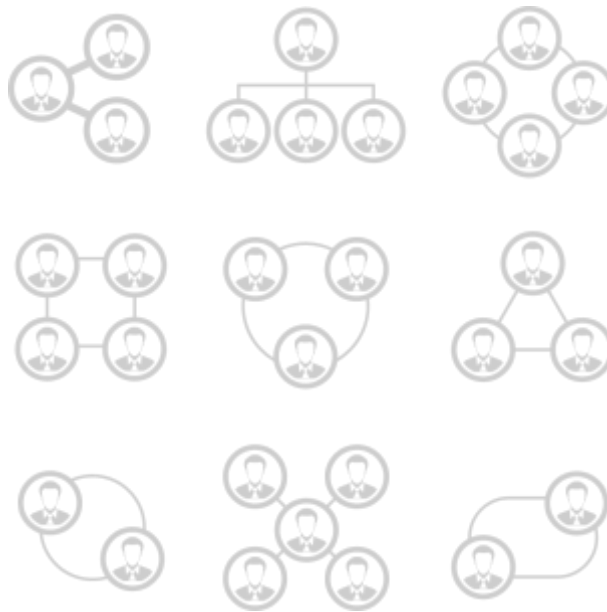


# Supply Chain Integration as a Source of Innovation:

A Study of Collaboration between  
Subsea Supply Companies in Norway



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Master thesis at TIK - Centre for Technology, Innovation and Culture

Faculty of Social Science, University of Oslo



# **Supply Chain Integration as a Source of Innovation**

*A Study of Collaboration between Subsea Supply Companies in Norway*

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## Abstract

The thesis investigates the notion that collaboration is a driver for innovation. Firms enter different arrangements of integration to achieve some form of competitive advantage. By analyzing two newly formed configurations of integrated companies in the industrial sector of subsea oil and gas, the thesis aims to shed light on the assumption that firms are motivated to enter collaborations to achieve innovation. Perspectives of Contingency theory, Transaction-cost theory, and Resource-based theory will be used as a framework for the study.

Findings show that the companies are integrating in part because of demands to reduce cost of services. However, any reduction in cost of services provided by the supply companies warrants new combinations of assets. The thesis argues that innovation in services is an important reason for integrating. Both process and product innovation may be achieved by combining company assets. Even if innovation is driven by demands to reduce cost, technological and organizational development is needed.

Different forms of governance are chosen depending on perceived challenges to achieve innovation and the goal of cost reduction. The two cases in the thesis are compared to discuss the potential benefits of governance modes chosen. An alliance mode presents more flexibility, while merger & acquisition overcome challenges related to, i.e. intellectual property rights. Integrating the theories offers the possibility of presenting a more complete explanation on how innovation through collaboration can best be achieved.

**Key words:** *Innovation, Collaboration, Company Integration, Supply Industry, Technology, Upstream Oil & Gas*



## Preface

My grandfather jokingly reference how his generation always used to walk whenever they needed to get anywhere. Now, I never believed he lived in an age before automobiles. Still, the statement probably held more merit than I would attribute his off-hand remarks during my child-hood years. I will try and use his line as an analogy of change over time. It could represent the process of writing this thesis, a most probable culmination of my academic education.

I know where my interests lie. So, I was happy when I found the ESST Master program. My exuberance carried me through the semesters. When SIVAC introduced a possibility to research in the context of oil and gas, I reached out and grabbed it. I soon realized that my pride would need to be contained, if I were to emerge unscathed (figuratively speaking). There was no fast mode of transportation, so the road ahead had to be walked at patient pace. Significant efforts had to be made to understand the complexity of this road not previously travelled. Some acknowledgements are therefore in order.

I would like to thank Kristin Fjellvang and Terje Bratfos for the upbringing needed to navigate the case of study. I would like to thank my fellow students for the road traveled together, and a special thank you to Cyriac for proof reading. I would like to thank my family, especially my mother and grandfather, for contributions. Furthermore, I would like to extend my thanks to councilors Erlend Osland Simensen and Taran Mari Thune. Erlend, you presented the context of oil and gas, and guided me through the needed conceptualization. Taran, you clarified demands and provided needed expertise in this process. For this, I am grateful.

Finally, I would like to thank my girlfriend, Hildegunn. You kept me up when I wavered, and helped me go the distance. The road would have been very different without you, and much less enjoyable.

## Abbreviations

bbI	One barrel of oil
CAPEX	Capital expenditure
CT	Contingency Theory
EPC	Engineering, Procurement and Construction
EPCI	Engineering, Procurement, Construction and Installation
FPSO	Floating production storage and offloading unit
INTSOK	Norwegian oil and gas partners
IP(R)	Intellectual property (rights)
NORSOK	Norsk Sokkels Konkuranseposisjon
OPEX	Operating expense
PLET	Pipe line end termination
RBT	Resource-based theory
RBV	Resource-based view of the Firm
SCI	Supply Chain Integration
SIVAC	Supplier Industry and Value Creation
SPS	Subsea Productions Systems
SSI	Simplify, Standardize and Industrialize
SURF	Subsea Umbilical's, Risers & Flowlines
TCT	Transaction-cost Theory
TIK	Centre of Technology, Innovation and Culture
USD/bbl	US dollar per barrel oil
UTC	Underwater Technology Conference



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# 1. Introduction

This thesis explores why large supply companies enter into collaborations. There has long been an articulated need for integrated relationships between different companies (Armistead & Mapes, 1993; Lambert, Robeson, & Stock, 1978). Collaborations can have several configurations where the parties are interdependent, yet remain autonomous (Williamson, 1991a, p. 271). The present thesis will primarily use the term integration as a general term for different collaborative configurations (Hagedoorn, Link, & Vonortas, 2000, p. 569).

This thesis will discuss rationales for company integration, by analyzing why inter-firm collaborations are formed. A lot has been written about the motives for companies to collaborate. The goal of this thesis is to contribute to the academic literature of company collaboration as a source of innovation. By presenting the frameworks of contingency theory, transaction-cost theory and resource-based theory, from management literature, the present thesis will attempt to explain drivers for company integration (T. K. Das & Teng, 2000; Pennings, 1975; Priem & Butler, 2001; Tadelis & Williamson, 2012; Van de Ven, Ganco, & Hinings, 2013; Williamson, 1975).

Cases of collaborative arrangements have emerged in the sector of upstream oil and gas during the last years. This presents a unique possibility to investigate reasons why companies start efforts of integration. Norway is a country that relies on oil, and has built a highly skilled national offshore supply industry (Fagerberg, Mowery, & Verspagen, 2009; Ryggvik, 2013). One segment within the upstream oil and gas industry system in Norway is the niche of subsea technologies. Suppliers within this segment are among the hardest-hit firms during the current market conditions. The current high capital expenditure (CAPEX), and high operating cost (OPEX), of subsea technology is not sustainable. Fewer contracts are awarded to subsea projects, there is less willingness to invest in projects, and huge cuts have been made in the employee base, both nationally and internationally. The sector is going through a transition, where the market has moved from the North Sea and out unto the world.

The cases addressed in this thesis are suppliers of subsea services. These companies are currently integrating. There exists an academic need for a systematic approach to

supply chain integration (Flynn, Huo, & Zhao, 2010). This thesis is a comparative study of two collaborative configurations between large suppliers of Subsea Production Systems (SPS) and their collaborations with suppliers of Subsea Umbilical's, Risers & Flowline (SURF). The petroleum sector is currently struggling, and efforts are being made to transition and readjust to the changing context.

**Table 1: Overview of Cases**

<b>Case</b>	<b>SPS</b>	<b>SURF</b>	<b>Collaborative structure</b>
1	OneSubsea	Subsea 7	Global Alliance
2	FMC Technologies	Technip	Merger & Acquisition

When oil companies plan for the development and operation of an oil field, they divide the field into fragments, which they then award to suppliers on a contract basis. When the project is complete, it is procured back by the operators. SPS and SURF companies can supply different segments of such fields. The two SPS-companies researched in this thesis are OneSubsea and FMC Technologies, and the two SURF companies are Subsea 7 and Technip. In short, SPS companies supply the technology located on the seabed, which are stationary, and SURF companies provide the supplies needed to move the extracted products from subsea to surface installations, called topside. Further description of what these companies provide will be presented in chapter 4, regarding the context of the case.

The subsea supplier firms are currently adjusting to find solutions to make the industry viable within the current market conditions of the sector. This need for readjustment was made clear in the *Oil and Gas in the 21st Century* report of 2015 (2016), and during the annual Underwater Technology Conference (UTC) in Bergen in 2016. Different forms of collaboration are seen as a strategy to overcome challenges, and several initiatives have been initiated over the last two years (BusinessWire, 2015; FMC, 2016b; OneSubsea, 2015; Saipem, 2015; Technip, 2015). The companies' express goals to combine expertise, and through this identify value-creating opportunities. The benefit for the client is potential access to a complete system from the get-go.

## 1.1 Aims and Objectives

The presented case allows research into motivations behind supply chain integration. It is of interest to understand the rationale behind efforts of entering inter-firm combinations. Norway has developed a skilled national offshore industry, and it could be relevant to understand how valuable assets could be affected by new directions in the upstream oil and gas industry. Three different conceptual theories will be presented as explanations for strategic decisions made in the case of subsea suppliers in the upstream oil and gas industry. The thesis will contribute to the literature of firm collaboration as a source of innovation.

The cases studied are the emerging company integration between the mentioned SPS and SURF suppliers. It is of interest to explore why collaborations are perceived as something beneficial when navigating a volatile market like that of oil and gas. Information on what these collaborative efforts hope to achieve is lacking. Based on these considerations, the following research question was formulated:

*Does the need for innovation motivate integration between subsea suppliers that deliver SPS and SURF?*

From this question, three sub-questions were derived to clarify a structure for the thesis. These sub-questions why firms now collaborate, how these collaborations could provide innovation in the services offered, and how the companies organize to achieve the goals. To explore the research question, a case study that are based on expert interviews combined with analysis of documents has been. The fourth chapter looks into context of the cases prior to the empirical and analytical chapter.

This is done to provide a foundation for any eventual findings. The sub-questions are formulated so to discuss the *why, what, and how* of supply chain integration. The thesis will position itself using key literature on theoretical perspectives for explaining company integration, to be used as a conceptual framework for the research done in this thesis (Chen & Chen, 2003; T. K. Das & Teng, 2000; Flynn et al., 2010; Sambasivan, Siew-Phaik, Mohamed, & Leong, 2013; Yasuda, 2005). By applying different theoretical frameworks, the present thesis will attempt to answer the main research question.

The first sub-question is: *Why are SPS and SURF suppliers starting to integrate?*

For a subsea supplier firm, there are many actors in the network that constitute the supply chain. This sub-question is formulated to answer why integration between SPS suppliers and SURF suppliers are happening. Uncertainty in the oil and gas market contributes towards supply chain integration in the subsea industry. The context of the industry is important in regards to this question, as the industry actors are now moving in the direction of a new systemic approach. The goal is not to answer why the industry is experiencing difficulties. Rather, it is aimed at discussing the strategic choice of integration to solve an established problem in the sector. If this can be established, it then becomes relevant to look at what is expected to come from collaboration.

The second sub-question is: *What type of innovation do the configurations expect to achieve with integration of SPS and SURF companies?*

It is an important part of answering the research question to understand what the expected innovations stemming from eventual collaborative efforts could be. The processes could be adjusted, and the technology could be changed. Interviews will contribute towards mapping the believed directions of this strategy. An analysis could potentially shed light on what may be achieved through collaborative efforts. When this is established, it begs the question of how this can best be achieved.

The third sub-question is: *How do the organization of SPS and SURF supplier integration differ in the cases studied?*

Companies have some expectations for venturing into strategic partnerships. The idea behind this sub-question is to compare the form of governance chosen by the suppliers collaborating to achieve the goals discussed in sub-question 2. Subsequently, potential challenges related to the innovation process could be uncovered. The question is not aimed to present the best mode of governance. Rather, it is to discuss the rationale behind chosen strategies of governance.

## 1.2 Thesis Structure

This thesis will be structured according to the three sub-questions. In chapter 2, a literature review will outline relevant concepts and theoretical perspectives on inter-firm collaboration and innovation.

The third chapter presents the methodology and data gathered. The qualitative data stems from public documents, reports from a conference on subsea, and interviews conducted with experts from the field of enquiry.

A fourth chapter regarding the empirical context of the subsea industry in Norway is presented. What they supply, and how they supply it will be explained. The importance of this industry will be touched upon, before showing how the industry is currently changing. The context of the supplier companies is taking a new direction, with collaborations forming. This chapter will then present announced company integrations. The goal of the empirical and analytical chapter is to analyze the rationale behind the strategic choice of collaboration in depth.

Last, the two cases are presented in the empirical and analytical chapter. This chapter will be structured based on the three sub-questions of the research question. Each sub-chapter in this chapter will first outline the findings from the empirical data, before an analysis and discussion in light of the theories is carried out. Empirical findings will be included with the analysis. This is a pragmatic choice, as the thesis has a thematic focus (Thagaard, 2003, p. 147). When the focus is thematic, the study should compare all available data regarding each theme. It is not the informants that are interesting in this study, but rather the information they can provide through their experience.

## 2. Literature Review

Much has been written about the outcome of company collaboration in management literature (Hagedoorn, 1993; Hagedoorn & Duysters, 2002; Hagedoorn & Schakenraad, 1994). However, Yasuda (2005) and Sambasivan et al. (2013) specifically warrant more studies on how and why strategic collaborations are formed. This thesis will refer to inter-firm collaborations as company integration. The term alliance will not be used as a single configuration, and instead accept that the term can have several versions, and acknowledge the premise that there exists some confusion about the naming depending on the context for which it is used (Hagedoorn et al., 2000, p. 569).

Theoretical rationales explaining official inter-firm collaboration differ, with some researchers arguing for integrating management theories (Sambasivan et al., 2013). Considering the empirical findings that show how collaborations can lead to innovation, the present thesis will review three perspectives to provide a framework for analysis of the research question formulated in the introductory chapter. The three theories that will be reviewed are contingency theory, transaction-cost theory, and resource-based theory (Conner & Prahalad, 1996; Pennings, 1975; Penrose, 1959; Van de Ven et al., 2013; Williamson, 1975, 1979). The perspectives these theories provide is one of managerial organization, contractual economics, and asset optimization. The theories postulate theoretical explanations at leadership-level, monetary-level, and resource-level.

If one looks to this definition of innovations processes, one could argue that the build-up of company integration initiatives is part of the scope of innovation processes, and that a social scientific approach is suitable for further understanding the development of an industry. Innovation processes include determinants such as economic and organizational factors, depending on whether or not these influence the development, diffusion, or application of the innovations (Edquist, 2005, p. 182).

The thesis must identify the intersection of relevant literature that postulate explanations for inter-firm collaboration. This is because the complexity of firm-



integration contains so many variables that one perspective on a case could undermine potential influencing factors. Such complexity warrants review on different theoretical rationales explaining strategies to cooperate, and on potential benefits of company integration. It would be relevant to explore which of the theories reviewed best explain innovation.

First, the overarching concept of innovation will be introduced, including a relevant historical account of this academic field. The reasoning for this is to present theoretical concepts, or perspectives, needed to open the *black box* where change happens. Furthermore, the theories of contingency theory, transaction-cost theory, and resource-based theory will be presented as explanations that rationalize the strategy of collaboration, and serve as a framework for why the collaborations occur. Lastly, the literature review will be summarized, and propose some assumptions for eventual findings.

## **2.1 Innovation and inter-firm collaboration**

In this day and age, innovation is part of the public debate, and regarded as an important contribution towards transition and growth. The field of innovation studies has steadily grown since the 1950s, especially in recent years (Fagerberg & Verspagen, 2009, p. 221). It was the economist and social scientist Joseph Schumpeter who provided the basis for innovation literature. Schumpeter argued that innovation was a major driving force for economic and societal growth, and that beyond the allocation of resources, growth came from new combinations of existing resources (Fagerberg, 2005, p. 6). Considering this, attempts should be made to understand the motivation of companies to collaborate in their innovative efforts.

Innovation rarely happens in isolation, but in collaboration with others (Edquist, 2005, p. 182). Innovation should be regarded as a process where interactive learning and collective entrepreneurship are important components (Lundvall, 2010, p. 9). Innovation is often a combination or continuation of something that already exists. Therefore, a large part of the innovation literature takes a systemic approach towards explaining the interconnectedness that makes up the constituents of a system that

could attribute to the direction of change. Standard economic models would treat innovations as extraordinary events that would, after a process of adjustments, create a new state of equilibrium. However, innovation is a fundamental and inherent phenomenon in modern capitalism (Lundvall, 2010, p. 8). Innovation is considered to be a driving force in economic and social change (Fagerberg, 2013, p. 19). The innovation system literature was developed to account for these factors, and help explain economic and societal trajectories.

New demands in industries could stimulate transition depending on the context. Freeman and Louçã (2001) explain how strong ties between different high-technological industries emerged already during the 1960s. These industries are recognized by uncertainty and fast transitions, but also a high cost of entry due to expensive investment costs. Traditional neo-classical and Keynesian theories regarding technological change and economic growth do not address the specifics of technological change in different periods (Freeman & Perez, 1988). Freeman and Perez (1988) postulated that a changed context not only leads to new products, services, systems and industries, but that it also affect directly, and indirectly, nearly all facets of the economy. New combinations of product and process innovations that may open a broad specter of investment and profit possibilities.

