



Universitetet  
i Stavanger

**FACULTY OF SOCIAL SCIENCES,  
UIS BUSINESS SCHOOL**

## **MASTER'S THESIS**

STUDY PROGRAM:

Master of Science in Business Administration

THESIS IS WRITTEN IN THE FOLLOWING  
SPECIALIZATION/SUBJECT:

Business Innovation

IS THE ASSIGNMENT CONFIDENTIAL? **No**  
(**NB!** Use the red form for confidential theses)

TITLE:

**ORGANIZING A CLUSTER TO FOSTER INNOVATION**

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## Preface

This 30 credit Master's thesis is included as a final part of the Master's Degree of Science in Business Administration with specialization in Innovation at the UiS Business School.

We are the first class to study the specialization "innovation" at UiS Business School. This has made the process challenging, but still very interesting. We were first introduced to the concept of innovation the first semester of our Master's Degree. We have taken three courses on the subject, before we started our research for our thesis. As a result, we got a deeper insight into the subject. This has helped us get a broader view of this research theme.

We would like to thank our supervisor, Elisa Thomas. We appreciate all the hard work you have done to help us in this process, and we are grateful for your good input and constructive feedback along the way.

We would also like to thank the people we interviewed during this process: Trine M. Øfeldt, Henrik Heggland, Kjetil Roalsvik and Eirik Wathne. We appreciate you taking the time to answer our questions, showing openness and making good input to our case study. Lastly, we would like to thank our family, fellow students and friends for their moral support.

We would like to inform the reader that the research findings are based on our own interpretation, and that we take full responsibility for any misinterpretations or misunderstandings that may have occurred.

## ABSTRACT

In this case study, we examine how the Dusavik base in Stavanger can be organized into a cluster to foster innovation. Literature on the subject does not present one single explicit cluster model that could be applied. Therefore, we drew from literature on collaboration, clusters and open innovation to put together categories to analyze the case. In order to answer our research question, we have used a qualitative approach and conducted interviews with company representatives at the Dusavik base. We have also retrieved documents and made observations to collect data that can be related to relevant theories. Our results show that the Dusavik base is missing two important cluster actors in order to be identified as a “complete cluster”. These are educational- and research institutions. However, we did find that the base does have central actors, like firm-to-firm interaction, government involvement and capital providers. We also found that the companies at the base do not work on innovation on a regular basis, and that collaboration between companies at the base happens mostly for specific projects. Finally, we established a link between theory and our research findings to make suggestions about how the Dusavik base can be organized into a cluster to foster innovation.

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# 1.0 Introduction

## 1.1 Background

In June 2014, the oil price reached its highest of \$115,06 per oil barrel, while in January 2016, the price fell to its lowest since 2003; just below \$30 (Valebrokk, 2016). This is a reflection of the continuous price fluctuations that occur in the oil-and gas industry, facing high unpredictability. The price fall has led to major economic consequences. Due to constant changes, the dynamic oil and gas industry is dependent upon several different factors. A report from OECD states that an increase in oil prices has encouraged a growth in oil-related activities (Winther, 2018). Equinor<sup>1</sup> has been a major contributing factor in the structure of the Norwegian economy and oil industry since 1972. For many years, the company has been the largest company in the Nordic region, consisting of around 20,000 employees (Statoil, 2018).

Equinor Dusavik is one of Equinor's six supply bases along the Norwegian coast. Co-located with ExxonMobil/Point Resources and Total, the three operating companies, as well as 60 oil-service companies are geographically dispersed at the Base. Equinor has a value chain that primarily focuses on upstream exploration activity, operation of offshore installations, but also the development, transportation and sale of oil and gas. The operations at the Dusavik base are not considered to be a core focus for Equinor, but is a necessary support process for primary activity to work. Without supply from land, offshore activity stops. Therefore, the base operation is a critical factor that Equinor needs to maintain efficient offshore operation. In fact, 10% of all costs in 2015 consisted of logistics for just one of Equinor's operating installations (Øfeldt, 2017). The base operation has not faced any major changes in the past 10-15 years; operating with more or less the same structure as before. This sector is facing a substantial development gap that needs to be filled in order to effectively reduce the logistic costs in Equinor. Seeing that Equinor has implemented efforts towards innovation<sup>2</sup> in several areas, the logistics and shipping at Dusavik is also an area that requires innovation (Øfeldt, 2017).

