operators and service companies, ensured a sufficient implementation, and fair division of liabilities, responsibilities and risk between the parties. However, this may not necessarily be the case. The NSC 05 may not be perfect and may not allocate the risks and responsibilities in an efficient manner, and as such, may not be the best reference point for evaluating the fairness of the contracts. In practice it may be viewed as unfair and present a skewed distribution of liabilities and responsibilities by the parties using the standard. If so, this presents a challenge to the interpretation of the results in this analysis, as the reference point is altered.

It may also present some issues with not having a proper definition of the term *operational risk* included in the work of the report, and only a mere quasi-definition based on the wider term *risk.* After all, searching for contents of *operational risk* without having a clearly stated definition to work with can provide some serious challenges, both for the work performed by the author and also the interpretation of the work by the reader. Constructing a proper and sound definition of the term for use within the boundaries of the topic of this work, would however be outside of the scope of this

report. Also, the discussion presented in chapter 2.2.3 on *operational risk*, should be sufficient to give the reader an understanding of what the author puts into the term.

The contracts analysed in this report are used for regulating relationships, events and situations which may be characterized by high complexity, and possess a wide range of severity. Consequently, assessing the formulations of the terms and conditions in the contracts, and the impact they will have on the overall risk level for the involved parties, becomes a challenging task. The consequential spectrum from changing, say the formulation of a sentence in an article and thereby giving it a new meaning, to altering the liability limits for the contractor, may have an unimaginable range. The effects of such changes and the significance of the risk sharing between the two parties may be extremely difficult to measure in monetary terms, and nearly impossible to determine with regards to intangible assets. As such, the valuation of the risk division found in the terms and condition of the contracts, are open for interpretation. The author's lack of experience with regards to such work should be taken into account by the reader. However the findings are, at the best of knowledge, interpreted in light of recognized contract and risk theory.

6. CONCLUSION

This chapter will present a conclusion to the hypothesis stated in the beginning of the report (chapter 1.2), and thereby complete the work in this report. Also, for further studies on this topic, a few suggestions are made, for what may enhance the understanding of implementation of operational risk in oil service contracts.

6.1 Conclusion to the hypothesis

The hypothesis, H_1, in this report was:

"Operational risk is well implemented and shared between the parties in contracts between the Service Company and its clients."

Its corresponding null hypothesis, H_0, was stated as:

"Operational risk is <u>not</u> well implemented and shared between the parties in contracts between the Service Company and its clients".

As discussed in the introduction chapter of the report, the use of the phrase *"well implemented and shared"* in the hypothesis, invites to a certain subjective interpretation, as assessing the degree of implementation and sharing of a concept such as *operational risk* in a contract is very hard to present objectively. However, when it comes to general *risk* sharing in contracts, the theory presented in this report is a good reference and serves as an adequate backdrop. As stated before, the term *operational risk* is not mentioned in any parts of the contracts analysed in this report. However, as *operational risk* was understood in this report to be a part of the definition of the more general term *risk*, only more specific for the day-to-day risk exposure in the activities and operations of a company or organization, it must be accepted to also include findings of implementation and sharing of the general term *risk* in the contracts.

Anyhow, with this in mind, and based on the findings in the analysis, the conclusion to the hypothesis in this report is:

Operational risk is <u>not</u> well implemented and shared between the parties in contracts between the Service Company and its clients.

In other words, the null hypothesis, H_0, is closer to the findings in the analysis than the hypothesis, H_1. The rationale behind this conclusion is that there was not found *any* explicit and only weak traces of implicit definitions of *risk* in the analysed contracts. There were not found any definitions, or mentioning, of *operational risk* in the contracts. Nor were there *any* references to any risk management standards, such as the ISO 31000 or equivalent, to be used by the parties in the connection with the contract work, establishing a common understanding of *risk* between the parties.

There are most certainly implemented measures in the contracts for *sharing* the liabilities and responsibilities involved with the work, and hence, indirectly, the *risks* involved in the contracts. This was also found to be in line with relevant and accepted contract and risk theory, as presented in this report. As such, one could argue that the contracts include *some degree* of implementation and sharing of *risk*. However, the contracts lack a proper explicit statement of how *risk* and, more specifically, *operational risk* is to be defined, understood and managed, in terms that are clear and unequivocal for all parties involved in the contracts. This implies that the hypothesis, H_1, which requires that *operational risk* is *well implemented,* cannot be argued as being fulfilled.

6.2 Suggestion for further studies

When working on a report such as this, several ideas are created on topics that would be interesting to do further research on, in relation to the findings in the work. The ideas could be related to topics that were outside of the scope of this report, or they could be generated as the work progressed, but not included here as there would not be sufficient time to implement them in the work.

As mentioned throughout the work, and as concluded in this chapter, *operational risk* is not *well* implemented and shared in the contracts between the Service Company and its customers. An interesting study could then be to investigate *how* this is best implemented in the contracts, to ensure a sufficient degree of understanding and communication of this important subject. Would it be appropriate to include references to risk management standards (such as the ISO 31000) or would it perhaps be better for the parties to agree on a common definition of *risk* and/or *operational risk,* and to draw up common tools for managing *risk* in the contracts? With the development in the industry, and the increased focus on risk management, there is certainly a need for implementing joint terminology for *risk* in the contracts. A shared understanding of the term could only be contributing to a more efficient risk management in the projects.

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