An argument can be made that a company's success over time is dependent on technological innovation (Malerba & Orsenigo, 1995). Schumpeter distinguished between five types of innovation: New products, new methods of production, exploitation of new markets, new ways to organize business, and new sources of supply (Fagerberg, 2013, p. 8). There are varying degrees of newness in innovations. An incremental innovation could merely represent a slight improvement or upgrade to a process or product, while a radical innovation could create a new market. A radical innovation can often require a significant investment in terms of resources and development, while incremental innovations are often built on existing solutions (Hurmelinna-Laukkanen, Sainio, & Jauhiainen, 2008, p. 279). One could say that innovation may represent competitive advantage. Innovation is the successful application of something new.

However, innovation is difficult to achieve, as it takes time and resources. Powell, Koput, and Smith-Doerr (1996) postulate that the locus of innovation can be found in

networks of learning, rather than the singular company. In other words, collaborations between firm is a way to achieve innovation. However, if the idea is that collaboration is inevitable, it is problematic. This diminish the element of choice. And an argument can be made that different variables contributes to the specific choices made by companies.

Hagedoorn (1993, p. 381) finds that while there are many motives for collaboration, the two basic categories of market and technology-related motives are the most prevalent. Especially of industries in the high-tech sector. Mature markets or sectors also tend to undergo processes of consolidation. Furthermore, if the collaboration target more objectives than simply innovative efforts, it demands a larger span of control (Hagedoorn, 1993, p. 382).

There has been a rapid growth in strategic alliances since the 1980s, particularly in an effort to improve technological development activities (Narula & Hagedoorn, 1999). The last couple of decades, strategic alliances have been used as a key growth strategy (Dhurkari & Nandakumar, 2015, p. 183). In recent years, companies acknowledge the need to collaborate on mutually beneficial projects (Lambert & Cooper, 2000; Wisner & Tan, 2000). Such cooperation's are identified as a special type of coordination (Buckley & Casson, 2010). This coordination affects allocation of resources in such a manner that none should be worse off, and someone is better off than they otherwise would be. Coordination may sound exclusively beneficial, but there are certain points that should be noted about the way the concept is applied in practice.

Doz and Hamel (1998) found that an unprecedented number of strategic alliances were being formed annually at the end of the millennium, and it has not slowed down in recent years, with a large quantity of management literature devoted to the subject (Inkpen, 2009). The present thesis argue that these efforts of company collaboration is viewed as a way to achieve innovation. Kale and Singh (2009) propose a strategic alliance cycle framework consisting of three distinct phases: Alliance formation and partner selection, alliance governance and design, and post-formation alliance management. The theorized rationale for entering strategic collaborations is to a degree the antecedent of these cyclical phases. Such integration could serve as a catalyst for competitive advantages.

## 2.2 Supply Chain Integration

The term integration will be used to distinguish between longer-term substantial combinations and more casual relationships (Grant & Baden-Fuller, 2004, p. 62). It refers to an agreement between “two or more firms to reach a common goal entailing the pooling of their resources and activities” (D. J. Teece, 1992, p. 19). An integrated relationship between manufacturers and their supply chain partners have been an articulated need for a long time (Armistead & Mapes, 1993; Lambert et al., 1978). However, there has been a call for a systemic approach to supply chain integration (SCI) in recent years. In this context, the present thesis will draw upon Flynn et al. (2010) definition of supply chain integration:

*the degree to which a manufacturer strategically collaborates with its supply chain partners and collaboratively manages intra- and inter-organization processes. The goal is to achieve effective and efficient flows of products and services, information, money and decisions, to provide maximum value to the customer at low cost and high speed.*

In such an agreements, the parties are interdependent, but yet remain autonomous (Williamson, 1991a, p. 271). Motivations or objectives for forming company integration may vary, depending on firms and context. These motivations may include; acquiring and exchanging skills, increasing efficiencies, getting access to new and critical resources, sharing risk and investment, entering new markets, facilitating strategic renewal, enhancing market power, and acquiring various kind of legitimacy (Dhurkari & Nandakumar, 2015, p. 183).

There are two ways to access external assets. It can be gained through merger and acquisitions (M&A), or through an alliance (Ranganathan & Lertpittayapoom, 2002). There are pros and cons related to the cooperative form chosen (Doz & Hamel, 1998, p. xv). T. K. Das and Teng (2000) indicate two conditions under which strategic alliances should be preferred over M&A's. One is if not all the resources held by the target firm is valuable to the acquiring firm, and second is when both organizations hold similar assets. Hagedoorn and Duysters (2002) illustrate that these options are driven by firm specific circumstances, as well as different environmental conditions. A point is made about protection core businesses when choosing mode of integration.

Integration of various theoretical frameworks can arguably help explain initiatives of supply chain integration (Sambasivan et al., 2013). This thesis will analyze the main research question from the perspective of; contingency theory, transaction-cost theory, and resource-based theory. This management perspective, contractual perspective, and resource-based perspective all propose different theoretical rationales for the company integrations presented in the case of study. When researching the motives of integration, these theories have been chosen for their applicability to analyze managerial organization, economic variables, and optimization of company assets. A combination of these three facets of organizational make-up could arguably present a richer more in-depth analysis to explain supply chain integration.

### **2.2.1 Contingency Theory (CT)**

Contingency theory is an organizational theory that seek to formulate broad generalizations concerning formal organizational structures typically associated with the use of different technologies. The theory claims that there is no best way to organize a company, lead it, or make decisions (Pennings, 1975). Rather, the optimal course of action is reliant on internal and external factors. A contingent leader will effectively apply their own style of leadership dependent on the situation (Donaldson, 2001).

Organizational design based on the theory has declined steadily since the 1980s. However, there has recently been a resurgence of interest, fueled by appreciation that design is a central problem of management scholarship and practice, a growing demand for theorizing and empirical research on ever-more-complex and dynamic situations, and acknowledgement that organizational design goes beyond structure (Van de Ven et al., 2013, p. 394). The main ideas of contingency have been described the following way (G. Morgan, 1986):

- Organizations are open systems in need of management that can balance internal needs while also adapting to external circumstances.
- There is no best way of organization. It depends on the task at hand, and context.

- The most important concern for management is achieving compatible alignments.
- Different environments need different forms of organization.

The role of externalities in the sectorial context of upstream oil and gas is an important factor in explaining the process of various strategic actions (Flynn et al., 2010). It is in this context that contingency theory is found to be relevant, as it helps explain strategies of inter-firm organization. Environmental uncertainty is found to be a primary reason influencing interaction between organizations (Thompson, 1967). Thompson argued that organizations have an incomplete understanding of the surrounding environment when they are unable to control or predict the variables bound to influence them. Several researchers have identified such uncertainties as a key factor in influencing inter-firm collaboration (Krickx, 2000; Podolny, 1994; Steensma & Corley, 2000). Empirical findings in terms of applied contingency theory could potentially contribute to a guide modeling for similar efforts.

Still, the most obvious critique of contingency theory is that it fails to deal with the fact that organizational designs are planned. The question is how an organization can effectively manage temporary and ambiguous settings? Van de Ven et al. (2013, p. 397) suggest to expand the idea of contingency theory, rather than let it limit possibilities. The variations of where choices can be made could significantly expand the conditional boundaries where contingency theory applies. In other words, reductionist research methods used to analyze the external fit between context and variables one-at-a time should be abandoned (Van de Ven et al., 2013, p. 429). This line of reasoning makes contingency applicable in a larger context, than analyzing ideal fit for just one part of organizational management.

Flynn et al. (2010) find that contingency approach indicate that supply chain integration relates to both operational and business performance. Supply chain integration is often viewed as a tool to navigate through uncertain and volatile conditions. Supply chain integration is found to often be beneficial to companies integrating (Flynn et al., 2010). However, studies find that internal integration and customer integration was more important than supplier integration when the goal was to improve performance.

Van de Ven et al. (2013, p. 429) finds that systems work better when maximizing external fits among its design components and levels of strategy, style, systems, structure, and culture. Contingency theory is potentially applicable in the context of this thesis, as it explains a commitment to work together considering external uncertainties. Still, achieving both an internal and external organizational fit remains an elusive goal. Factors one need to account for exceeds the bounds of rationality for theorizing a conceptual model (Van de Ven et al., 2013, p. 430).

### **2.2.2 Transaction-Cost Theory (TCT)**

Transaction-cost theory is derived from Transaction-cost economic. This is a form of economic organization examined through the lens of contracts (Tadelis & Williamson, 2012; Williamson, 1975, 1979). This perspective could arguably have a role in the management of supply chain integration (Williamson, 2008). This is because any organizational procurement needs to ask the question of whether to make or buy what is being procured. Transaction-cost theory finds that when all costs are considered when accounting for actual cost of outsourcing, acquisitions is not always the best strategy. Cooperation may be mutually beneficial. The theoretical rationale may help structure efficient transactions when markets fail (Williamson, 1975).

An important aspect of rationalizing company integration using transaction-cost theory is that it goes a long way to explain organizational willingness to commit capital into a joint venture (Flynn et al., 2010). The transaction-cost theory perspective is aimed at explaining activities of strategic collaboration. Tadelis and Williamson (2012, p. 1) make a point out of the fact that transaction-cost economics should not be regarded “as an all-purpose theory of firm and market organization”. Rather, the view is that organizations matters for economists if organizations are susceptible to analysis through the application of economic reasoning.

Hennart (1988) argue that the transaction-cost framework can help explain why seemingly dissimilar companies may benefit from cooperative efforts. Transaction-cost economics includes all costs in the consideration when decisions are made, not just market prices. This can in large part help explain why collaborative efforts are mutually

beneficial, seeing as the total cost of producing needed assets may exceed the cost of buying said assets.

Kogut (1988) show us why this mode of transaction is chosen over alternatives as supply contracting, licensing, spot market purchase, or acquisition. Based on the transaction-cost theory perspective, some key attributes of outsourcing and strategic alliances are identified by Aubert, Rivard, and Patry (1996). These are the level of uncertainty, specificities of required assets, difficulty of performance assessment, and the frequency of transactions.

However, they argue that the dominance of strategic alliance governance relates to transactions of low frequency, high asset specifications, and low-level of uncertainty. Transaction-cost economics argue that the transaction is the basic unit of analysis and will therefore treat governance as the means to create order. When order is infused it could “mitigate conflict and realize mutual gain” (Tadelis & Williamson, 2012, p. 3). Alliances will be preferred when this form of cooperative venture minimizes the sum of transaction. That is, if the transaction cost is intermediate and not high enough to justify vertical integration (Krickx, 2000). The present thesis will draw upon transaction-cost theory to explain opportunistic behavior in the formation of supply chain integrations.

Transaction-cost economics is made operational through three basic steps (Tadelis & Williamson, 2012; Williamson, 1975, 1991a). First, the key attributes across which transactions differ must be identified, with the transaction being the basic unit of analysis. Second, alternative modes of governance are described. Third, these are combined through applying the *discriminating alignment* hypothesis: Transactions that differ are more efficiently governed by varying modes of governance (Tadelis & Williamson, 2012, p. 8).

The theory of the firm as a structure of governance postulate a bottom-up construct. Transaction-cost economics examine activity through the lens of contracts (Tadelis & Williamson, 2012, p. 46). Rather than focusing on goods and services and subsequent supply and demand rationale, the transaction-cost theory focuses on transactions and organization. Therefore, the boundary of companies is not given by technology, but rather through the boundaries of contractual terms. However, the theory has been criticized and labeled a danger to organizational management, due to influencing



practice, as opposed to a primary aim of explaining decisions made (Ghoshal & Moran, 1996). Companies are not something to merely substitute the structuring of efficient transactions when markets fail.

Organizations poses unique advantages in the governing of different kind of economic activities (Ghoshal & Moran, 1996). This is because the activities of a company may hold value beyond the logic of a market. Transaction-cost theory fail to recognize this difference. Williamson (1991b, p. 77) claims economy is the best strategy, which fails to recognize both short term and long term gains. In other words, Williamson ignore innovation-related activities. Such exclusion may be because many of the activities associated with innovation happen internally in companies (Dosi, 1988). This is therefore not easily described in transaction-specific terms (Ghoshal & Moran, 1996, p. 35).

### **2.2.3 Resource-Based Theory (RBT)**

The resource-based theory is an influential theoretical framework for understanding how firms achieve competitive advantage, and how it can be sustained over time (Eisenhardt & Martin, 2000; Penrose, 1959; Prahalad & Hamel, 1990; Schumpeter, 1934; D. J. Teece, Pisano, & Shuen, 1997). The present paper will see if the resource-based view of the firm (RBV) is applicable in explaining why strategic alliances form.

Resource-based theory assumes that one may conceptualize firms as bundles of resources. Furthermore, these resources are distributed heterogeneously across firms, and that the resources will carry on over time (Amit & Schoemaker, 1993; Penrose, 1959). These assumptions have been the framework of researchers whom have theorized how such valuable resources can help achieve a sustainable competitive advantage (Conner & Prahalad, 1996; Nelson, 1991). The view assumes that the resources in question are not easily imitated, and the competitive advantages can be achieved by introducing novel value-creating strategies. Such resources, and the ability to access these resources, can be defined as capabilities.

T. Das and Teng (2003) have studied alliances from the perspective of resource-based

theory, and found competitive advantage to come from acquisition of resources. Competitive survival depends on a firm's ability to innovate, integrate, and adjust over time. Motives for cooperative formation may be driven by the idea that acquisition of non-overlapping resources may make companies capable of adjusting to such ordeals (Chen & Chen, 2003; Yasuda, 2005).

Yasuda (2005) argues that a resource-based view of the firm is well suited to explain why strategic alliances are formed. This is because it is recognized that the primary motivation of strategic alliances is the access to resources. There are primarily three motives for developing inter-firm relationships: management, financial, and technological (Townsend, 2003; Wong, Tjosvold, & Zhang, 2005). According to the resource-based perspective, it is the amount of resources needed and the availability of alternatives that relates to the degree of dependence from one firm to another (Varadarajan & Cunningham, 1995). Interdependency is when one actor does not control all conditions needed to achieve desired outcome (Monczka, Petersen, Handfield, & Ragatz, 1998, p. 558).

Despite interest in company assets, it is argued that potential success of strategic partnerships will lie in complementary capabilities, rather than whom had access to assets in the first place (Garcia, Lessard, & Singh, 2014). Resource-based theory state that combination of complimentary resources leads to innovation, which could arguably be unsatisfactory in wholly explaining certain advantages companies achieve in more volatile contexts (D. J. Teece et al., 1997). This is because the industries volatility demands continuous readjustments. Access to superior capabilities may be unsatisfactory due to internal and external variations. A critique of such a rationale is that it reduces the important antecedent of valuable company assets. The tangible and intangible assets represents the resources in this equation. However, such assets do not appear out of thin air. It is the result of management, history and routines.

In other words, potential success of a partnerships will rely more on two companies complementing each other to innovate, rather than just gaining access to something that already exists. Competitive advantage may be maintained, or increased, by adding dynamic capabilities on top of the ordinary skill-sets. Such capabilities may be regarded as core competences (Prahalad & Hamel, 1990, p. 81). Therefore, they could be the drivers of new sources of competitive advantage (Henderson & Cockburn, 1994;

D. J. Teece et al., 1997). The degree of change corresponds with capabilities that address the need for adaption. These are attributes that define a company's ability to develop, reconfigure external and internal resources, and integrate them (D. Teece & Pisano, 1994; D. J. Teece, 1993, 2012; D. J. Teece et al., 1997).

It is of interest to revisit a former paragraph concerning the vagueness of the term capability, and consider the applicability of the concepts at hand. The perspective of dynamic capabilities has been criticized for being recursive and lack concrete specific applicability (Priem & Butler, 2001; Williamson, 1999). However, this was acknowledged by Eisenhardt and Martin (2000, p. 1107), whom made an effort to identify specific routines which have been the subject of "extensive empirical research". It is arguably a *culture* of productive routines that constitutes the prerequisites for successful integration.

## 2.3 Summary

This chapter discuss why companies integrate. An argument is made that companies integrate to achieve innovation. Innovation is inherently difficult because of the demand it puts on resources, market conditions, and time. Considering this, is company integration driven by the need to innovate? The thesis examines different rationale for collaboration to provide a framework for analysis on why collaboration is initiated. This will contribute to the literature on explaining why firms engaged in supply chain integration.

Different theories offer different rationales for entering into cooperation agreements. The present thesis draws upon contingency theory, transaction-cost theory, and resource-based theory to explain such company integrations. While the motives for company collaboration may be varied, an attempt will be made to analyze the case in light of the three chosen perspectives. This will be done by analyzing why the companies are initiating collaboration, what they expect to get from it, and how they are choosing to govern the collaborative relationships. It would be interesting to examine if any of these perspectives can answer the research question completely, or if a combination of perspectives is needed.

**Table 2: Overview of Theoretical Assumptions**

Assumptions on:	Why are SPS and SURF suppliers starting to integrate?	What type of innovation do the configurations expect to achieve with integration of SPS and SURF companies?	How do the organization of SPS and SURF supplier integration differ in the cases studied?
Contingency theory	Supply chain integration is initiated to make available a wider variety of skills depending on unpredictable needs.	Advantage of integration through external and internal alignment, leading to optimal management.	Governance that present best solution to achieve strategic adjustments when needed.
Transaction-cost theory	Cost of transaction motivates supply chain integration.	Advantage of integration comes from the restructuring of contracts. Innovation is driven by an effort to capture transactional value.	Governance depends on how optimal transactions can be achieved.
Resource-based theory	Access to non-overlapping assets motivate company integration.	Acquisition new resources could present options for needed innovative development.	Governance depend on how best achieve successful integration of non-overlapping assets.