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<sup>1</sup> We are using the name Equinor, which is the new official name of Statoil since 15/05/2018.

<sup>2</sup> Innovation is defined as "new or significantly improved goods, services, processes, organizational or marketing models that are used to achieve value creation and/or social benefit" (OECD, 2005).



The Dusavik base consists of a handful of Norway's core oil-and gas firms. When firms locate in a cluster<sup>3</sup>, it opens for social collaboration. Forus and Tananger, which are two of the largest industrial clusters in Western Norway, consist of industries of different scope and size. These are examples of nearby clusters, that portrays some of the same characteristics as Dusavik. This closeness that is brought by location creates an environment that can spark cooperation, knowledge growth, and innovation (Forus, 2016). Because of its high concentration of industry related firms and favorable location in terms of firms' activities, Dusavik portrays aspects that could promote a cluster. Though lack of important cluster actors at the Dusavik base may be the core issue that prevents the base from fostering innovation.

The petroleum sector is a field with an increasing focus on innovation. There has been a growth of large oil related companies, low oil prices, and a more environmental friendly focus. Because Equinor is such a central part of the oil and gas industry of the Norwegian Continental Shelf, it is crucial that they keep innovating (Statoil, 2018).

This thesis focuses on the innovation aspect of geographically concentrated firms within the oil-and gas industry. By introducing cluster theory, we will try to see how and if the Dusavik base can utilize the theory to further improve their innovative activities. Today, Equinor is under a one-to-one contract with several of the operators at the base. With this, we will look further into the research question of "How the Dusavik base can be organized into a cluster to foster innovation?".

## **1.2 Purpose**

### **1.2.1 How collaboration leads to innovation**

More and more people are clustering in urban areas, and it is not just because they enjoy the cosmopolitan atmosphere and large skyscrapers, but because there are numerous industrial advantages for a firm to locate in these areas. These are benefits like networking, increased productivity, economies of scale and knowledge spillovers (Florida, 2005). People usually

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<sup>3</sup> A Cluster is defined as a "geographic concentrations of interconnected companies and institutions in a particular field" (Porter, 2000).

flourish in environments with like-minded people, here ideas are brought to life, and innovations arise quicker and more efficiently.

Economists started already in the early 1900s to recognize that social proximity was important when it came to a firm's expansion and competitiveness (Weber, 1909/1929). It creates advantages to position people in a cluster from an industrial point of view. This makes production cheaper, causes productivity to increase, and if the producer is located in a cluster; it is more likely that the product will face an improvement of incremental innovations (Porter, 1990).

Innovation often happens through collaborations (Vitasek, 2015). Hence, networks play a central role in the outcome of successful innovation and clusters. One can say that innovation in networks is a theory that innovation and relationships depend upon each other (Huston, 2007).

Satell (2005) says that in today's society the greatest resources and capabilities of a network lies outside the firm. It is crucial for a firm to have broad social network with strong ties, because this can further generate opportunities for them. By having the "right relationships", it can help you get ahead by consuming new and substantial information on what's trending, as well as getting first-hand novel information. Hence, knowing the importance of networks is vital for a firm's ability to innovate and stay relevant. The literature on innovation states that a firm doesn't innovate in isolation, but is dependent upon thorough interaction with its environment. This statement is related to the fact that the market can serve as a push for innovation, because sellers and consumers constantly merge according to supply and demand (Fagerberg, 2013).

Further, in order to answer the research question, we introduce a theoretical framework in the next chapter, focusing on how collaboration affects innovation. Looking at how an agglomeration<sup>4</sup> economy can be developed through collaboration will be a prominent notion throughout the paper.

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<sup>4</sup> Agglomeration economy is a geographic concentration of complementary companies, as well as supporting institutions where firms benefit economically from being located in a cluster (HBS, 2015).

## **2.0 Literature Review**

The purpose of this chapter is to provide an overview of relevant previous research regarding our problem. The chapter begins with an introduction of innovation, what consequences open and closed innovation have, and influencing factors for innovation. Then we will review what effect collaboration has on innovation. We will go deeper into research of what characterizes a cluster. On this topic, we will classify gaps that can hinder innovation, as well as cluster initiatives to foster innovation.

### **2.1 Innovation**

“An important distinction is normally made between invention and innovation. Invention is the first occurrence of an idea for a new product or process, while innovation is the first attempt to carry it out into practice” (Fagerberg, 2013). In other words, innovation is the process of translating an idea or invention into a service or good, which has enough value for a customer to willingly pay for it (Innovation).

#### **2.1.1 Incremental and Radical innovation**

There has been an approach to classify innovations according to how radical they are compared to current technology. From this perspective, continuous improvements are often defined as “incremental” innovations, and completely new innovations are defined as “radical”. In most cases, it requires a series of incremental improvements to recognize the economic benefits of “radical” innovation. Hence, the bulk of economic benefits come from incremental innovations and improvements (Fagerberg, 2013).

#### **2.1.2 Types of innovation**

Depending on the use of factors of production, a company can make many types of changes in its method of work to improve productivity and/or performance. The Oslo Manual (OECD, 2005) outline four types of innovations that include a wide range of changes in a company's activities:

1. **Product innovations** encompass significant changes in the capabilities of a good or service.
2. **Process innovations** is characterized by significant changes in the delivery method in a production
3. **Organizational innovations** are implementation of new organizational methods; often in terms of business practices, the workplace organizations or a company's external relations.
4. **Marketing innovations** involve implementation of new marketing methods; ranging from product design, product promotions and ways of pricing a good or a service.

In many cases, innovations may have characteristics that include more than one type of innovation. Because of this, it can be challenging to categorize these innovations as a single type. When collecting data of an innovation that includes several types of innovation, this will often improve the quality of the result. A change where several types of innovations are involved, creates improvements on several areas. For example, a product innovation often requires a change of the process of this development (OECD, 2005).

## **2.2 Collaboration**

With the tight global competition today, existing solution arenas are becoming less compatible (Frank and Pillar, 2003). This change drives the opportunity to find new solutions in order to keep up with such fast paced economy. Social and economic changes are two of the influencing factors that have restructured firms' businesses; moving away from the traditional vertical integrated forms of business, towards a more flexible and lean hybrid organizational form (Powell, 1987). With this, close relationships and cooperation between independent firms can be beneficial for both open markets and formal organizations (Miles and Snow, 1992). Instituting forms of joint effort between firms may create a greater span of potential outcomes, compared to a traditional vertical integrated form of business.

The concept of collaboration has many definitions and meanings. Cooperation, in terms of collaboration is often referred to as "the process where competing forces transcend diverse agendas and achieve win-win outcomes" (Thomas, 1992). Also, meta-capability reflects learning ability, renewing skills and the ability to adapt to changing environments (Beyerlein,

2006). By incorporating new external knowledge through collaboration, firms are enriched with new knowledge and a diverse aspect of resources. Through the process of collaboration, it is also important to overcome systemic barriers that arise with integration. Overcoming structural differences, at the same time, orienting team skills and talents are key concerns that need to be in balance in order to establish grounds for further collaborating activities (Beyerlein, 2006). If underlying barriers are not managed properly, collaboration may not reach its potential.

### **2.2.1 Collaboration due to proximity**

Further, looking into collaboration between firms in the context of proximity, theories suggest that several benefits arise through close relations. Through interaction between firms located within the same nearby area, innovation is merely a consequence (Fitjar and Pose, 2016). This fundamental statement demonstrates the important role of geographical proximity and its relation to innovation, as well as collaboration and its contribution to new knowledge. Hence, the formation of relationships between firms is a leading argument for innovation.