The table present a summary of the theories, in term of proposing assumptions regarding the sub-questions explained in the introduction, which are derived from the main research question. These assumptions are to be explored when considering eventual empirical findings. Contingency theory makes an argument for strategical flexibility, while transaction-cost theory proposes a perspective from a cost-benefit point of view. Resource-based theory is about achieving competitive advantage through accessing of new resources. The theoretical assumptions will be explored in the empirical end analytical chapter.

# **3. Research Process and Methodology**

Prior to the overall research methods used in the present thesis, an Introductory account will touch upon the why the case researched was chosen. However, for all intent and purposes, focus will primarily be given to the process of gathering data, and on subsequent analysis utilized on the gathered data. This includes the planning, gathering, and analyses of relevant literature, public documents and media, industry presentation, and qualitative interviews. Validity of the data will be discussed during the following sub-sections of this chapter. Last in this chapter will be an explanation regarding general validity, as well as relevant ethical considerations.

## **3.1 Conceptualization of the Research Project**

To a certain extent, a researcher should acknowledge that prior knowledge, perspectives, and understanding could shape the data in regards to qualitative research. Both cooperation with informants, as well as researchers conceptual understanding of topics, could affect the data (Thagaard, 2003, p. 47). Such awareness about personal engagement is necessary to distinguish the authors socio-political view from the research.

Through the process of writing this thesis, it has been necessary to approach the topic in a manner which has come naturally for the author, which is that of a pragmatist. A pragmatist can be methodologically defined as someone that focuses on solutions to problems and outcome of the research (Creswell, 2007, p. 22). An example of this is that the choice of topic was chosen prior to the theories used. The needed literature was to a large degree the result of a necessity to explain the information gathered, as opposed to dictating what information to gather.

Another pragmatic choice was to accept that no form of quantitative data was available for collection within the timeframe of the thesis project. While quantitative data alongside qualitative data could arguably have strengthened eventual findings, access to such data from relevant companies was unavailable. Last, it is a point to note that

the subject of study had to be adapted many times during the process, as readily available data that showed specifics to be analysed was hard to access.

The case of a Norwegian petroleum sector in crisis is indeed a highly relevant real-life event. According to Thagaard (2003, p. 48), it is important to design a research plan. Such a design entails a description of the research questions, and the guidelines for the research. By doing a case study, the researcher has the possibility to retain a holistic perspective in regards to the meaningful characteristics of real-life events (Yin, 2009, p. 4). Yin (2009, p. 2) postulate that that the following must be mapped in the planning phase:

- Identify research questions or other rationale for doing a case study
- Decide to use the case study method, compared to other methods
- Understand its strengths and limitations.

In inductive research, which this thesis represent, conceptualization is an important part of the process needed to make sense of related observations (Chambliss & Schutt, 2013, p. 61). To clarify the focus, two initial informants with experience from subsea were contacted. These informal iterative interviews gave the researcher a more in-depth understanding of the field, and helped steer the direction of the search. Through a “*snowballing*” effect, a more formal initial informant was contacted for interview. The outcome of this process, along with experiences from a subsea conference, lead to the research question being formulated in the introduction.

## 3.2 Conducting a Qualitative Case Study

In the following section, an explanation shall be given of the case, and why a case study method was chosen for the thesis. It will be followed by descriptions of the methods used to collect data, and a discussion of the thesis' limitations. The field of study is a new one, and any eventual findings are preliminary. The accessibility of data makes a comparative study difficult, and interviews of key personnel was chosen as a key method of collecting data.

The case of study was chosen because of the affiliation with the SIVAC project, as well as industry changes making this an interesting case of entry. Yin (2009, p. 18) provide a twofold definition of case studies. First, he emphasizes the scope of a study. Second, he addresses technical issues related to how a case study is conducted. This is because there are many variables that falls outside the validity of qualitative data point. Such issues will benefit from multiple sources of data converging in an inductive fashion.

The goal of this study is to answer why strategic integrations happened in this specific industry, and how it could influence the development in this sector. This is a phenomenon where understanding the *how* and *why* in the question is important. At the same time, it should remain within the concept of the supplier industry in oil and gas. Therefore, this is arguably a good place for a case study. This study also analyses data collected from a representative subset of sources at a specific point in time, thus constituting a cross-sectional study (Chambliss & Schutt, 2013, pp. 25-26).

This case study needed multiple sources of evidence, as it was difficult to gain access to private company documentation, and organize interviews. This can be viewed as a strength, and a limitation. The lack of transparency in the case of interest made it difficult to gather relevant information. On the other hand, what could be gathered had to come from different sources, thus providing converging lines of inquiry. Yin (2009, p. 116) state that this is often referred to as triangulation, and give case validity.



### 3.3 Data Gathered

In the following sections of this sub-chapter, the methods chosen for collecting of data will be presented. A rationale will be presented for the data collected, and how it could contribute to answer the three sub-questions of the research question. The time available for collecting data in the ESST program was not sufficient to get access to extensive sets of exclusive data, due to the lack of transparency experienced in oil and gas.<sup>1</sup> Thus, surveys or a wide variety of interviews was not a possibility. The data-sets consists of literature research, news media, industry presentations and personal observations, as well as qualitative interviews of expert personnel.

Adhering to the guidelines of purposive sampling, albeit limited, helped ensure that the sampling “represents the setting or issues studied” (Chambliss & Schutt, 2013, p. 98). The data can be “exactly what is needed in a case study of an organization, community, or some other clearly defined and relatively limited group” (Chambliss & Schutt, 2013, p. 98). However, gathering information from a substantial number of informants proved very difficult. All eventual informants would be accessed through the authors existing network, and not through formal channels.

Any eventual documents on the companies’ motivation behind company integration was gathered from publicly available sources. This would be the conference presentations, press releases, and documents from the companies’ home page that were available, as well as other news media. Sapsford (1999, p. 235) state that an extensive investigation of the data’s source and of the applied methodology should be conducted to validate the material. This also includes a scrutinizing of the data in regards to the aims behind what is presented. If there are any uncertainties behind the limitations of the data, it should be pointed out.

I had access to the data from the Underwater Technology Conference (UTC) in Bergen. The annual UTC in Bergen has a history of presenting relevant speakers on important topics of the subsea industry. Industry presentations from UTC was used for data in this thesis. UTC claim to be the oldest subsea conference in the world, with

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<sup>1</sup> This is an acknowledged problem in the industry, with presenters at UTC 2016 jokingly referring to the phenomena as industry “permafrost”. One example of this problem is possible communication between industry actors being identified as part of the motivation behind industry JIP’s (DNV-GL, 2016).

UTC 2016 being their 22nd conference. UTC was sponsored by Statoil, OneSubsea, Subsea 7, GE oil & Gas, to name some relevant contributors. The data utilized in this thesis consist of industry presentations and a report written from the UTC for the SIVAC project, expert interviews, as well as press releases providing necessary information in regards to motivations behind efforts of company integration. This is used to account for such collaborative efforts (Yasuda, 2005).

### **3.3.1 Literature Research**

The core literature was decided upon by using the Oslo University Library, Web of Science, and Google (Scholar). I entered keywords like e.g., collaboration, networking, innovation and oil and gas in various combinations using Boolean terms (and, not, or). If the literature found was relevant for the case of study, I would apply a “snowballing” system. Meaning I would look up the citations within the literature to acquire a stronger base of relevant information. Additionally, some of the books and studies read during the European Studies on Society, Science and Technology (ESST) program was referred to. If relevant books were not published online, I used the Oslo University library.

The first step in the process was to extract relevant information from the empirical body of work that existed in the literature, to serve as basis to answer the sub-question of the main research question. The reasoning behind this was to position the research topic within the existing literature. This would be done by applying it as a descriptive foundation, and later to provide an explanation for any eventual findings. The literature used was screened in regards to its usefulness for the present thesis and in regard to quality prior to use (Punch, 2014, p. 100).

### **3.3.2 Press Releases and News Media**

Retriever and Google was used when searching for media. All the companies had press releases announcing the strategic alliances, as well as a short description of perceived advantages gained through cooperative efforts. Other media reported on the

creation of these configuration, and served as a source to describe the predicament of the current crisis in the industry. The goal of gathering this data is to help answer the three sub-questions. It is also a primary source for explaining the change in context that has lead up to the forming of inter-firm collaborations.

Considering the source being well known newspapers, it is reasonable to assume that the information conveyed were not fabrications or untrue. Therefore, this data is considered credible. However, this data is again only applicable as a reference point for expected output of the strategic alliances. This kind of analysis involves drawing on content that is representative to explain an occurrence that is agreed upon over time (Riff, Lacy, & Fico, 2014, p. 3). The data was used to analyze typical patterns, characteristics, or to identify important relationships.

Press releases come from companies that have an agenda of portraying successful ventures, and does not represent a complete descriptive analysis of the innovative role that strategic alliances may play in the development of SPS-SURF suppliers. However, these limitations are accepted in this thesis, and regarding the research conducted. This is because the data is only used in the present thesis in a qualitative manner, to describe conveyed industry motivation behind strategic alliances.

### **3.3.3 Industry Presentations and Report from UTC 2016**

During UTC 2016, several presentations were made about the direction of SPS and SURF suppliers. These presentations were made available to all attendants at UTC, and were retrieved with the consent of the conference arrangers. The subsea sector is conducting much research and development (R&D) in a continuous effort to improve. An essential part of research communities is conference presentations (Rowley-Jolivet, 1999). Conference presentations consist of three modes of communication: Language, gestures and visual communication. In this context, language refers not only to what the speaker says, but also the written text on the slides, as well as formal languages like mathematics or chemical symbols. The rhetorical aspect is of importance, as conference presentations are more casually presented, by people whom aim to persuade (Carter-Thomas & Rowley-Jolivet, 2003, p. 61).

The visual possibilities give strength to conference presentations through enhanced communicative potential, compared to the visuals of traditional research articles. However, conference papers have an obvious restriction in that it can only ever represent a partial view of a genre (Carter-Thomas & Rowley-Jolivet, 2003). During UTC 2016, several presentations were made about the direction of SPS- and SURF-suppliers. An essential part of research communities is conference presentations (Rowley-Jolivet, 1999).

The upstream oil and gas industry has been generally downsizing after the price-drop in 2014. However, the Boston Consulting Group (BCG) found that the focus has mainly been on capacity reduction, not efficiency (Holm, 2016). BCG identify key cost reduction drivers as technology innovation and “system” simplification, i.e. process innovation. These topics were continuous in many of the UTC presentations in 2016. The presentations were thoroughly examined to see if they were the result of collaboration, or beneficial to collaborations. Presentations held that presented interesting material is excluded from this paper if they do not contribute to answering the research question. Also, presentations that was about simplifications, industrialization or standardization was excluded if it was apparent that these did not take cooperation into account, as exemplified by the development of a standard in Statoil that was vehemently objected to by conference attendees (Fiske, 2016; Vangås, 2016).

The author of the present thesis wrote a nine-page report for the SIVAC project shortly after returning from the conference in June, 2016 (Fiske, 2016). The methods used in the report from UTC is one of observation and impressions.<sup>2</sup> The trip was productive in that valuable insight was gained, and interesting facets of the industry was introduced. The trip that led to the report also made possible the access of the conference presentations, as these are protected by a password given to participants of the conference. The conference has given permission to use the data for future publication through the present thesis.

The limitation of this report is the fact that the author did not have prior knowledge about the discussed industry, technology or alliance formation. Therefore, the author

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<sup>2</sup> Report is available for the SIVAC-project. Can be made available if needed.

was informed about said topics by the people presenting the subjects. Consequently, it goes to follow that presentations, and subsequent impressions are dependent on how subjects were introduced.

Based on the previous consideration of the limitations, this thesis will do a qualitative evaluation of the conference presentations, as well as an empirical analysis of overall tendencies to include common themes in the presentations. These methods will be sufficient to capture different aspects of industry motivation behind strategic alliance formations, and exemplify examples of innovation. It is believed that the presentations, despite their limitations, still represent perceived motivation from the industry suppliers, and are therefore judged as valid data for use in this thesis.

### **3.3.4 Qualitative Interviews**

In this thesis, several interviews were carried out with actors from the subsea sector, whom are involved in the system in different ways. There is one informant from each of the configurations that constitute the cases studied. There is one informant that represent an oil company, which are the client of suppliers. The last informant is the chief engineer in smaller company that deliver services to SPS companies, whom have prior experience from two SPS companies.

A central idea has been to find interviewees whom represent a position in the sectorial structure in terms of subsea technology or the strategic alliances created. The interviews of the experts were done to diversify the data related to the mapping of innovation processes. However, the method was also in parts chosen for pragmatic reasons. Qualitative interviews offered the opportunity to gather “people’s perception, meanings, definitions of situations and constructions of reality” (Punch, 2014, p. 144). The goal was to identify the variety of facets related to the strategic inter-firm collaborations, i.e.; challenges and beliefs.

A reflection on how the interviews were to be analysed prior to conducting them was important, and helped shape the interviews to answer the problems related to the research question (Patton, 2002). This was considered when the interview guide was

made.<sup>3</sup> When the guide was formulated, focus was given to write precise and short questions. The interviewees should all be asked the same questions, with the same intent (Patton, 2002, p. 353). It was also of interest to keep the interview in line with the theoretical framework. However, the guide was revised throughout the process, and adapted to the individual interviewed. The guide also served the purpose to help the interviewer remember the focus and structure of the research.

Decisions on whom to interview varied depending on a series of different factors. It should be acknowledged that the ESST program has restricting possibilities for deconstruction of complex cases due to limited time. The sampling methods used is a mix of availability sampling and purposive sampling, and informants were chosen because of their unique positions and knowledge about the topic of enquiry (Chambliss & Schutt, 2013, pp. 97-98).

Still, a high level of pragmatism was needed in the process of gathering informants. Continuous efforts through official channels were ignored or rejected. Potential companies that could be the topic of analyses rejected approaches made. When all was said, and done, the informants gathered were a result of a snowballing effect that started through the researchers own personal network. None of the informants were available through official channels of communication. There was also a strong demand for secrecy and anonymity. This lack of transparency is a problem for another time, and one that should be of interest. Nevertheless, a group of representative was gathered, considering the scope and method of this thesis.

The method of generating data is semi-structured interviews with R&D and management staff. The technological and commercial side of doing business are often intertwined, due to the contractual nature of the relations between the actors in the upstream oil and gas supply chain. It therefore goes to reason to assume that the respondents from these departments are familiar with the current situation in depth. The informants represent different parts of the supply chain and were selected to understand how the different parts of the supply chain could react to collaboration.

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<sup>3</sup> See appendix II for interview guide.

**Table 3: Overview of informants**

	<b>Segment of the supply chain</b>	<b>Position of the respondent in the company</b>	<b>Interview date</b>
<b>1. Informant, Company A</b>	Engineering and construction	Chief Engineer of Development	03.08.2016
<b>2. Informant, Company B</b>	Engineering, construction and installation	Discipline Manager of Operations <sup>4</sup>	09.06.2016
<b>3. Informant, Company B</b>	Engineering, construction and installation	Technology Manager	04.08.2016
<b>4. Informant, Company C</b>	Operating oil company	Operation Manager	09.08.2016
<b>5. Informant, Company D</b>	Engineering, construction and installation	Chief Engineer	10.08.2016

As mentioned in sub-chapter 3.1, three initial interviews were conducted to get an understanding of the case in question. These interviews were used as markers for direction when working on chapter 4, regarding the context of subsea. It was after these interviews that more semi-structured interviews with experts were arranged and conducted. There are two possible SPS companies, and two possible SURF companies, where two of the experts may come from. This is being kept confidential, adhering to their expressed wishes. The same goes for the two other experts. They did not want to be recognisable, so to be able to speak more freely to the researcher.

When possible, a face-to-face interview was arranged. However, due to geographical spread, some interviews were conducted using Skype. It should be acknowledged that this kind of research creates a knowledge that is the product of interactions between the researcher and participants, in a specific context (Carter & Little, 2007, p. 1319). It is therefore important to understand that the data collected in these interviews are influenced by a set of variables, such as; academic background, personal knowledge, and methods of collection.

The interviews were conducted in Norwegian or English, depending on interviewees native language. All the interviews were recorded with the use of an audio recorder application on a mobile phone. There are particularly two good reasons to use such a device. First, it verifies the interview and how it was conducted. Second, it is easier for the researcher conducting the interviews to concentrate on the conversation and

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<sup>4</sup> Recorded initial interview, not one of the four main informants.

answers provided by the informants. The interview guide was constructed prior to the interviews with the help of the thesis councillors input. It was further developed and adjusted depending on the interviewee.

After the interviews were gathered, analyses was done in three steps (Miles, Huberman, & Saldana, 2013). The interviews were recorded and loosely transcribed, before codifying them. This was then interpreted in the context of analyses. Quotations are paraphrased if needed for two reasons; clarity, and for the sake of anonymity.

First, the study coded for informant's belief of what would benefit from company integration. It was of interest to understand whether the collaborations were believed to influence innovation. Second, questions were asked if there were experimental process stemming from the inter-firm organization, meaning if the collaborations had opened for new approaches to developing solutions. The questions were asked to investigate how the companies were adjusting to the new collaborative efforts.

Third, an analysis of the interviews was done to identify barriers in achieving the desired innovation from integrating. These could be economic, technological, or systemic, in that the whole sector and industry possess innate inertia in terms of adapting per necessity. However, potential barriers could be just that; plural, i.e. varied and complex. This could help explore the strategies chosen to make integration work going forward.