Many theories support the positive relation between two collaborating firms. One argument for switching from competition to collaboration is a result of a growth in “post-alliance payoffs” (Li and Nguyen, 2017); Maximizing profits is often a major motivating factor, while reduction of cost or risk is another driving force due to technological change. Furthermore, what often determine the switch to collaboration is also dependent on the technology replacement and patent protections within the individual firms. The reward in this case, depends on the control of intellectual property rights, transaction costs and sunk costs that are associated with market entry (Li and Nguyen, 2017). With this said, there are a lot of motives to collaborate for innovation.

### **2.2.2 Barriers to collaboration**

Hansen mentions four barriers that companies may face when collaborating (2009). The following barriers are:

1. **Not invented here.** This barrier often arises when there is a lack of willingness to seek knowledge outside of the four walls of a company. This is often characterized by companies that use internal resources for research, as well as communicating primarily within the company.
2. **Keep it for ourselves.** This barrier often arises when there is a lack of willingness to help and share experiences. This is often characterized by competition, where there is a fear of losing competitive advantage by sharing knowledge.
3. **The search barrier.** This barrier often arises in situations where it is difficult to find information and resources. This is often characterized by large companies, large physical distances, too much information and a lack of network.
4. **Transfer barriers.** This barrier often arises when it is difficult to transfer knowledge from one place to another. This is often characterized by a lack of common framework and good relationships (Hansen, 2009).

### 2.3 Open Innovation

Based on previous research studies, we know that when similar firms co-locate in a geographical location, they benefit from specialized labor and other inputs from local actors (Park et al., 2012). More firms are making use of open innovation, and are slowly moving away from the traditional closed innovation. Closed innovation is characterized by the context of bureaucracy, whereas open innovation is characterized by shared knowledge from related entities. The free access of others' sources allows for a much greater span of knowledge, though there is no exclusive right for the application of open innovation. One reason behind this move from closed to open innovation is the fast-paced environment and constant technological changes that occur frequently and rapidly. Seeking new means to overcome the risk of falling behind, open innovation has become a popular source of knowledge creation (Chesbrough, 2004). The idea behind open innovation is that innovations are not always developed entirely within a single firm. Essentially, open innovation theories propose that the creation of innovative outputs is promoted by more openness toward external sources of knowledge. This openness stimulates the flow of knowledge and the information flow amongst companies. Internal and external knowledge environments have changed the way firms think and how they act, using open innovation. The open innovation approach does not require a firm to replace all of its existing R&D efforts. However, it does change the primary question leaders should be asking to "How can my firm create significantly more value by

influencing external actors to bring many more innovations to market?” This highlights the importance of having an open mindset towards sources of innovation and the significance of external actors (Muller, et al. 2013).

Two important aspects of open innovation have contributed to the increased application of searching for innovation; complementary knowledge across boundaries and integration of external sources of knowledge has led to a broader and more complex use of existing capabilities in a cluster (Huang, 2013). It is important to note that the fundamental idea behind open innovation is the importance of not isolating or excluding any individual, community or participant of the “ecosystem”. The motivation behind individuals and groups that make open initiatives contrasts the firms that merely adopt open innovation to sustain value creation and acquire new knowledge (Park et al., 2012). In order to maintain a competitive advantage through investments in narrow core competences, as well as providing more innovative offers, require a broad collection of resources and capabilities to satisfy the growing demand. Therefore, firms rely on a heavier use of external resources to support their knowledge to innovate in common (Crespin-Mazet et al., 2013).

Conceptualizing open innovation as the driver for developing fundamental competence through allocating resources can help to generate an increased level of performance and boost competitiveness (Shamah and Elssawabi, 2015). Additionally, this would reproduce the cooperative relationship between supply chain actors as benefits increase to firms that appreciate both an external and internal climate of trust (Waston, 2005).

## **2.4 Closed Innovation**

With closed innovation, firms require a strong type of control. The knowledge and technology is focused internally within a firm and its employees to reach the sufficient level of quality (Alawamleh et al., 2017). Firms that use closed innovation conform to the philosophy that lucrative innovation are developed, manufactured, marketed and distributed within the four walls of the firm. This means that the R&D strategy operates as an in-house exploitation (Inauen & Schenker-Wicki, 2012). External firms will not have access to information within individual firms, and will thus, not profit from these internal knowledge creations. With an internal development focus, the firms itself will have an advantage of releasing such

innovative outcomes to the market and further have a competitive advantage. This entails a lot of investment in innovative activities within a firm, and can be highly costly in order to research and develop products strictly based on internal and various public information (Chesbrough, 2014).

## **2.5 Influencing factors for innovation**

Cluster benefits that emerge through the concentration of collaborating firms affect both the upstream and downstream of the value chain in a given location (Serra, 2008). With this, aspects of production, manufacturing, distribution and logistics behind the value chain can be influenced by being located in a cluster of new technologies and knowledge. The National Resource Council of the U.S. states that initiatives towards clusters improves innovation and performance for firms involved. However, the cluster initiative heavily depends on the policy of cluster organizations. Not all clusters are socially structured to favor exchanges and sharing of resources (2012). Following are factors that can help innovation to be developed in clusters.

### **2.5.1 Knowledge spillover**

Storper and Venables (2004) explains the creation of spillovers as a result of spatial proximity and its tendency to improve flows of information. The exploitation of knowledge and ideas produced by one firm, and further adopted and applied by another firm creates a basis of innovative activity. This information flow is what innovators depend on. The natural tendency of knowledge spillovers promoted by clustering is one beneficial factor that is encouraging competitive advantage through sharing of resources and interaction between co-located firms. The spatial proximity within clusters is further fostering social interaction, interactive learning, creation of trust, which again, fosters innovation (Crespine-Mazet et al., 2013); overall, such concentration enables cluster firms to combine resources to generate new knowledge and innovations (Bathelt et al., 2004). Although spillovers generate positive externalities, the concept is vague, and can be both intentional and unintentional, creating grounds for both positive and negative outcomes (Petruzzelli et al., 2009). Heavy competition between firms in cluster areas can therefore hinder, or be negatively affected through unintentional sharing of knowledge through natural flow of spillovers.



### **2.5.2 Trust**

The development of cluster identity relies on building trust, creating bridges of meeting points and having a shared vision. The vast difference of firms' performance with regards to cluster initiative propose room for benchmarking and cross-cluster learning. Thus, the interaction between cluster firms is not always strong enough to operate with the performance expected; limiting mobility, sharing of knowledge and collaboration (Morgulis-Yakushev and Sölvell, 2017). Involving partners inside a cluster need to actively engage amongst each other, building relations on trust in order to sufficiently cooperate in terms with clusters to achieve the best possible performance.

Management and scholars have in recent years paid attention to open innovation as a new paradigm (Monsef et al., 2012). However, in order to achieve open innovation, trust is a fundamental aspect. Shamah and Elssawabi (2015) analyze different types of trust to achieve an optimum understanding of open innovation. They reflect on trust in the terms of;

- Trust within organizations
- Trust between organizations
- Trust between organizations and their customers

### **2.5.3 Competitive rivalry**

Keeping in mind that activities within a cluster due to interactions and collaborations heavily relies on both external and internal forces, firms also risk losing their competitive advantage due to unforeseen or changing circumstances (Porter, 1998). This issue in particular, is highly relevant for the oil and gas industry, which has had major ups and downs the past years, affecting multiple oil-and gas related companies. Thus, open innovation is particularly relevant where the need for new knowledge and technologies is important to follow changes in the economy. Strong competition between rival firms might coexist in the presence of a cluster. However, this competition also triggers firms to continuously be more innovate and create new technology and knowledge (Serra, 2008). A cluster might include both cooperating firms and strong competitors. This combination allows for various means of knowledge sharing and creation of innovation, based on collaboration between firms or rivalry caused by a need to have a constant competitive advantage.