This last part is subject to the informant's own experience. It is reasonable to assume that any barriers experienced is colored by what the informants perceive to be potential problems. The data generated is not large in scope, nor particularly varied. It therefore goes to reason that the analysis is preliminary and could serve as the base for a more in-depth study of more informants. Additional more in-depth interviews would contribute significantly to the internal validity of the research. The general findings from the interviews will be discussed in the empirical and analytical chapter. All the data will be analyzed to discuss the research question in an in-depth manner befitting a qualitative case study. Quotations from the interviews will be used to corroborate findings.



### 3.4 General Validity & Ethical Concerns

This chapter has discussed why the methods used were chosen, as well as how the data was gathered to ensure validity and reliability. The research undertaken should be transparent for academic reviews, to enable a critical and reflexive lens on the work carried out. The possibilities of such a process is related to the validity of the researcher's conclusions and ethics. For the sake of validity, it is important to be clear about the methods used (Chambliss & Schutt, 2013, p. 53).

The degree of which a study corresponds with the real world reflects validity. It is important that findings reflect what they attempt to unveil (Krippendorff, 2012, p. 313). Another aspect of validity is whether the researcher can reflect and criticize their methodological choice, and subsequent analysis. Not to remove personal bias or errors, but rather to acknowledge the fact that choices made could affect the results of the study (Kvale, 1995).

The Norwegian Center for Research Data state that it is important to maintain the integrity of those interviewed before and after an interview (NSD, 2016). I sent an overview of the research proposal prior to interviews to make sure my informants were comfortable with the project and subsequent recordings of the interview. A consent form was formulated to be signed by the researcher and the informant prior to interviews.<sup>5</sup> I also sent relevant quotations used in the thesis to the informant it concerned before completion. This was done so they could correct any mistakes. This was done to ensure that the thesis used reliable and confirmed data.

The data collected was regarding companies, and not persons. The informants are not identifiable, maintaining a high level of anonymity. The answers given by informants are hard to gather from these individuals to test validity. However, different data has been used to triangulate any findings for the sake of validity.

The next two chapters will outline any findings stemming from the methodical choices described in this chapter. The data will be analyzed and discussed in relation to the literature reviewed in the previous chapter.

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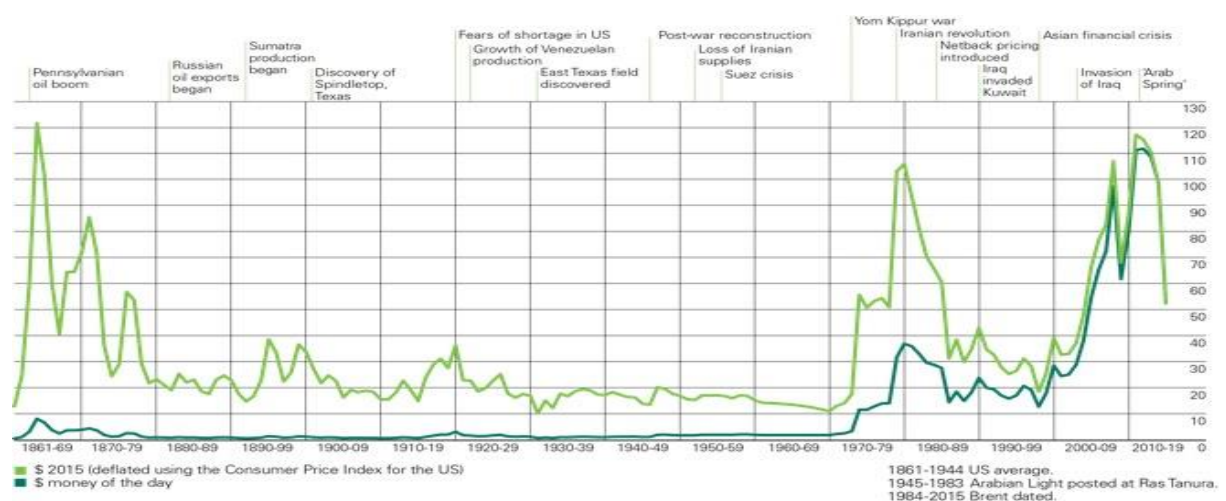
<sup>5</sup> See Appendix I for consent form.

## 4. The Context of Subsea Suppliers

The oil industry is one of the largest industries in the world. An International Energy Agency Oil Market Report (2015) forecasted for 2016 a worldwide average demand of nearly 96 million barrels of oil and liquid fuels per day. That amounts to more than 35 billion barrels a year. Oil is a paramount resource in the world, and it is reasonable to also assume that nearly everybody living in the industrial world is a consumer of oil in one way or another. However, the supply and demand of oil is highly cyclical and volatile, making the prices subject to fluctuations.

The price of Brent crude oil per June 2016, was approximately \$46-48 per barrel (USD/bbl), according to the Intercontinental Exchange Brent Index (ICE, 2016). This price was comparatively higher than at the start of the millennium. However, parts of the upstream oil and gas industry have been experiencing economic turbulence the past years due to what can be considered relatively low prices of crude oil as compared with the beginning of 2014 (Strøm, 2015).

*Figure 1: The price of Crude Oil 1861 – 2016, US dollars per barrel*



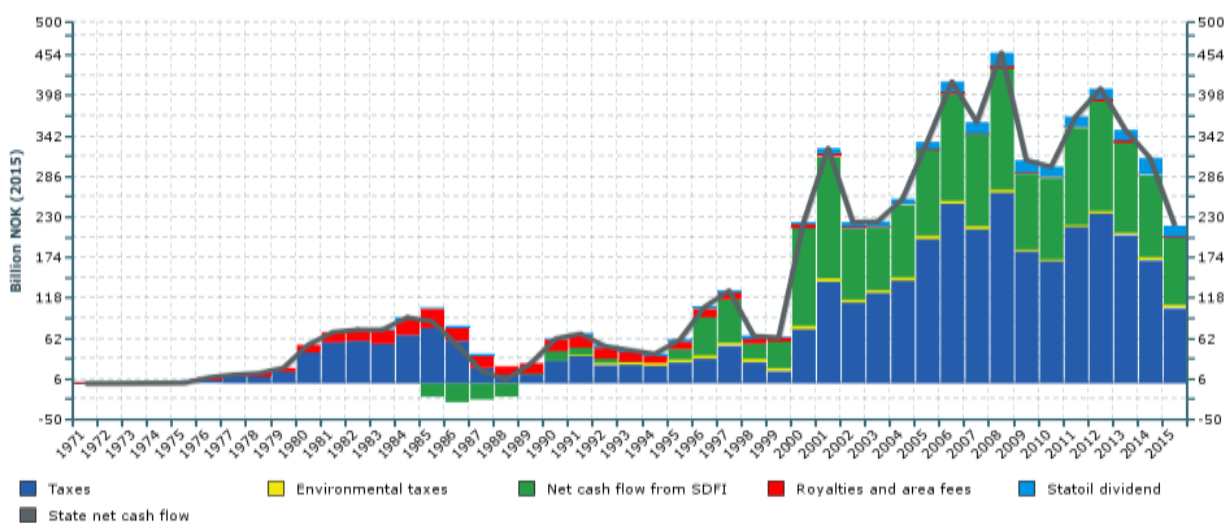
Source: BP (2016)

Since June 2014, the price of crude oil has dropped radically, from around \$114 bbl,

and immediate market outlook does not bode well for the industries affiliated with upstream oil and gas (EIA, 2016; Mathisen, 2016). Thus, many firms are struggling, due to the estimated expenditure per barrel extracted exceeding the calculated margin of profit. Many people have lost their job, and unemployment in Norway has risen partially because of the downturn in the economy.

Norway is both economically and culturally invested in the oil and gas sector, with clear ties to national identity (Fagerberg et al., 2009). National economies may rely heavily on a certain industry, with the supplier industry of those sectors dependent on market conditions for their survival. Norway represent a country with a high dependency on the upstream oil and gas sector, with a rich history of extracting oil from the North Sea continental shelf (Fagerberg et al., 2009; Ryggvik, 2013). The Norwegian government's total net cash flow from petroleum activities in 2015 was NOK 218,3 billion, about 20% of total government revenues (Finance, 2016a).

**Figure 2: The net government cash flow from petroleum activities, 1971-2015 (Updated 11.05.2016)**



Source: Ministry of Finance, Statistics Norway (2016)

The Norwegian oil and gas industry have an attached supply chain constituted by many specialized firms, that support different facets of the necessary services that are demanded. These may vary from oil and gas exploration, extraction and production

activities, as well as eventual decommissioning. Any technological innovation in these companies have traditionally been oriented towards solving specific tasks related to these services.

These numbers don't account for the service and supply industry, which is a natural activity due too sectorial spill-over, becoming highly specialized over time (Ryggvik, 2013). Development of such activity has given rise to a large Norwegian supply industry, where employment is directly or indirectly attached to the petroleum sector (Ministry of Finance, 2016b).

This supply industry in Norway has developed into world-leader during the last decades. Distinguishable characteristics are high competence in especially subsea technology and services (Ryggvik, 2013, p. 133). However, coinciding with this development in competence is also an increasingly high cost and margin, as well as opulent R&D and expensive technological solutions driven by big investments and high oil prices, or as one informant described it:

*There was a crisis during the 80s that was reminiscent of what is happening now, and it was then that subsea was developed as a solution to reduce costs. (...). Still, if you add up rising expenses the last 5 to 10 years, there has been a rising increase in the cost of subsea, no doubt. There has been more focus on harsh environment for development, which is a totally different ball game opposed to further down on the shelf (2. informant).*

The market related to upstream oil and gas is cyclical and highly volatile. This is because the sectors success is tied to fluctuations in oil prices, availability of new fields, and willingness to invest. When the prices are high, companies tend to invest in activities. However, the same companies want to keep up productivity and profitability when prices are low, thus demanding cost reduction during down-years. The prices of oil collapsed in the second half of 2014, and these low prices are persisting at the time of writing the present thesis in the last quarter of 2016. A report from the U.S Energy Information Administration (EIA, 2016) forecast continued low prices into 2018. These changes have had great effect on the Norwegian supply industry.

Statistics Norway (SSB, 2016) reported that July 2016 saw the highest rate of

unemployment in Norway since 1996, adjusted for seasonal variance. Many projects and contracts in the subsea supply industry are being cancelled or postponed. Because of the volatile nature of the oil market, supply companies should be able to adapt their services to the changing conditions of the market. In this situation, volatility is a label given to markets where the competition is continuously shifting, and firms should adjust accordingly to rapid and unpredictable changes. The current market conditions create an atmosphere where suppliers from the sector scramble to create value, to remain “afloat”. Whole systems exist, including at the national, regional and sectorial levels, for this world leading industry.

The activity of the sector has not gone unnoticed, and has spurred academic interest towards understanding more thoroughly how the innovative processes occurs in the upstream oil and gas supplier industry. The Norwegian Research Council, through the Petrosam2 program, is funding the research project aptly named Supplier Industry and Value Creation (SIVAC), which is studying the Norwegian petroleum-related supply industry and its influence and effect on innovation in the oil and gas sector, and value creation in the Norwegian economy. The present thesis is written under the SIVAC project.

## **4.1 What the Companies Supply**

In the following paragraphs, the present thesis will try to account for a rudimentary overview of the products and services the suppliers included in this paper provide. While some of these companies are producers and providers of other goods and services, the overview shows why they are included in the SPS and SURF categorization. The SPS firms have expertise and capabilities in subsea products and technologies, while the SURF firms’ assets and expertise lie in engineering and installation of subsea to surface technology. However, this is not a clear-cut case, as some companies provide services, not only products. Therefore, what is supplied may vary, yet still qualify for a SPS or SURF categorization.

When an oil and gas project is presented, there are, as mentioned, several sub-projects that need to be completed to achieve a successful project. An informant from a SURF company explained the process in the following simplified manner:

*When i.e. Statoil makes a find offshore, they will make a tender for our company and competitors to compete for. They want our help to install the infrastructure that is placed on the seabed to extract oil and gas. (...). We install all that is yellow on the seabed (2. Informant).*

Dividing a project up into several sub-projects awarded through EPC or EPCI contracts to supplier firms serve primarily three purposes. First, it creates work packages small enough to be manageable by specialized companies. This could lead to optimized solutions for the projects, as the projects are done by specialized companies with expertise and experience in the different fields. Second, smaller more manageable sized companies carry reduced risk. This may lead to more companies that can compete for contracts, as opposed to a few big conglomerates controlling a monopoly, which brings us to the last purpose. Third, the idea is that the free market can force prizes down, and that the competitors are incentivized to improve their product. Increased competition could lower the prices of tenders offered for announced contracts.

#### **4.1.1 Subsea Production Systems (SPS)**

SPS are wells located on the seabed. Here, the petroleum is extracted from reservoirs, and tied back to an existing production platform through pipelines where the resources flow. SPS technology covers all phases of underwater productions systems and the interfaces between the subsea systems. This entails a list of products that represent technology or subsystems within the SPS (Norsok, 1998).<sup>6</sup>

The companies that provide SPS technology in Norway are primarily Aker Solutions, FMC Technologies, OneSubsea, and GE Oil & Gas. They have done this when

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<sup>6</sup> Norsok released a fourth standard in 2015. However, that is a commercial product, and therefore unavailable.

awarded Engineering, Procurement and Construction (EPC) contracts by oil companies. There are different segments of such contracts. The engineering part is all the calculations of what is needed considering the different requirements. Procurement is the acquisition of needed assets through a supplier, one example may be the purchase of actual tangible pipes to be installed on the seabed, and construction is the making of technological system and parts.

However, any further description of what constitutes SPS is inherently difficult, as there are variations on what suppliers deliver. Either in terms of capabilities, competences, intellectual property (IP), or assets. More specific examples will, if necessary, be provided in the empirical and analytical chapters of the thesis.

**OneSubsea** is a subsidiary to Cameron, which is a Schlumberger company. Schlumberger Limited had an annual revenue of \$35.47 billion in 2015, down 27% from 2014 (Schlumberger, 2016). OneSubsea is the provider of SPS in this arrangement. OneSubsea have locations in the United States, and in Bergen, Norway. Some products and services included in this is headlined by the following: Subsea tree systems which are the arrangement of valves needed to control the oils that flow from reservoirs, subsea wellhead systems, subsea manifold systems which is the gathering point for several flowlines before redirection to another control point in a system, subsea flowline connection systems which are the pipes needed for the oil to flow from one point to another.<sup>7</sup>

**FMC Technologies** provide a variety of subsea technologies, with SPS being one of the products they supply. FMC Technologies revenue of \$6.36 billion in 2015, down 20% from 2014 (FMC, 2016a). The company has locations in several countries, one of which is in Kongsberg, Norway. They include some of the following overview of products within the SPS-label: Drilling systems that drills the ground to find oil, subsea trees which is the mentioned control point, tie-in and flowlines with tie-ins being pipes that lead back to an end point like a platform or FPSO, manifolds which is the described gathering point for subsea flows of oil and gas, controls and data management (CDM) that control the mentioned technologies, and electric technology which is a potential way of controlling the mentioned constituents of a production system.<sup>8</sup>

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<sup>7</sup> <https://cameron.slb.com/onesubsea/technology-and-innovation/production-systemsfmc>

<sup>8</sup> <http://www.fmctechnologies.com/en/SubseaSystems/Technologies/SubseaProductionSystems.aspx>

#### 4.1.2 Subsea Umbilical, Risers and Flowlines (SURF)

SURF, on the other hand, comprises the engineering and construction work related to upstream oil and gas fields developed subsea, including riser and umbilical activity, and flowline and tieback projects. SURF companies are often awarded Engineering, Procurement, Construction and Installation (EPCI) contracts. There are similarities between EPC contracts and EPCI contracts. What differs is the scope, in that EPCI also entails installation of technological systems. However, the scope of SPS and SURF is also somewhat different on the EPC part of the contract.

Still, there may be overlaps. SURF is necessary to transfer data and power from topside vessels and platforms to the subsea production systems on the seafloor, and provide the products and installation for this part of the oil extraction operations (INTSOK, 2013, 2015). There are many companies that deliver different products to this part of the supply chain, but this thesis primarily focuses on data from SURF suppliers that have officially entered strategic partnerships with SPS supplier.

**Subsea 7** carry out EPCI contracts, with SURF responsibility on several Norwegian projects. Subsea 7 had an annual revenue of \$4.75 billion in 2015, down 31% from 2014. They have several offices around the world, including a few in Norway, but some are, however, closing because of downsizing. The main office is in Stavanger. They work with technology ranging from risers, mechanically lined pipe, electrical heating technologies, and hyperflow riser towers.<sup>9</sup>

**Technip** is a supplier who recently bought, and subsequently merged with the FMC corporation (FMC, 2016b). Technip had a reported adjusted for annual revenue of \$12.20 billion (Technip, 2016). The company has several offices in Norway, including Stavanger and Oslo. Technip operations in Norway are mainly linked to EPCI projects for subsea systems. Some of their core services in Norway include: Project management and engineering, underwater contracting, subsea structure decommissioning, and project management and engineering, procurement, construction and installation (EPCI) of flexible pipe, flowlines and risers, umbilical's, spooled rigid pipe and associated underwater activities (SURF).<sup>10</sup>

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<sup>9</sup> <http://www.subsea7.com/en/media-centre/datasheets/technology-datasheets.html>

<sup>10</sup> <http://www.technip.com/en/entities/norway/servicing-epci-projects>



## 4.2 Integrating Supply Companies

The price on Crude oil plummeted during the summer of 2014. Fluctuations in oil prices is nothing new, but the huge swing in oil prices has had drastic effect on the upstream oil and gas industry, especially in Norway. The same goes for financial investments in the industry of upstream oil and gas, as these declined prior to the fall in oil prices (A. A. Nilsen, 2016). With no upswing in sight for crude Oil, limited new fields available, and a gradual acknowledgment that the current situation may persist, efforts are being made to adjust. One such adjustment is an emerging trend of supply chain integration. There are four major companies that compete for, and deliver SPS. This thesis is looking at two of those companies, OneSubsea and FMC, but the other companies, Aker Solutions and GE Oil & Gas, have also formed collaborations with SURF companies.