## 2.6 Cluster

According to Porter (2000), clusters are defined as “geographic concentrations of interconnected companies and institutions in a particular field”. He also said that the geographic variety of a cluster could be everything from “a single city or state to a country or even a group of neighboring countries”. These clusters occur because they increase productivity where it is possible for firms to compete (Porter, 2000). With given productions (labor, capital, land, etc.) and external economies, the traditional theories explain cluster theory considering sharing of labor supply and services in related industries (Park et al., 2012). Clusters including bundles of linked industries and other entities are important to competition. In a cluster, firms are often related through skills, technologies, or common inputs (Porter 1998). Further, more recent studies also explain cluster theories based on aspects of social relationships (Park et al., 2012). Though the activities within a firm is important in the creation of competitive advantage, the immediate business outside of the companies’ four walls plays a vital role for innovation (Porter, 1998). In fact, it is found that cluster development is particularly throbbing where the intersection of skills and technologies from assorted fields merge; stimulating innovation and new businesses. Clusters have a tendency to emerge at locations characterized by related and supportive activities, that further can nurture the industry. With this, the proximity between firms makes sharing such resources, knowledge and skills more accessible, where close and frequent interaction of resources tends to create knowledge spillovers (Serra, 2008).

Clusters does not only include firms, they can also include other organizations such as educational institutions, research institutes, government organizations and capital providers. Firms and other organizations inside vibrant clusters are normally networked and connected in numerous ways; e.g. through resource-and information mobility and sharing. They are also regularly involved in collaborative projects, where the complexity differs, depending on the type of “bridge-building” activities (Bathel et al., 2004). It is important to see cluster as a collection of various complementary actors, and also how these interact with each other. In a cluster, the most important factor is the firm. However, there are other related actors that are essential to innovation growth in a cluster, like individual entrepreneurs, research organizations and educational organizations, capital providers and government (Lindquist et al., 2013).

A learning economy is commonly facilitated through interaction among actors in a cluster, which can create an opportunity to learn from each other. Clusters can promote cooperation based on trust and innovative technologies (Ganne, 2014). Interaction, communication and cooperation happens within a firm across departments and sectors, but also externally. The degree to which interaction is present in a cluster is affected by trust, motivation and affiliation (Øfeldt, 2017). From interactions, collaborative efforts are often established, which can further lead to innovation.

### **2.6.1 Cluster Dimensions**

Bathelt et al (2004) have categorized the cluster in a horizontal and vertical dimension. Additionally, he has identified the benefits of regional and local clusters, as opposed to interregional and extra-local interaction among firms. A cluster is a mixture of geographical agglomeration of related and supporting industries, including firms that are both vertically (buyer-supplier) and horizontally (competing) related.

The vertical dimension of a cluster consists of firms who complement each other and are connected through a network which involves suppliers, services, and customer relationships (Bathelt et al, 2004). With this, you can say that a vertical dimension cluster is consisted of a group of different entities that all utilize from offering their best qualities and creating the greatest achievable product to the end customer.

Bathelt et al (2004) says that the horizontal dimension of a cluster consists of firms who produce similar goods that compete. Opposite to vertical dimension, a horizontal dimension of a cluster generates similar products that often have very few differences. However, the great thing about horizontal dimensions is that even if the products appear the same due to functionality of the product, users can still point out the differences between them. Customer loyalty and brand equity is what retains the value of a company. It is healthy that there is on-going competition. This forces them to constantly innovate and stay on top of technology to create the best possible end product for the customer.

## 2.7 How clusters benefit from agglomeration of firms

A cluster providing agglomeration economies is a geographic concentration of complementary companies as well as supporting institutions and where firms benefit economically from being located in the cluster (HBS, 2015). Two acknowledged and commonly known agglomeration economies present today are technology “mecca”, Silicon Valley in California, and the country music city of Nashville, Tennessee (Duranton et al., 2015). Regional clusters are capable of overcoming structural limitations associated with small sized companies because of agglomeration economies. Not only does agglomeration economies promote employment growth and foster firms, they are “channels of knowledge diffusion because geographical distance hampers knowledge flow” (Capello and Caragliu, 2012). However, one can argue that the geographical distance is no longer a threat to successful firms and knowledge flow, rather a central part of the industrial environment. Clusters have created hubs of various industries across the world, and although they may be located in different parts of the world, firms still come together and foster growth and productivity.