Much of the sector identify the business model described in sub-chapter 4.1 as a problem, and a subsequent trend of ever increasing costs of doing business (Skaugset, 2016). There are currently few projects awarded, as the margin per barrel oil is not sufficient to initiate projects. There is high cost of operation, OPEX, and high cost on capital expenditure, CAPEX. Because these costs are so high, there is an industry demand to reduce cost. This hits subsea especially hard due to the need for adequate solutions, and subsequent complex technology. It is difficult to reduce prices beyond a certain point because of the advanced and costly assets demanded from subsea development.

Company integration may present solutions to overcome these problems. When the suppliers integrate, they may take a holistic approach to field development, as well as integrate their mechanisms for solving challenges. It is reasonable to assume that the companies in question can contribute with different sets of intangible know-how and skills. Such skills are not easily imitable, due to the vague and ambiguous nature of such assets. Hall (1992) argue that such tacit know-how, managerial systems, and skills, all fall in the category of knowledge-based resources.

Technip and FMC Technologies announced May 19. 2016 that the companies would merge. The goal was to create a global leader in the subsea industry. The transaction

is set to bring together two market leaders that would build on the success of their existing alliance and joint venture, Forsys Subsea (Technip, 2015). The press release state that the combined company will offer a new generation of comprehensive solutions in subsea, by uniting innovative technologies and common cultures to enable rapid integration. This combination of assets is created to provide a flexible commercial model that can provide integrated and discrete solutions to customers across the value chain (FMC, 2016b). This combination of companies is a form of vertical integration (Porter, 1980).

OneSubsea and Subsea 7 announced in July 2015 that they had entered a global alliance. The perceived idea of the alliance is that it will bring together Subsea 7's technology and experience in seabed to surface engineering, construction and life-in-field services with OneSubsea's production and processing systems technologies. However, the press release announcing the alliance did include a disclaimer. It read that any statements are based on expectations, and that the final results may vary. However, what the result of the alliance may be is not the primary focus of the thesis. Rather, it is about mapping the rationale behind cooperative formations.

OneSubsea's Chief Executive Officer, Mike Garding, state that OneSubsea's "established competencies in subsurface modelling and production systems engineering will be further strengthened by integrating the SURF expertise provided by Subsea 7". Subsea 7 believe that such a combination of firm capabilities is unique in that it "provides clients with the opportunity to significantly improve subsea field economics over the lifetime of the development" (OneSubsea, 2015).

The goal of the alliance is to jointly design, develop and deliver integrated subsea solutions through their combination of subsea expertise. This was announced to encompass SPS and SURF, as well as subsea processing systems and life-of-field services. By combining company resources on select project collaborations and engaging early to improve field development planning, the configurations hope to cooperate with clients to deliver integrated SPS and SURF solutions. It could be argued that such characteristics is a shift in paradigm are descriptive of the period the petroleum industry in Norway is currently experiencing (Freeman & Perez, 1988). Vertical integration may not be the best solution, as the high cost of investment, and rapid need for changing technological solutions may prove too much to bear.

FMCTechnip have merged to adjust to new conditions. However, this is not the general trend as most SPS and SURF integration has taken the form of a formal strategic alliance. The configurations being formed to adapt to the new context could arguably steer the direction of innovation. Literature show that new products or services may emerge from combining already existing capabilities (Powell & Grodal, 2005).

FMCTechnip had more than 49.000 employees operating in over 45 countries at the time of the merger, with combined revenues of approximately \$20 billion (FMC, 2016b). Chairman and Chief Executive of FMC Technologies John Grempe, said that “this is a compelling combination that will (...) capitalize on new opportunities and drive accelerated growth.” The new CEO of FMCTechnip, Doug Pferdehirt, state that they are looking forward to bringing together the outstanding employees and cultures of both companies, to position the company at the forefront of a new generation of solutions in the industry.

The thesis will use the data available to analyse the inter-firm configurations described. Incidentally, the two configurations also represent two very different strategic collaborative structures. These configurations were started within a year of each other in 2015 in the form of strategic alliances, after the economic downturn. The actual FMCTechnip M&A did not happen before May 2016. These two configurations were among the four configurations of SPS and SURF alliances presented at UTC 2016 (Espedal, 2016).

## 5. Empirical & Analytical Chapter

This chapter will be structured after the three sub-question of the main research question. The three theories presented in the literature review will be used to shed light on the emerging supply chain integrations between the cases presented. The goal of the present thesis is to attempt an explanation of the rationales for entering strategic company integrations. Empirical findings and analysis will be intertwined in this chapter. This is because the analysis is structured thematically, which is best served by integrating all the sources of data continuously (Thagaard, 2003, p. 147). This thematic approach divides the text into different categories. An analysis of the connections between the themes provides a foundation for a holistic understanding. This also made the triangulation, as described in the methodological chapter possible.

The first section is aimed at answering why a certain strategy of collaboration was chosen. This will be put in the context presented in chapter 4, and discussed in light of the academic literature on inter-firm cooperation. Industry presentations and expert interviews will corroborate any findings. Announced goals of collaboration will be compared, and a discussion will ensue.

The second section will answer what the data can tell us about potential innovations stemming from collaborations in subsea between the case companies. Industry presentations will be used to illustrate what the industry expects might emerge from the integration of SPS and SURF, while the interview will be used to provide in-depth analyses of these expectations. Furthermore, this will be placed in the context of the theoretical rationales used as framework for this thesis.

The third section will attempt to answer how believed goals of collaboration steer the direction of inter-firm organization. A discussion will follow on how the theoretical rationale may help explain the form of governance chosen in the supply chain integration that is happening.

## 5.1 Strategies to readjust

During the Underwater Technology Conference 2016, the overarching concept was reflected in the title of the conference: *Lean Subsea – the way forward!* Several presentations were held addressing different perspectives on the perceived future of subsea. The common thread was how to readjust successfully to the current context. There is a need to substantially cut cost of services delivered. One of the interviewees corroborates this point, and explains that “operators have a certain goal. This means that they have set a target for 50% cost reduction. Meaning, if they bought a screw before, they now want a similar one doing the same job, for 50% of the price (1. informant)”.

However, how to strategize in the context of subsea to achieve this is not clear-cut. This sub-chapter will attempt to answer the following question: Why are SPS and SURF suppliers starting to integrate?

To maximize a company’s potential in the free market, business strategy is important. D. J. Teece et al. (1997, p. 513) found that advantages were due to markedly lower costs, or offered “markedly higher quality or product performance”. This mean that advantages do not lie in the economic profits accrued through product positioning in the market. It rests on the firms “idiosyncratic and difficult-to-imitate resources” (D. J. Teece, 1982, p. 46). This provides the foundation for the strategic choice of supply chain integration as a means for value creation.

The supply industry of subsea is currently forming different configurations of collaborations. The industry is reacting to uncertainty of future projects and reduced willingness to invest. Companies are making strategic choices based on a need to navigate through future variables out of their control. This is in accordance with a contingency theory perspective, as strategic choices made is happening because of context (Flynn et al., 2010). Qualitative findings done by researcher at the SIVAC project correlate with the perception that collaborative efforts are being made. A preliminary analysis on a set of interviews conducted by PhD-candidates from the Center of Technology, Innovation and Culture, at the University of Oslo, found that market demands made companies adapt to find ways to collaborate for cost-effective

solutions.<sup>11</sup> This is a general trend in the upstream oil and gas industry, and not specific to SPS- and SURF-suppliers. One informant postulated following motives for entering these specific forms of integration.

*I think one of the motives for these kinds of cooperations could be based on a trend in the industry. The perception could be that everyone is doing it; we must follow suit. A second reason is attributed to stock prices, that the owners see potential in increasing the value of the company stock. A third motive is about releasing the potential of such company integrations, but I think it is quite unclear on how to release that potential (5. informant).*

In accordance with Flynn et al. (2010) discussion on contingency theory, it seems that collaborative strategies in subsea is a new occurrence due to externalities. There is a strong agreement among the informants, industry presentation, and press releases that these collaborations are happening due to duress in the industry. According to Buckley and Casson (2010), Company integration stemming from duress do not come without potential hazards. The context or state of a participant in collaborations may be so that the opposite to company integration may spell disaster.

This may result in increased bargaining leverage for the participant not under duress, which may be counterproductive to the cooperation. However, this is perhaps accepted because the gains of a cooperation still outweigh the alternative (Buckley & Casson, 2010, pp. 42-43). This is noteworthy, considering the state of the oil & gas sector. It could seem that all suppliers of subsea are currently under duress. However, company leverage may vary depending on the different organizations impact in the industry.

Official efforts of supply chain integration have not been made prior to the summer of 2014. This is despite empirical studies having advocated the advantages of industry collaboration for decades, as shown in the literature chapter of the present thesis (Hagedoorn & Schakenraad, 1994). Contingency theory can to a large part account for why strategic changes are being made, but it cannot elaborate on a rationale explaining motives for supply chain integration. Therefore, one may perhaps argue that contingency theory is more suitable to explain why no alliances had been made prior

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<sup>11</sup> A citation is lacking because any work to cite is not publicly available. To publish these findings without giving credit would be plagiarism, so I am giving credit to SIVAC-researchers for transparency's sake.

to the summer of 2014. It does, however, not offer an extensive explanation for goals of company integration. It just touches upon the first layer of analysis, as it is necessary to analyze the potential outcomes of collaboration between SPS and SURF companies.

There is a positive relationship between innovative performance and inter-organizational collaboration (Faems, Van Looy, & Debackere, 2005). Success is often found when organizational integration creates effective new patterns as alternatives for traditional ways of overcoming challenges (Ettlie & Reza, 1992). There are possibilities to create new patterns and routines which are more effective. One way is to combine two suppliers from the beginning of field development, that delivers technology which is integrated. The Companies that are capable to draw upon local assets as well as connecting to the larger network made possible through collaboration, may prove to be particularly successful (Cumbers, Mackinnon, & Chapman, 2003, p. 1702).

Subsea SPS and SURF suppliers in Norway has become companies that offer specialized assets. The development of a skilled national offshore oil industry has had a specific economic model, which is now forcing readjustment upon the suppliers in this industry. These companies are attempting to use different configuration of collaboration as a solution to the problems. These large companies with offices spread around Norway are hoping to combine assets to innovate on specific projects. Companies in the city of Stavanger could collaborate with companies that are based in the city of Kongsberg on specific solutions for a field, through a strategic integrated configuration.

A goal is to reduce cost, while still provide adequate or improved solutions to the current system. This initiative is recognizable in time having started post-downturn. This indicates that the spark for such strategic choices is a form of readjustment to dynamic context. This correlates with the rationale of contingency theory, arguing that strategic choices are made to prepare for uncertain market variables (Pennings, 1975). Still, contingency theory does not present a fulfilling theoretical framework to explain the choice of collaboration. This is because the theory does not explain how to achieve the correct externalities for optimal alignment with internalities.

There is currently too much uncertainty regarding the outlook of subsea to know how to invest strategically, while also carrying all the risk. The current assets held by SPS or SURF companies are not adequate to maneuver alone in the current context. Such companies are now joining forces, to readjust. The services offered are currently inadequate in the market as is, as the cost of doing business is too high to make investments profitable. And there is no immediate improvement in sight (Mathisen, 2016). There is an immediate need to reduce the cost of services offered to remain competitive.

### 5.1.1 Direction Towards Company Integration

There is a trend as the four major SPS companies (Aker Solutions, GE Oil & Gas, FMC Technologies, OneSubsea) have started efforts of integration with four large suppliers of SURF. However, this does not explain the goals of such efforts. That owners have a goal to increase their stock value is probable, as this would increase their financial wealth. Still, any financial benefits are to a certain extent reliant on successful collaboration to reap benefits in the long run. This brings us to another important aspect, regarding releasing the potential of SPS and SURF integration. One informant articulated a difference in the company integrations now being done.

*Alliancing and joining up used to be a way of sharing risk, and we have done that before. But mostly it was a way of handling economic risk. What we are doing now is quite unprecedented in the last 15 years, in terms of depth of engagement and level of integration. As part of the alliance we are taking a joint approach towards clients to understand their needs (3. informant).*

The announced supply chain integrations of FMCTechnip and OneSubsea-Subsea 7 show commonalities that are calls for further investigation (FMC, 2016b; OneSubsea, 2015). They both announce that partnering up could create more integrated projects, and that a supply chain of SPS to SURF will make possible more holistic and intertwined solutions. There seems to be an idea that by pooling the assets of these companies, advantages could be achieved beyond mitigation of risk. This is in line with the perspective of resource-based theory, which postulates that risk is a driver of cost



that can be reduced through outsourcing of services (Priem & Butler, 2001). One informant partially corroborates these announced goals.

*There have been collaborations before to some extent, depending on your definitions, since this industry is based on companies delivering different parts of a total system. However, the integrative efforts have not been at this scale (1. informant).*

However, the same press releases want to clarify that the perceived benefits from the company integrations are merely explorative, and no definitive guarantees can be made (FMC, 2016b; OneSubsea, 2015). As shown in the field of literature on networking, collaboration between organizations has been proved to be beneficial towards the innovative performances of firms (Faems et al., 2005). This aligns with the expectations of Lefebvre and Merlin (2016), who argues that reduced CAPEX may be achieved through early adoption of an integrated design approach for SPS and SURF scopes. One informant specified that the current form of collaboration represented something new.

*We have had collaborations before. However, the more recent major collaboration is major. The benefits of this collaboration can come on a few different levels. What we are aiming for is cost reduction, and more efficient solutions. Both in materials used and how we use manpower (3. informant).*

Tattersall (2016) presented Subsea 7 and OneSubsea's vision for their global alliance during UTC 2016. He argued a case for change in the current system, stating that early engagement in field development enabled optimization. This was argued to be because interfacing of disciplines is essential for successful field development. One informant also spoke about the potential of improving upon the interfaces between SPS and SURF.

*There have always been interfaces between SPS contracts and SURF contracts, where the interfaces interact with each other and they have always been very ugly in term of executing contracts where we need to share information across those interfaces. So, there are gains to be had in terms of easier communications to ease those interfaces (3. informant).*

### 5.1.2 Mutually Beneficial Collaborations

The integrated project execution could improve outcome reliability (Tattersall, 2016). By integrating project execution, one could reduce gaps in scope definitions and clarify boundary limits of projects. These gaps originate when different concepts of planned fields are not aligned. Such gaps carry with them a running cost that is avoided in an integrated model. This form of integration could also limit the need for late resolutions of technical interfaces, or other performance related issues. Integration is believed to mitigate risks, improve interfaces, deliver more predictable outcomes, and finally reduce cost.

Transaction-cost theory argues a rationale where all phases must be accounted for in an eventual calculation of cost (Hennart, 1988; Tadelis & Williamson, 2012; Williamson, 1979). It could be argued that the strategic choices for cooperation is done to reduce cost, and this seems correct. However, it does not necessarily account for how to achieve reduced cost. A rationale based solely on transaction-cost theory will offer an incomplete rationale on motives for inter-firm collaborations. This is because inter-firm organization are potentially driven by more factors than solely the cost of transaction.

This argument can especially be made in high-tech industries such as subsea, where customers of solutions delivered demand a certain level of quality and safety. The solutions offered also need a certain level of dynamism. The data shows that the companies are trying to achieve some synergetic effects through integrating, in accordance with resource-based theory (T. K. Das & Teng, 2000; Yasuda, 2005). Collaboration between organizations has been proved to be beneficial towards the innovative performances of firms. Faems et al. (2005) show in their analyses a relationship between innovative performances in companies and collaborative efforts. Innovation of projects always differ because the specific variables of all fields delivered to always vary, demanding new adapted solutions. This complicates the notion that certain technologies can be delivered from a general stock. There is also competition in the market, and a constant need to evolve is a prerequisite for survival.

Still, it would be too simplistic to simply *black box* innovation as an eventuality of collaboration. Nelson and Winter (1982) argued the positive effects of a more

evolutionary perspective, where capabilities and decision rules were prioritized. In their theory, the *black box* where company advantages originated was a larger focus. The linear idea of expected input equals expected output was challenged, as they argued that the heterogeneity of organizations' capabilities was an important explanatory factor for the competitive advantages that originated from some form of innovation. Analyzing potential compatibility of assets and the subsequent perceived results of combining said assets, is necessary to explain motivation for forming company integration between SPS and SURF providers.

### 5.1.3 Summary of Sub-question 1

It is argued that collaborative efforts are being made to access new assets, possibly resulting in needed innovation. Innovation is not certain, but empirical findings suggest that potential novel solutions may be accessed because of collaboration. Either through internal and external alignment, contractual possibilities, or access to valuable assets.

**Table 4: Summarized findings for Sub-question 1**

Why are SPS and SURF suppliers starting to integrate?		
Theory	Assumption	Findings
Contingency theory	Supply chain integration is initiated to make available a wider variety of skills depending on unpredictable needs.	It appears that contingency theory has partial applicability, because company integration has seemingly happened due to the downturn. Still, it does not explain the strategical choices made. Rather, this rationale would argue that integration makes companies more adept at handling uncertainties.
Transaction-Cost theory	Cost of transaction motivates supply chain integration.	These collaborations are not all alliances. A strategic choice has been made to acquire a service, and to incorporate it under one management. However, this theory does not fully offer an adequate explanation to account for the need for innovation. Economic transactions do not account for what is needed to achieve the goals.
Resource-based theory	Access to non-overlapping assets motivate company integration.	This theory does not present a complete explanation for why collaborations happened when it did, considering that inter-firm collaboration has been a salient strategic direction in business management for many decades. However, it does offer a more complete rationale for why collaborations are formed in the first place. The reason being partially that competitive advantage in subsea is solely not gained through competitive pricing. Subsea also depends on the quality of services offered.

The interviewed informants were asked questions about the collaborations, and what they expected would come from it. They were all in agreement about the rationale behind collaborative effort, in that it could save costs. This goes to show that there is an innate belief that integrating company organization could have positive effects on value capture. However, what innovation would eventually come from this collaboration was somewhat more uncertain. It therefore becomes pertinent to open the *black box* of innovation, to look at potential for competitive advantage. These potentialities are part of the equation that may help explain the rationale for integrating companies.

## 5.2 Expected Outcome from Collaborative Efforts

The conference mediator addressed the situation at hand on the opening day of UTC 2016, and unveiled the new abbreviation in subsea: *SSI - Simplify, Standardize, Industrialize*. Cost reduction was the focus, as industry viability was the main agenda. The general theme was that there must be made concerted effort by all branches of subsea management to achieve survival. As shown in the previous sub-chapter, there is a motive of achieving innovation through integration. That is why this sub-chapter will attempt to answer sub-question 2: What type of innovation do the configurations expect to achieve with integration of SPS and SURF companies?

Innovation through integration can affect process innovation and product innovation, both which are entailed in the sub-question formulated. According to one presentation at UTC, 64% of field development projects are facing cost overruns (Tattersall, 2016). In other words, these integrative efforts must capture the potential of innovation to achieve the goals of reducing cost. However, the presentations and interviews show that there are different views on what is believed to be achieved through these collaborations. One informant spoke about the potential of capturing synergetic effects in the following manner.

*I believe there is a wish to achieve synergies. However, I think it is quite hard in the case of SPS and SURF. There is only a potential for synergies there, whether this can be achieved is really the question. Can they access that potential (5. informant)?*

What the data have in common is a primary belief in process innovations. All informants believed the collaborations could benefit the processes related to contracts awarded. This does not mean that shared product development is not possible. Rather, that such efforts could stumble upon certain difficulties, as exemplified by one informant.

*There are advantages and disadvantages of alliancing. (...). Determining ownership of IPs is one such disadvantage. (...). We are trying to create a space for development within the context of the alliance. However, some of our competitors could potentially have an easier time to take care of challenges related to IP (3. informant).*

## 5.2.1 Process Innovation

Several presentations at UTC spoke about process innovations through collaboration. Over 18% of the 61 presentations held, mentioned process innovations through collaborative efforts. Considering the wide variety of presentations, there seem to be a general acknowledgement that there are likely improvements to be made in the integrative processes of subsea development projects.

**Table 5: Overview of mentioned process innovations**

Number of conference presentations presenting process innovations:		
Shared message of process and product innovation	Stand-alone mention	Total mentions (No. of presentations at conference)
6	5	11 (61)

One challenge that cause cost escalation in subsea is the procurement-driven commercial model (Rowe, 2016). SPS and SURF services cater to a multi-billion-dollar industry, where a large part of the problem has been attributed to the rising cost of services and technology, despite a relatively mature market (Skaugset, 2016). One of the primary drivers for high cost in subsea is the OPEX. A large part of reducing OPEX is in simplifying the contracts on projects. In other word, improving the economic practice of transaction-cost (Tadelis & Williamson, 2012).

As seen in press releases, and other media content during the few last years, companies in the oil & gas sector has been downsizing substantially, even closing local offices in Norway (Lilleby & Lorentzen, 2016). The amount of revenue collected from awarded contracts does not match the expenditure of running costs. This new reality has lead companies to lay off or downsize substantially, with a recognition for simplifications becoming evident. Simplification could potentially reap economic benefits. One informant spoke about his expectations, saying that “what I expect from these integrations, is that those companies rationalize, resulting in a smaller employee base. (5. informant)”.

Processes that are not optimized could lead to organizational overlap, ineffective routines, technological complications, and subsequently high OPEX. The conference presentations correlate with the assumption that downsizing conducted in the last couple of years is an effort to reduce OPEX, so that the break-even price USD/bbl can reach a viable level. Firms working on EPCI and EPC contracts will sometimes conduct overlapping work.<sup>12</sup> If this can be removed through integration, it will constitute reduced OPEX and improved efficiency. Still, this means an optimization that goes beyond the purely economic. The right combination must be found, which correlates with resource-based theory (T. K. Das & Teng, 2000; Yasuda, 2005). Both companies have tangible and in-tangible assets. Since some of these overlap, efficiency can be found through a combination of resources to optimize the solution, and avoid such overlaps.

As of June 2016, Technip had reduced its fleet from 36 to 23 vessels. Schlumberger, Haliburton, Baker Hughes and Weatherford had a combined total of 80 000 jobs cut by the end of the first quarter 2016 (Holm, 2016). These employees are the holders of knowledge, and represent potential resources lost (Galbreath, 2005). An informant corroborated this while also expressing concerns for potential consequences.

*When we have an employee base, and the company's revenue then goes from 100% to 30-40%, there are too many employees. Then you have the seniority principle. This industry's senior experts are now retiring, and new one have been hired. However, key personnel are lacking because the new experts are the first to go when you must downsize, and must abide by the seniority principle (1. informant).*

A presentation from the Boston Consulting Group (Holm, 2016) state that efficiency has not followed suit, as downsizing has mainly been on capacity reduction. This means that companies are currently not capable of conducting the same number of projects as prior to downsizing. The reduction in workforce has so far been more about cutting cost due to lack of projects. Not because they would have been unnecessary had there been projects. In other words, they were redundant due to lack of work, not because there were better organizational structures. This is reflective of a short term view on the economics of the sector (Ghoshal & Moran, 1996). If one also consider

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<sup>12</sup> The abbreviation is described in the fourth chapter regarding context.

that 73% of all field development projects are reporting schedule delays as of June 2016, there is apparently a need for improved efficiency in this equation as well (Tattersall, 2016). One informant spoke about potential consequences of downsizing.

*The biggest reason for cost is employees. Then you must downsize. You may find ways to reduce cost, but this can often lead to unwanted consequences, like reduced safety. We might need a couple of big accidents before we acknowledge that safety must be improved upon. To me it seems accidents must be substantial before they are heeded (1. informant).*

Still, another informant's primary belief was that synergetic advantages would be in the contractual model. Meaning that potential for innovation could be found in the combination of assets accessed, and not necessarily in the resources lost through downsizing (Galbreath, 2005).

*SURF and SPS are very different companies in terms of what they deliver through EPC and EPCI contracts. I believe any potential there lies in improving contract models, rather than new innovative technical solutions (5. informant).*

If SPS and SURF are integrated, there will be overlaps in terms of what they can deliver. This means that downsizing may commence without going on accord with the total package delivered (Williamson, 2008). However, the current context of oil and gas has led to substantial downsizing. This is not without reason, but companies must beware.

*You must downsize substantially. The biggest expense of such companies is the OPEX. (...). You must downsize according to revenue to capture value. (...) Everybody is speaking of cost reduction. How is this done? (...) You may find ways to reduce cost, but this can often lead to unwanted consequences, like reduced safety (1. informant).*

In the current model, the technical design of field development is done exclusively by the operator. The next step is to fragment the project, and procure the different parts from suppliers based on the lowest price. After the procurement, the project is



executed with limited integration and significant overlaps. The consequences, per the industry, are sub-optimal project performance. This is because of; failure to drive sufficient improvements in reliability and efficiency, inability to leverage technology system innovation and integration, and limited collaboration with leading service companies at the design phase Rowe (2016). One informant described the situations the following way.

*At the moment, our clients take a look at this from a commodity perspective. It is difficult for them right now to step back and take the wider view on our solutions, and look at them in a total value perspective. Both in terms of factoring CAPEX, and the traditional OPEX perspective, and even things like whether our solutions can deliver increased production rates, by integrating technology in our package. For these alliances to deliver on their potential, the operators need to look at them in this way. And if not, then I think we are wasting our time (3. informant).*

Simplifying the work methods is a large part of what the companies want to achieve from the collaborative efforts, meaning internal and external factors can align more easily as per contingency theory (Van de Ven et al., 2013). There is believed potential for enhanced management process and improved schedule robustness through integration (Lefebvre & Merlin, 2016). The goal is to achieve leaner processes, meaning that the organizational set-up could change.

While the cutting of cost is a driving force, a boost in quality is also desired (Araujo, 2016). Aker Solutions presented a necessity for collaboration, warranting communication from reservoir too Topside. This also demands certain changes in industry culture. A presentation at UTC exemplified this, showing that there existed excessive demands for documentation between actors in field development (J. A. G. Nilsen, 2016). It was stated that if this was avoided, millions of dollars could be saved. In other words, excessive complexity complicates managerial decisions, and leads to excessive costs (Tadelis & Williamson, 2012; Van de Ven et al., 2013).

However, the above-mentioned possibilities may also be partially achieved through optimal combinations of assets. OneSubsea and Subsea 7 believe that they offer an integrated approach that can deliver value (OneSubsea, 2015). The organizational set-

up is announced to reduce risk, reduce cost, accelerate execution, enhance production and recovery, and increase efficiency. According to RBT, advantages may be had if a successful pooling of resources can be found in a strategic alliance (T. K. Das & Teng, 2000; Yasuda, 2005).

Rowe (2016) referred to a specific case where the optimal solution was found because of integrated field development. It is interesting to note that in this case, the optimal solution did not entail the lowest possible CAPEX, and did accelerate schedule by two years. This entails a long-term view which argues a strategy that goes beyond the short-term static rationale of traditional transaction-cost economics (Ghoshal & Moran, 1996). Forsys Subsea found that integrated field development could deliver a lean project, shaving of cost (2016). The cases used during UTC exemplified advantages of integrating planning of fields. Still, any form of integration seems very dependent on a third actor; the operator. At least according to the informant working for an oil company.

*If the oil companies enter a total package deal with both the SPS and SURF companies, it is predictable. However, I doubt this. I do not think oil companies want to commit, I think they want to keep the freedom to choose optimal solutions for fields in development. This is the way it has normally been done. Changes might depend on the mentality going forward (4. informant).*

This last part is very interesting. It shows that operators could be able to choose if collaborating SPS and SURF companies may cooperate on a given project. Operators could choose the technology they deem necessary at any given time, meaning collaborative efforts would need to be greenlighted by the oil companies to remain strictly integrated. If the industry could agree upon interface standardizations, company integration would be beneficial. If standards were agreed upon, contingency theory would be more applicable as managerial decisions would have fewer external restrictions (Van de Ven et al., 2013). There are still some uncertainties in endeavors to come, despite perceived advantages. One informant questioned the relationship between operators and the inter-firm organization.

*I think it [integration of companies, ed. author] allows us to provide the most joined up and holistic view of field development activities for our client.*

*Challenge is of course, what you think of as the core businesses for operators, and I don't think they like to let go of that (3. informant).*

The integrated companies seem to partially be reliant on operators to achieve the desired synergetic effects. One informant made the following argument.

*These alliances are a threat to employees within these companies (...). If these alliances work, then it can change the mode of working, which could be threatening to operators. If operators don't like this way of working, they can kill it. We are finding operators than can like this way of working, and the smaller ones are currently more positive. If this catch on, the larger operators will follow. (3. informant).*

It seems that operators must play a role in a concerted industry effort to make this happen, seeing that completely different SPS and SURF configurations might not necessarily warrant a common technological trajectory in the industry. The informant from company C was also weary of this, stating that one “could fear a technological race, however, the hope is that it could lead to standardization (4. informant)”.

## 5.2.2 Product Innovation

SPS and SURF technologies represent an end-product, like Subsea Trees (XT's), Pipeline End Termination (PLET), umbilical's, flowlines, or risers, etc. The total system constituted by such technologies is an operational oil field. Development of such products is an eventuality of future subsea ventures, and therefore deemed an important part of this thesis. Group President in Cameron, Rowe (2016), believed there to be a need to enhance production and recovery.<sup>13</sup> He presented a belief in capital efficiency through technology. For this to happen, there must be technological development, seeing as the products offered must either remain the same or be improved upon, while also being available at reduced cost. This could be a question of make or buy, in an effort to reduce cost margins, or it could be about a combination of

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<sup>13</sup> OneSubsea is a Cameron, Schlumberger company.

assets to create an improvement (T. K. Das & Teng, 2000; Tadelis & Williamson, 2012; Williamson, 1979; Yasuda, 2005).

One presentation at UTC exemplified potential solutions to a case of field development (Lefebvre & Merlin, 2016). The argument was that by integrating SPS and SURF contracts, management of interfaces became part of the normal engineering workflow within the contractor. In the case presented, a traditional contract split meant there were 70 physical interfaces between SPS and SURF in that case. One alternative could reduce these physical interfaces to 40, through layout simplifications. Such contractual simplification would be in line with transaction-cost economics (Tadelis & Williamson, 2012). However, integration would include the interfaces in the scope of one contract. Integration could help with contracts being signed, however, the improvement is more about combining resources in an effective manner to solve complications (T. K. Das & Teng, 2000; D. J. Teece et al., 1997; Yasuda, 2005).

Such integration of subsea scopes could open a new range of solutions, via joint R&D. The literature tells us the importance of networks in R&D, as well as product development due to the growth of knowledge-intensive industries. Empirical studies have shown that internal R&D, as well as technological sophistication correlate positively with the number and strength of strategic alliances (Freeman, 1991; Hagedoorn & Schakenraad, 1994). The goal of R&D collaboration between suppliers is often to reduce input cost and increase labor productivity (Belderbos, Carree, & Lokshin, 2004, p. 1488).

This sub-chapter will include sections on how company integration hope to achieve reduced CAPEX, increased efficiency, or both. This could happen through technology innovation, or new technology. However, while both technological innovation and new technologies was mentioned as possibilities stemming from collaborative efforts, there were obvious discrepancies in the number of mentions of the two during the presentations held at UTC 2016. There primary focus seemed to be on incremental innovations; that is, on improvement regarding solutions already offered.

The possibilities of new technologies were merely mentioned in bullet points during larger presentations at UTC 2016 (Fiske, 2016). One informant corroborated this view, stating “we are being told to venture into new markets with our technological

development. (...). However, such development is not being followed up due to financial risk and low *technology readiness-level* (1. informant).” For these reasons, the present paper believes that development of new technology, i.e. radical innovations, is not the primary motivations behind company integration (Hurmelinna-Laukkanen et al., 2008). Therefore, this thesis will primarily focus on incremental product development as a goal for these company integrations.

**Table 6: Overview of mentioned incremental product innovations**

Number of conference presentations presenting possible technological innovations:		
Shared mentioned of process and product innovation	Stand-alone mention	Total mentions (No. of presentations at conference)
7	4	11 (61)

As show in table 4, 11 presentations held mention of incremental technological innovations. Only 5 presentations mentioned new technology (table 5), and only in broad unspecific terms.

**Table 7: Overview of mentioned radical product innovations**

Number of conference presentations presenting possible new technology through collaboration:		
Shared message of process and product innovation	Stand-alone mention	Total mentions (No. of presentations at conference)
3	2	5 (61)

As with OPEX, CAPEX is part of the cost of doing business. Industries are served with reducing the amount of expenditure to be or remain viable. The reduction of CAPEX, and how this can be achieved could be an important driving factor for company integration. Sirevaag and Myklebust (2016) state that there is a need to reduce overall SURF CAPEX, and that SPS need to configure, standardize and industrialize. Such development demands combination of assets to be achieved (T. K. Das & Teng, 2000).

Integrated flow assurance optimization is a select technical optimization enabled by integrating SPS and SURF (Tattersall, 2016). Such integration could potentially optimize system operability, reservoir performance, pressure management, material

requirements, and global system thermal performance. One example presented is where integration could reduce scope of drilling. SPS would not be reliant on manifold technology in the presented system, with a reduced number of connections. SURF on the other hand would have reduced installation scope, as certain obsolete technologies would not be needed. This is a possibility achieved by combining tangible assets, as postulated by resource-based theory (Galbreath, 2005; Priem & Butler, 2001).

Forsys presented a case on how integrated field development of SPS and SURF had led to reduced cost, stating that an investment in technology by one branch could lead to substantial savings in the other (Lefebvre & Merlin, 2016). If this is indeed the driver for company integration, it leads us back to a practice driven by economic thinking (Tadelis & Williamson, 2012). When subsea suppliers collaborate on R&D, the presentation showed that solutions may be more beneficial for one supplier, but the whole may benefit the total product delivered. One informant believed this as well.

*What we believe is that the solutions and concepts we are developing for our clients are much more joint up, integrated and optimized. (...). It's not just about spreading financial risk. Its more about looking fundamentally on the solutions and getting them more optimized. (...). I believe we are looking at more efficient solutions from an architectural point of view, than just contractual (3. informant).*

They also advocated that an integrated approach would make possible the use of the most available technologies. However, this does not tell the whole story.