## 2.8 Cluster Initiatives

Lindquist et al. (2013) describes cluster initiatives to normally be involved in a number of activities to achieve a number of objectives. There are six main types of activities which are pointed out;

1. **General cluster networking** is where diverse types of actors gather to get a better understanding of the cluster’s strengths and weaknesses. Typical activities include sharing of information through seminars, developing websites, inviting speakers and publishing cluster reports.
2. **Human resources upgrading** is to improve and help develop the already existing bundle of skills, by for example giving vocational training, management education or technical training. These efforts focus on different target groups of people. These can include managers as well as students, in order to ensure a future supply of skilled labor.
3. **Cluster expansion** focus on increasing the number of companies by promoting inward investment to the region or through incubators.

4. **Business development** promotes company operations through sharing of services to reduce costs, joint purchasing and joint export promotions.
5. **Innovation and technology** aims to endorse product, process and service innovations. These efforts promote innovation through collaboration and networking between firms, as well as collaboration between business sectors.
6. **Business environment** looks at enhancing microeconomic conditions for business through improving institutional and legal setting and improving the infrastructure.

These cluster initiatives are activities that individually, or collectively have shown to enhance innovation within a cluster. A challenge faced with cluster initiatives are the ability to incorporate them in such way that they can be sustainable, as well as setting objectives and further monitoring performance (Lindquist et al., 2013).

## 2.9 Innovation Gaps

By creating a pool where companies, research and education institutions, and other cluster actors can come together, exchange ideas and collaborate in projects, the innovation climate can be radically enhanced (Sölvell & Williams, 2013). Yet, Sölvell & Lindquist (2011) identified seven gaps of innovation in a cluster that can be a hinder in this process. Firstly, there are five internal gaps:

1. The research gap barring between firms and research organizations
2. The education gap barring interaction between firms and education organizations
3. The capital gap barring interaction between education organizations
4. The government gap barring interaction between firms and public bodies
5. The firm-to-firm gap barring interaction among firms in the cluster

Secondly, Sölvell & Lindquist (2011) identified two more innovation gaps, external to the cluster. These are critical to the innovative dynamics:

6. The cross-cluster gap barring interaction with firms in other clusters/technologies
7. The global market gap barring interaction with global markets and value chains

The seven gaps provide meeting places and activities where common issues can be discussed and acted, together. This can help the cluster actors to overcome problems by interacting.

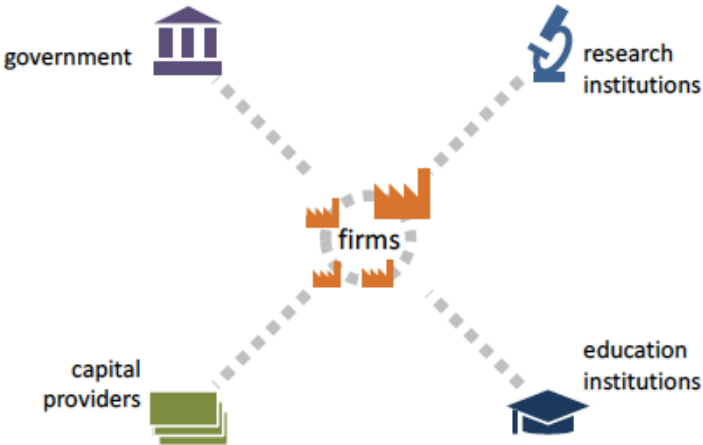


Figure 1. The Gap model – types of actors in a cluster.  
Retrieved from “The Cluster Initiative”, by Lindquist et al., 2013. p. 37.

An ideal cluster is where the firms, government, research institutions, capital providers and educational institutions perfectly collaborate, as it can be seen at Figure 1. However, there are many barriers that prevents interactions. These barriers are what create gaps in a cluster, disrupting such collaboration. With this, a central role for cluster organization is to join these gaps to further improve interaction and performance within the cluster (Lindquist et al., 2013).