*The interfaces between SPS and SURF has been an extremely cost-heavy link. (...). The companies deliver different kinds of technology, so if one common technology for the interfaces could be achieved, it would be beneficial. However, the companies might want services from a SURF company, but a different SPS company than the one the company is partnered with. (...). This could be because the SPS companies might not have the asset in demand (4. informant).*

Physical interfaces between SPS and SURF contracts are numerous and usually managed by the operator (Lefebvre & Merlin, 2016). Standardization of technology is seen as a major goal, and the belief is that proven standardization may result in cost effective technology (Rowe, 2016). However, this warrant that standardization can be

achieved, which is not given just because of SPS and SURF integration. The demanded collaboration may differ, depending on operator demands.

Some technological solutions in the industry could perhaps have specs above need, driving up prices. If the products could be simplified and fit for purpose, so to achieve a reduced price, it would constitute a technological innovation. Such specs would then be primarily driven by the cost of transaction (Williamson, 2008). Still, such reasoning would arguably not consider the complexity of the technological solutions needed. A presentation at UTC asked for technological solutions that were adequate, stating it is necessary to simplify products (Haug, 2016). However, any technological change needs to be accounted for, and one informant described the need to account for all technical alterations.

*Technological improvements can have complicated consequences. If you think of a chain, that has a weak link. You can change that weak link with something much better, thus improving the chain. However, the structure of these technological systems is something completely different. If you replace a part here, improve upon it substantially, it can weaken the other parts of the system (1. informant).*

If we take the previous statement into account, it is reasonable to assume that any changes in technology, even simplification, demands development. Also, there is a goal in the industry of subsea to innovate, due to challenging locations demanding solutions that fit. Meaning solely economic reasoning would be too simplistic an explanation for innovative goals. A goal to deliver innovation and new technology was announced by Statoil in 2016, despite the need to cut costs. However, it was not made clear whether this was believed to be achieved through collaboration (Araujo, 2016). Still, company integration could potentially help develop the technological solutions offered, as more assets could potentially be combined for innovative solutions (D. J. Teece, 1977; Yasuda, 2005).

*Our alliance partner is a product driven company, and its attitude towards risk is very different than ours. There is a large level of uncertainty when handling large EPC and EPCI contracts. (...). We have to get over this when working together. Also, when developing technology, what is an acceptable risk when developing technology (3. Informant)?*

There are several potential possibilities for product innovation. However, there are different ways to look at this. It could be that the technology is improved upon because of integration. However, the mantra of *SSI* (Simplify, Standardize, Industrialize) is rather about finding common technology for field development. This technology may already exist, with integrated companies developing projects together. Such integration could potentially improve upon technologies, such as; flow assurance, control systems, or design to vessels (Tattersall, 2016). Early integration of SPS and SURF scopes is thought to be a step toward sustainable costs and risk reduction by “helping to achieve the leanest development scenario” (Lefebvre & Merlin, 2016). If such is the case, the assets needed already exist. Integration is then about having integrated management that can act accordingly to demands, to stay competitive. That means that integration is about having the assets needed to readjust when needed (Donaldson, 2001). A large part of the high CAPEX is due to convoluted technological interfaces, and a simplification is perhaps needed.

Layout simplification means less physical interfaces, which could arguably be achieved through integration because this will help make interface management part of the normal engineering workflow within the contractor. In other words, integration could potentially be about optimizing the situation for managerial decisions (Van de Ven et al., 2013). Development of standard interfaces could simplify this connection point for SPS and SURF. A combination of resources is arguably a prerequisite for achieving a common standard all companies may agree upon (Markard & Worch, 2009). An example of standard interface is the Statoil CAP-Xtm solution, which is a satellite structure where the idea is that it is compatible for the equipment of choice (Ramberg, 2016). Such a satellite structure can be placed in and around a system, where specific purpose technologies need to be placed. This could reduce cost through simple design, reduced footprint, reduced rig scope, open structure with a direct tie-in, and by presenting an open platform with standard interfaces. Still, integration of such standards across the board is reliant on industry agreement.

Standardization was a big part of UTC 2016, repeated in many presentations. Araujo (2016) believed that standardization was key to driving down cost. This is due to a couple of different reasons. Open and constructive dialogue between customers and



suppliers could be made possible through opportunities of greater scale. The second aspect being that if collaborative ventures are started as early as possible in the field development it can maximize value. This would ensure that innovation fits the needs of the field being developed.

However, company integration is not necessarily a given positive if innovations are not mutually beneficial. FMC Technologies had a presentation about subsea separation technology, where they concluded that it could reduce the necessity of SURF on certain oil fields. They summarized the presentation stating that such technology could be used as an effective tool for increased oil recovery. That it could be “game changing... if we let it” (MacKenzie & Jahnsen, 2016). If this technology reduces the scope of SURF needs, as suggested, it is interesting to do further research on how Technip acts accordingly. Especially considering that Technip have now acquired and merged with FMC. On the other hand, the alliance of OneSubsea and Subsea 7 is setting up a system to try and handle such decisions; strategic decisions that affect both companies. An informant explained it as follows:

*Through the alliance, we have access to the full pore-to-process thinking, which we believe to be pretty special. Because of this, we have more tactical arrangements with more companies in terms of system development. Where we can share IPs and the similar (3. informant).*

IPs does of course present a challenge in terms strategic alliances. How to handle situations of intellectual property during company integration does, however, relate to form of governance chosen. Or as one informant pointed out:

*There are advantages and disadvantages of alliancing. (...). Determining ownership of IPs is one such disadvantage. (...). But we do have a team of people which is comprised of members from each of the companies which is analyzing the potential for technology development which both companies are contributing with. We are trying to create a space for development within the context of the alliance. (3. informant).*

Nevertheless, it could come down to finding the right fit. This is in line with the argument made in contingency theory; that alignment of external and internal factors is very

important in management (Van de Ven et al., 2013). One informant corroborated this view.

*Potential product development depends on which companies combine. If it is two companies that deliver very different products, I think there are few gains. However, if there are many overlaps, there may be something to gain (5. informant).*

### 5.2.3 Summary of Sub-question 2

An argument is made that the integrated companies are looking to improve both processes related to services offered, as well as products delivered. However, while these improvements could arguably be explained by economic thinking, it would be an error to practice integration effort through solely economic thinking. As for a managerial perspective as theorized in contingency theory, it seems that more externalities need to align for optimal internal management to be achieved. Contingency theory do not seem very applicable as explanation for how to achieve what is needed in these integration

**Table 8: Summarized findings for Sub-question 2**

What type of innovation do the configurations expect to achieve with integration of SPS and SURF companies?		
Theory	Assumption	Findings
Contingency theory	Advantage of integration through external and internal alignment, leading to optimal management.	It appears that contingency theory has partial applicability, because integration makes a larger quantity of assets available for needed contingencies. Still, it does not explain the need to develop the standardized solutions. It seems the externalities are not there to achieve optimal alignment with the internal.
Transaction-Cost theory	Advantage of integration comes from the restructuring of contracts. Innovation is driven by an effort to capture transactional value.	One of the configurations in the case is a M&A. A strategic choice has been made to acquire a service, to incorporate it under one management. The resources have been made available. This view can also help explain a common commitment of capital in a strategic alliance. However, this theory's rationale on innovation fails to incorporate a long-term dynamic view on innovation. Nor does the theory offer an adequate explanation regarding synergetic effects.
Resource-based theory	Acquisition new resources could present options for needed innovative development.	This theory does present an explanation on the strategic rationale used to achieve needed development of subsea services offered. By combining the assets of both SPS and SURF, the integrated companies hope to achieve a more complete solution to offer operators. The reason being partially that competitive advantage in subsea is solely not gained through competitive pricing. Subsea also depends on the quality of services offered.

The empirical data shows us that the services offered must be innovated upon to achieve the goal of reduces cost. Integration seems to be happening to unlock potential for development. It becomes relevant to compare the forms of governance chosen, by the collaborative configurations. The present thesis argues that this is part of the equation that may help explain the rationale behind strategies to integrate in subsea.

## 5.3 Chosen Form of Governance

In the context of transaction-cost reasoning, alliances are preferable to acquisitions when the needed asset is specific (Dhurkari & Nandakumar, 2015, p. 183). This is because the cost of access may be prohibitive, and uncertainty will exist over the assessment of performance of the targeted firm. In other words, it is expensive to buy assets, and you might not receive what was believed to be acquired. However, literature suggest that approximately 30-70% of strategic alliances fail because they neither helped companies achieve perceived goals, nor provided any strategic advantages (Bamford, Gomes-Casseres, & Robinson, 2003). Considering that the cases researched in this thesis is a M&A and an alliance, this sub-chapter will attempt to answer sub-question 3: How do the organization of SPS and SURF supplier integration differ in the cases studied?

Resource-based view of the firm argues capabilities to be a prevailing source of company success (Conner & Prahalad, 1996; T. K. Das & Teng, 2000; Yasuda, 2005). Findings suggest that “capabilities contribute more significantly to firm success than either intangible or tangible assets” (Galbreath, 2005, p. 984). To create such capabilities, complementary investments must be made in process development, tangible assets, as well as established relationships that cross defined organizational boundaries (Winter, 2000, p. 984). These capabilities develop into company specific routines which are carried out tacitly by individuals within the organizations. Thus, a companies’ capabilities intertwine with the learning, practice, and organizational experience. The tacit factor of employees in a firm do arguably matter. One informant explained this, before elaborating on the potential pit falls of companies that grew too big.

*I think a sense of ownership is important. You must live with such decisions, and stand for them. However, in big companies, it is the system that takes responsibility for decisions (4. informant).*

Capabilities may seem like a vague term, as it is often described as complex and hard to identify. A capability is something that “is reflected in a large chunk of activity that enables outputs that clearly matter to the organization’s survival and prosperity”, and

is therefore not easy to replicate (Winter, 2000, p. 983). The concept of capabilities is rooted in the ideas and activities of knowledge and knowledge-creation (Iansiti & Clark, 1994). In other words, that the evolution of capabilities correlates with the process of developing knowledge.

OneSubsea and Subsea 7 has entered a strategic global alliance, announced to be mutually beneficial. The strategic management literature defines strategic alliances as voluntary arrangements between companies involving sharing, exchange, or co-development of technologies, products or services (Gulati, 1998). Grant and Baden-Fuller (2004) postulate alliances to cover the following agreements; supplier-buyer partnerships, technical collaboration, joint research projects, shared new product development, outsourcing agreements, shared manufacturing arrangements, cross-selling arrangements, common distribution agreements, and franchising.

However, the choice by FMCTechnip to alternate from the strategic alliance trends emerging<sup>14</sup> in oil and gas can be understandable if one considers that the failure rate of alliances is quite high. The difference in strategic management is supported by the academic literature. There are several reasons alliances might fail, as opposed to joint venture or merger and acquisitions. An estimated 50% of the failed alliances researched by Bamford et al. (2003) were terminated eventually (Lunnan & Haugland, 2008, p. 549). While the literature acknowledges the possibility of failure, the industry demand may warrant strategic alliance formations, depending on different variables. Some of these may be to mitigate risk, or to access resources needed. As shown in the above sub-chapters, motivation is due to a need for a competitive advantage. Still, the form of governance chosen lays the foundation for developing the needed capabilities for integrating companies to be successful in their innovative endeavors.

### **5.3.1 Differences in Governance of Integrating Firms**

The newly combined FMCTechnip, was a joint venture prior to merging. This configuration also established a new company during the joint venture, that of Forsys

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<sup>14</sup> The two other major SPS companies, Aker Solutions and GE Oil & Gas, have formed arrangements of cooperation and joint venture with SPS companies.

Subsea, in an effort to capture the alliance synergies of the two different supplier companies (Technip, 2015). However, it has now officially merged, and vertically integrated the management of the businesses. Still, one informant is quite adamant that the reality is that this is an acquisition, not a merger.

*I am calling this a sale, even though they call it a merger. It is a big company and a smaller company. When they come together, it is not really a merger, it's a sale. They are calling it a merger; I am calling it an acquisition. (...). I believe the name of this company will be only Technip in a few years (1. informant).*

The informant was very skeptical of whether innovation would be achieved through this mode of governance. It could seem that a M&A has been done to smooth the external and internal alignments needed for optimizing company integration (Van de Ven et al., 2013). This idea could also correlate with the economic reasoning of transaction-cost theory, given the right set of variables, in that the largest advantage gain of such an acquisition would be reduced competition (Tadelis & Williamson, 2012).

*I am not so sure this will lead to improved products, or increased effectivity. However, Technip is getting rid of a competitor. Even though the companies are different, they deliver many similar services that overlaps (1. informant).*

The global alliance between OneSubsea and Subsea 7 has tried to achieve something reminiscent of FMCTechnip, in terms of vertical integration. However, they are not getting rid of a competitor. They could arguably have identified different cost-driving variables, arguing against M&A (Tadelis & Williamson, 2012). Rather, they believe advantages can be achieved through alliance integration of resources (T. K. Das & Teng, 2000).

*We have an alliance that came about a year ago actually, in a response to perceived needs to deliver a more end-to-end view on of system design. In a way, it's more of a way to achieve a more formal vertical integration without the formal process of merger and acquisition (3. informant).*

Vertical integration emerged as a tool during the 1980s to improve upon a company's competitive position. This term is given much attention in "Competitive Strategy" by Porter (1980). Volatility in certain markets will put pressure on companies to engage in vertical integration, as this is beneficial due to uncertainties in the markets (Gilson, Sabel, & Scott, 2009). Porter defines vertical integration, according to Svorken and Dreyer (2007), as "(...) the combination of technology distinct production, distribution, selling and/or economic processes within the confines of a single firm" (Svorken & Dreyer, 2007, p. 7). This means that every part of an enterprise is controlled by shared management. OneSubsea and Subsea 7 is trying to achieve this level of integration through a third organization that represents the alliance.

*We have a third organization that represents the alliance. That organization makes decisions on which projects we go into together, and which to chase separately. This team is integrated, and it's been given strategic limits. (...). It seems to be working quite well. They can leverage the different base organizations. They can access all the functions needed for the alliance. (...). We are quite flexible (3. informant).*

Despite perceived benefits, vertical integration is not necessarily the preferred method of reducing risk. Gilson et al. (2009) finds rather than vertical integration, the preferred strategy is alliances. This is primarily due to products changing at a pace where it is not beneficial for a company to stay on track with all technological development. It is easier to acquire something than continuously staying updated on whatever in-house technology that has become obsolete. OneSubsea and Subsea 7 are trying to combine the best of alliancing and vertical integration. The M&A of FMC Technip comes with a potential caveat.

*FMC deliver total packages. But don't make all the parts, like umbilicals. That is bought from a third party, before selling a total package. Now Technip produce their own umbilicals. Having bought FMC, there is no reason FMC should buy umbilicals from anyone but Technip (1. informant).*

Vertical integration would assume all developments are done in-house, which is difficult in sectors that are demanding rapid change. However, vertical integration

theories still hold merit when trying to understand the motives for integrating companies. This vertical integration that has emerged from the merger of FMCTechnip is opposed to OneSubsea and Subsea 7's official global alliance. This is a more dynamic collaboration, as the companies are seemingly free to pursue other cooperations.

This is coincidentally the case with Subsea 7, as they have newly entered into collaboration with Aker Solutions and DetNorske on a joint project (DetNorske, 2016). One could argue that while this flexibility is an advantage, it is also a continuation of the system that existed. This is because OneSubsea is a direct competitor with Aker Solutions. This begs the question of what OneSubsea's incentive for company integration is, when there is clearly no interdependence. This is a problem from the perspective of contingency theory, as it complicates potential for dynamic readjustment of all factors that constitutes the integrated companies (Van de Ven et al., 2013). This is a problem that could occur, but they are currently of the perception that the third part organization that represents the alliance is adept at making the right decisions on a project to project basis.

*We are trying to see field development we can collaborate on. (...).. There is a really deep level of integration between the teams strategical and technical solutions. It may really be an integrated company, which is good, to get any value out of an alliance (3. informant).*

Several technical optimizations were presented that could be enabled by SPS and SURF integration (Tattersall, 2016). There could be an increase in timely outcomes without delays, or increased access to latest projects experience and what was learned. Schedules could perhaps become more robust and reliable, and more reliable access to latest market technology thus avoiding generic non-optimized solutions. There is arguably potential in this integration, but it is dependent on the concept of knowledge transfer. Knowledge transfer in oil and gas is according to Burnett and Williams (2014) improved by maintaining personnel relationship. Maintaining a personal relationship across companies that are large may not be a given. One informant formulated is skepticism about increasingly large companies.



*Many people are saying these integrations should reap synergetic effects. I am not so sure about that. When a company grows, to fast, and too big, it could become too bureaucratic. The people who works down in the system could feel like they lose autonomy. There could become excess coworkers, who don't understand their role. I am not so sure this will become very effective (1. informant).*

### 5.3.2 Collaborative Challenges

Synergies will not happen easily unless corporate governance reduce the hierarchical structures (K. Morgan & Cooke, 1998). If such structural changes can be achieved, the consequence is the ascendancy of a locus of collaboration and learning that can drive the innovational processes. This is arguably the antecedents of resource-based theory (Augier & Teece, 2009; Eisenhardt & Martin, 2000; Shuen, Feiler, & Teece, 2014; D. J. Teece, 2012; D. J. Teece et al., 1997). An informant highlighted the need for structural changes to achieve integration. He saw potential success if this could be achieved, as well as a move from the traditional commercial model of tendered procurement.

*I believe a closer relationship between SPS and SURF can be a major benefit, if you exclude the commercial aspect. (...). These companies might be places in different countries. If you can develop a common team on the same location, to develop a total package, it could be very beneficial (4. informant).*

Considering this, the Informants were asked about challenges in making cooperative efforts work, resulting in varying answers. Two informants acknowledged that the system was beset with more than one definable barrier. One informant stated the barriers were primarily due to technological incompatibility. The last informant believed that the sector could have a negative systemic culture, meaning it was primarily the way the system was set up that was a possible hindrance for potential development. One informant argued that that the M&A of FMCTechnip must find ways to overcome clear systemic problems to achieve successful integration.

*FMC have been very good at developing new technologies. Development to make technology safer, or to increase recovery rate of oil. This has been the big*

*advantage of FMC, and I believe this is partially the interest of Technip when acquiring this company. Because, in all honesty, what is the value of this company? It is the people. Now slavery is long since abolished, but the interest is in the people bought. I therefore believe the challenge here is to motivate the employees to collaborate across countries. They must find a way to motivate the personnel to relocate (1. informant).*

A longitudinal study propose that the structure of networks influence the potential for knowledge creation (Schilling & Phelps, 2007). The study shows that dense local clustering foster communication and cooperation, due to improved information transmission capacity. Considering the types of company integration described in this thesis, this study provides some general validity for comparison. Technip is based in France, while FMC is in Kongsberg. These geographical locations will need to be overcome to achieve optimal synergetic effects. OneSubsea and Subsea 7 do not share a location either. However, these are companies in a global alliance. Their potential collaborative success is largely based on shared goals due to interdependency, and not “involuntary” integration.

The social interactions, particularly in the form of learning capacity, network competence, and high trust, can be decisive for the outcome of collaborative efforts. The argument goes that collaboration involves tacit knowledge, that is, knowledge which is not easily transferred to another person by means of writing it down or verbalizing it. Accordingly, successful collaboration requires shared experiences and personal interaction. It is the tangible and in-tangible assets that need to be accessed and combined to achieve success (Chen & Chen, 2003; Galbreath, 2005; Yasuda, 2005). There is no guarantee that this will simply happen through combination, and the companies are reliant on certain meta-processes for successful integration (Shuen et al., 2014). A subsequent step is to achieve some form of willingness to interact. This is, however, easier said than done, as exemplified by one informant’s reluctance to relocate.

*Technip’s development offices are much larger; however, can they create an attitude where people are willing to relocate to new offices across national boundaries? Myself for example, I would not want to relocate. The integrated company must find a way to collaborate across boundaries (1. informant).*

If personal interaction and sharing of experiences constitute successful collaborative efforts, it might open up for new technological regimes and technological trajectories. Malerba (2005) refer to technological regimes and technological trajectories when describing how the knowledge and learning environment steers the direction of technological development. Geels and Schot (2007) formulate something similar when postulating that coordinated activity through cognitive and organizational routines, shared by firms and the actors involved, form a technological regime. These discussions could help explain the direction of the technological development within subsea, as it is these kinds of shared routines that shape the direction of the innovations that take place within such a system.

However, one informant reiterated skepticism of potential motives of one configurations integration, stating that he did not believe that these efforts were made solely to innovate. “What is being said is that these cooperation’s will reduce cost and improve efficiency. But I believe that owner motivation is about increasing the value of the stock (5. informant)”. If one argues that the boundaries of contingency theory can be broadened to include a larger scope of management, it reduces the inherently difficult process of innovation to something driven by intentions (Van de Ven et al., 2013). And not by the innovative elements within a company. Not all actors in subsea were favorable towards the new direction of company integration.

The belief of Reinertsen AS (2016) was that the creation of cooperative efforts could create conglomerates that could result in more lock-in problems in the development of subsea. Rather, the company suggested projects should be more fragmented, leaving solutions up to the specific experts. They argued that increased competitions would force prices down, and that solutions could be improved upon more precisely if fragmented further. This is an obstacle for company integration, as the configuration must find a way for assets to incorporate the notion that strategies chosen are mutually beneficial. If the integration of companies is driven by the wrong motives, finding competitive advantage could prove difficult. Solutions need to be innovated and applied across the sector, before economic and managerial rational should drive strategic decisions (Tadelis & Williamson, 2012; Van de Ven et al., 2013).

### 5.3.3 Summary of Sub-question 3

It is argued that the form of governance chosen for the integration arguably depends on identified variables of potential success. However, different approaches are being chosen. A M&A creates a vertically integrated company that does not have to worry about IP rights. However, an integration through M&A is not necessarily because of mutual benefit. The OneSubsea-Subsea 7 alliance try to achieve similar form of vertical integration. However, these companies maintain their independency, while collaborating from a need of mutual benefit. Still, they must overcome challenges related to conflicting interests in regards to IP's, or contracts awarded by operators.

**Table 9: Summarization of findings for Sub-question 3**

How do the organization of SPS and SURF supplier integration differ in the cases studied?		
Theory	Assumption	Findings
Contingency theory	Advantage of integration through external and internal alignment, leading to optimal management. A form of governance that puts management in a position where needed strategic adjustments can be made is preferable.	It appears that contingency theory has partial applicability, since integration makes a larger quantity of assets available for needed contingencies. Still, it does not explain the need to develop the same solutions. Capabilities of rapid change are void if the needed solutions are not available when change is due. External and internal alignment is hard-pressed if industry standards don't exist.
Transaction-Cost theory	Governance depends on how optimal transactions can be achieved.	One of the configurations in the case is a M&A. A strategic choice has been made to acquire a service, and to incorporate it under one management. The resources are then made available. However, this theory does not offer a rationale on how to achieve innovation. It takes for granted that it will happen, not offering adequate explanation of synergetic effects.
Resource-based theory	Governance depend on how best achieve successful integration of non-overlapping assets.	This theory does present an explanation on the strategic rationale used to achieve needed development of subsea services offered. By combining the assets of both SPS and SURF, the integrated companies hope to offer more complete solutions to operators. The reason being partially that competitive advantage in subsea is solely not gained through competitive pricing. Subsea also depends on the quality of services offered.

The data shows us that the configurations have chosen different forms of governance. Still, the reasons for this is unclear. While there is a possibility that they want to achieve the same level of innovative capabilities, the configurations seem to have identified different challenges in terms of achieving competitive advantage. Still, these perspectives are somewhat lacking in terms of social challenges related to integrating.

## 6. Conclusion

This thesis will summarize the findings of the research questions. Furthermore, the implications of the findings considering the theory will be discussed. This will conclude in an answer of the main research question. The perspectives of contingency theory, transaction-cost theory and resource-based theory have been used as a framework (T. K. Das & Teng, 2000; Pennings, 1975; Tadelis & Williamson, 2012; Van de Ven et al., 2013; Williamson, 1975; Yasuda, 2005).

The first sub-question deals with why collaborations were chosen as a strategy by the cases in question: *Why are SPS and SURF suppliers starting to integrate?* The present thesis finds that these suppliers need to readjust to a changing context. Efforts are made to prepare for an uncertain industry where investments are not given, and where oil prices remain low.

The choice of collaboration is motivated by a need to reduce cost, as the cost of services offered are too high. Reduced OPEX, as well as reduced CAPEX, is the primary goal of supply chain integration. Combining the SPS and SURF companies that constitute the cases could lead to improved access to resources, in the form of tangible and in-tangible assets. The empirical data gathered state that an “optimal combination” of assets is the goal of collaborations. The need for economic viability drives the need for innovation, and can function as explanations for the creation of these configurations. The present thesis argues that the mentioned theoretical perspectives should be separated in terms of practical applicability. Contingency theory and transaction-cost theory serve the functions of more explanatory rationales for collaboration, while resource-based theory is more practical in its nature (Ghoshal & Moran, 1996; Van de Ven et al., 2013; Yasuda, 2005).

This thesis finds that collaboration is motivated by potential innovation in terms of cost reduction through process and product innovations. The second sub-question deals with what is to be achieved: *What type of innovation do the configurations expect to achieve with integration of SPS and SURF companies?* It is found that the companies hope to achieve process and product innovations through these collaborative

configurations. There is little belief in the idea that these collaborations can lead to radical new technology. However, there is a genuine belief in incremental technological innovation. There is a need for product development, due to the complex nature of the technology used and better systems integration. If one part of a technological system is changed (i.e. simplified specs to achieve reduced price), it could mean the whole technological system needs adjustments because of it. The parts fit as part of a greater whole, and not like the links of a chain.

The empirical data show that a reduction in OPEX through downsizing is unsatisfactory, as the reduced work force cannot handle the same work load as before the downturn. The contingency theory is lacking applicability when explaining innovation of subsea solutions (Van de Ven et al., 2013). The industry has few shared externalities. Because of this, it is difficult for management to readjust according to needs. The tools needed might not exist. Transaction-cost theory is applicable to explain the drivers of the current development, because the major problem for the sector is identified as the high cost of services (Tadelis & Williamson, 2012). Still, it is not satisfactory because it just argues a short-term static point of view. The long-term dynamic aspect of the industry should also be considered, when explaining what can be achieved through collaboration. Resource-based theory argue that it is access to previously unavailable assets that make possible needed solutions, i.e. innovation. The resource-based theory considers the short-term needs, as well as the more dynamic long-term view of development (Yasuda, 2005). However, resource-based theory does not explain the antecedents needed to successfully achieve the goal of collaboration (Shuen et al., 2014).

These three theories explain choices based on external considerations. Still, there are more problems related to successful development. The fact is that powerful oil companies who tender for services have much to say about which companies are to collaborate on any given project. These operators may need to be convinced of the benefits of supply chain integration. They could give contracts to companies not in an official collaboration. This would mitigate the effects that supply chain integration could achieve.

The last sub-question explores the form of government chosen to achieve the presented goals: *How do the organization of SPS and SURF supplier integration differ*

*in the cases studied?* The chosen form of government could be a choice of how to achieve optimal management and lowest cost of transaction.

Contingency theory and transaction-cost theory both offer explanations on how collaborations should be governed. Contingency theory argue that management should be put in an optimal situation, whether it be through an alliance or M&A. Van de Ven et al. (2013) argue to broaden the borders of contingency theory, making the choice between alliancing or M&A explainable within such a perspective. Transaction-cost theory argue that the question of collaborative governing is one of cost (Tadelis & Williamson, 2012). It might not be the best choice to merge, as it could be more expensive than alliancing. Resource-based theory is applicable as an explanation to modes of government for an optimization of non-overlapping assets (Chen & Chen, 2003). Variables warrants specific forms of governance to achieve desired effects.

There are pros and cons with either alliance or M&A. There are specifically problems related to IPRs. Arrangements on how to decide upon ownership of mutually developed solutions must be made. This is not an easy task for open-ended alliances, as the developed solutions could then be made available to competitors. They need to deal with potential conflicts of IPRs, as well as a need to continuously develop a relationship based on mutual benefit. M&A's overcome the problem of IPR, but could be hampered by lack of independency. Furthermore, technological improvements could be developed by outside companies. A merged company can be in a situation where they spend a lot of resources on costly in-house development, which can then turn obsolete.

The overall research question asked was: *Does the need for innovation motivate integration between subsea suppliers that deliver SPS and SURF?* This thesis argues that the empirical data gathered show that innovation is a motive for collaboration. However, there can also be other motives to drive supply chain integration, e.g. economic and organizational.

The three theories can present assumptions for why companies should collaborate. However, the perspective of resource-based theory is most applicable to explain how to achieve technological product innovation through collaboration (Yasuda, 2005). An argument could be made through the perspective of contingency theory that innovation

happens through the choices made by management. Still, this diminishes the fact that innovation is inherently difficult. Something similar can be said about transaction-cost theory; that it removes the heterogeneity of the constituents needed to achieve innovation.

The table below represent theoretical findings considering the main research question.

**Table 10: Overview of Theoretical Findings regarding the Research Question**

<i>Does the need for innovation motivate integration between subsea suppliers that deliver SPS and SURF?</i>		
Theory	Perspective	Conclusion
Contingency theory	This theory considers the various perspectives of management. Optimal organization should achieve alignment of external and internal factors. Suitable management can then be positioned to achieve best practice.	The perspective can help explain efforts of company integration. However, it does not fully explain how innovation can be achieved in the case of study. The form of governance chosen in the integrated configurations could be motivated by optimal alignment of external and internal factors. If the pieces fit, management is best positioned to make successful decisions per contingency. However, it seems the industry have not agreed upon needed external factors to achieve effortless alignment with internal assets. It is therefore difficult to know what the task at hand entails for the management side.
Transaction-cost theory	The theory argues the perspective of economy. Optimal solutions can be explained through economic reasoning. There is an argument to be made as for its validity as a driver of strategic decisions.	What is needed in the sector of subsea demands innovation to achieve more than just reduced cost. Increased efficiency must also be achieved if the companies are to uphold the same level of production as during financial upswings. The theory does not account for the long-term dynamic of the industry. It is not just the short-term static state of subsea that is needed, to survive the current predicaments of the upstream oil and gas sector. There are also long-term gains to be had in the development of technology. Optimal solutions for the long-term are not necessarily the same as optimal solutions for the short term.
Resource-based theory	The theory argues the perspective of company resources. Optimal assets can be accessed through combining tangible and intangible company assets. The argument is that integration of non-overlapping resources could lead to competitive advantage.	This perspective elaborates on how to achieve potential innovation needed for competitive advantage. To that extent, the theory is applicable to explain what the supply chain integrations could achieve. However, the theory lacks explanatory power for other motivational drivers for company integration. Also, the theory does not explain what is needed to achieve successful combination of assets. These are the antecedents described by dynamic capabilities. These dynamic capabilities can be company specific, and efforts must be made to access them as well, to achieve potential innovation.



The thesis has explored the motives for collaboration between companies, as called for in recent research (Sambasivan et al., 2013; Yasuda, 2005). This served as the basis for the main research question. A move towards company integration is important for the companies to achieve sustainable competitive advantage. While contingency theory, transaction-cost theory and resource-based theory do not effectively present a complete framework for such strategies on their own, the perspective on resource-based theory do help explain the immediate advantage of combining non-overlapping.

The value and validity of this form of study is that it can reveal barriers for successful collaborative efforts. Before collaborations can have a positive outcome, an understanding of why they are formed is important. This study presents an understanding of why the companies integrate. When potential barriers, or motives, are unveiled, actions can be taken accordingly. In the cases presented, efforts must be made to solve the possible issue related to oil operators. Efforts should also be made to integrate companies on a more personal level, as opposed to just economically and contractually. The assets held are largely knowledge based, meaning much competence and know-how is held by the employees. This means that efforts should be made to get key employees on board to achieve synergetic effects.

This thesis attempts to answer to why collaborations are formed to begin with. The study represents a part of a greater whole, and could be used as a basis for further research. One example is the element of personal relationships, and cultures, in the subsea sector, which has been left out in the context of this thesis. It would also be interesting to investigate what specifically the companies are doing to achieve innovation, in terms of development and organizational changes. Furthermore, research on how oil operators react to changes is important. It could seem that efforts of innovation through collaboration is dependent on powerful third parties.

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# Appendix I – Information and Consent Form

Oslo, .., .., 2016

**Research project:** Study of what could come from company integration between subsea suppliers

**Interviewer:** Robin Reistad Fiske, Center for Technology, Innovation and Culture, University of Oslo.

**Interviewee:** ...

**Purpose of the study:** The general purpose of this study is to improve our understanding of the development of Norway's subsea suppliers emerging collaborative efforts. To gather information for this analysis, semi- structured interviews will be conducted with people from different segments of the industry in Norway. Experts, researchers and government officials could potentially be approached if deemed necessary.

**Expected duration of research:** Should be finalized in the Autumn semester of 2016.

**Usage of information:** The information gathered will be used for the analysis undertaken to complete this specific research project. The transcribed interview could also be made available for use to the SIVAC research projects upon further agreement. Upon completion, the study will be published internally at the University of Oslo, possibly also externally, if the involved parties agree. This consent form does not represent such a consent for external publication at this time. The final product will be publicly available, unless interviewed companies require different levels of confidentiality.

**Participation:** The interviewee is not in any way obliged to take part in this study, and may decline to participate. Also, the interviewee may withdraw from the study at any time. If the interviewee decides to withdraw, the information provided will be removed from the collected data, and will not be used in the analysis. If the interviewee wishes, he or she can remain anonymous. The interviewer will take all precautions to assure the privacy and confidentiality of the interviewee. The interviewee can ask questions about the research at any time, and may receive information about the research results and conclusions if desired.

By signing this document, the interviewer confirms that he/she will commit to the description above.

By signing this document, the interviewee confirms that he/she is familiar with the above information, and agrees to participate in the research project.

Interviewee

Interviewer

## Appendix II – Example of Interview Guide

Interview Guide			
Interviewee:			
Date:	Start:	Finish:	
Theme	Questions	Notes:	
Introduction of interviewee	1. Would you kindly give a brief introduction of yourself?		
About subsea strategic technological partnerships	2. Has your company been involved in collaborations/partnerships with other subsea companies?		
	>How/why?		
	3. What do you expect this collaboration could contribute with?		
	Example: How about the development of SPS/SURF related technology?		
	Example: How about influencing the processes regarding SPS/SURF related organization?		
	4. Have there been similar collaborations before? Albeit unofficial?		
	If yes: Are there any differences for the company between official and unofficial collaborations?		
	5. How will the companies juggle the need for collaboration, and the need for competition in the industry?		
Identifying partner capabilities	6. Could you tell me about what capabilities your company, and your partners bring into this collaboration?		
	>How are decisions made in this new context?		
	>Are there any room for experimental processes?		
	7. How has this collaboration affected your internal work processes?		
	If non: Do you believe there to be challenges, or barriers?		
	>Do you believe there to be some system reluctance towards integrating these firms?		
	>Technological barriers?		
	>Economic barriers?		
	If yes: Could you explain?		
	>Opening for follow up regarding what is being said.		