There are several influencing factors that can affect the development of a cluster. The most prominent theoretical framework throughout our case study is to identify the existing gaps of a cluster, and implement cluster initiatives to further foster innovation. The next chapter will present the methodological procedures followed during this research.

### **3.0 Method**

In this section, the goal is to describe the research design that we found to be the most suitable approach in order to answer how the Dusavik base can be organized into a cluster to foster innovation. With this, the method chapter will encompass the type of research design we applied and the approach for data collection and analysis. We will also take a closer look at the interview guide, discuss the process of how the data was created and how we collected the data through a qualitative approach. The reliability and validity of the conducted study will also be described in this process, including a look at potential errors and barriers that conflicted with the findings. The choice of method depends on the nature of the issue that are being studied, the maturity of the notion, restrictions and limitations of the setting, as well as the ability of the researcher (Morse & Field, 1995).

Choosing a research method is a structured and systematic process with the purpose of carrying out a research work. Once a problem has been formulated, a plan must be created for how the issue will be faced. This part is called research design and considers what and who to research (Befring, 2002). The methodology discloses how to approach and analyze the assumptions that are assumed and see if they are consistent with reality or not (Johannessen et al, 2011).

#### **3.1 Research method**

When choosing a method, we distinguish between qualitative and quantitative method. To approach our research question, we have chosen a qualitative method. A qualitative method gives a broader and deeper understanding, and is characterized to be more flexible and open compared to a quantitative method (Johannessen et al, 2011). The reason behind the chosen research method lies in the thesis, the research theme and the approach. Because of continuous changes of innovative solutions, dynamic environment and overlapping partnerships, we want an in-depth understanding of what impacts a cluster. At the same time, we would like to know how the co-located firms cooperate today and see what barriers exist and what factors are needed to promote innovation through collaboration. With this, the choice naturally falls on a qualitative research approach.

To answer our thesis, we have chosen a single case study, using a qualitative method. Qualitative data is referred to all non-numeric data or data that has not been quantified and can be a result of all research strategies. Such data analysis assists this by allowing you to develop theory from your data (Saunders et al, 2009). The topic we have chosen to research is broad, and the use of innovation within each firm varies. The term innovation has several different interpretations depending on the use of it. For this reason, an analysis of such topic requires a greater degree of in depth research. A qualitative method is often used where little research has been done and in studies that require flexibility and openness (Thagaard, 2009).

### **3.1.1 Advantages and disadvantages of qualitative research design**

With the process of selecting a research design, there will be certain advantages and certain disadvantages that follows the use of a specific design.

#### ***3.1.1.1 Advantages***

With qualitative method, a great strength when answering questions regards to “what”, “why” and “how” qualitative studies pertain to the experience in a setting. It is also a good tool to use in a setting that is relevant for a point in time only. Innovation is constantly changing, and heavily depends on current conditions. This way, interviews, for instance, is a good tool to use to collect rich and deep data (Morse & Field, 1995). With a qualitative approach, questions can be adapted to the specific field of study as it is more flexible (Boeje, 2010).

#### ***3.1.1.2 Disadvantages***

Some of the disadvantages with using qualitative method is the practice of not being able to measure any quantitative approaches. A critic of going from a theory to empiricism is the notion of searching for information that seems relevant from one’s own perspective that may support the expectations you created in advanced (Boeje, 2010). Issues of replicability and generalization of such single case study can become a challenge because of the uniqueness and distinctiveness of the one specific case study.



### 3.2 Presentation of case study

As previously mentioned, this research studies the Dusavik base. Dusavik is a region located North of Stavanger municipality, where the base is placed along the bay that borders between Stavanger and Randaberg municipality. It was established mainly because of the oil and gas activities that started in the Southern North Sea in the 1960- and 70's. In order to operate the offshore oil and gas activities, the base is an important part of the supply chain. This creates a lot of job opportunities on shore. A base area is a place where oil services companies and operators are located to support an effective value chain of the oil industry. For such oil-related firms, it is ideal to be located as close as possible to the coast line and offshore operations. This idea creates potential grounds for clustering effects, where oil and gas companies are attracted to a certain area, to operate sufficiently along the base with similar firms.

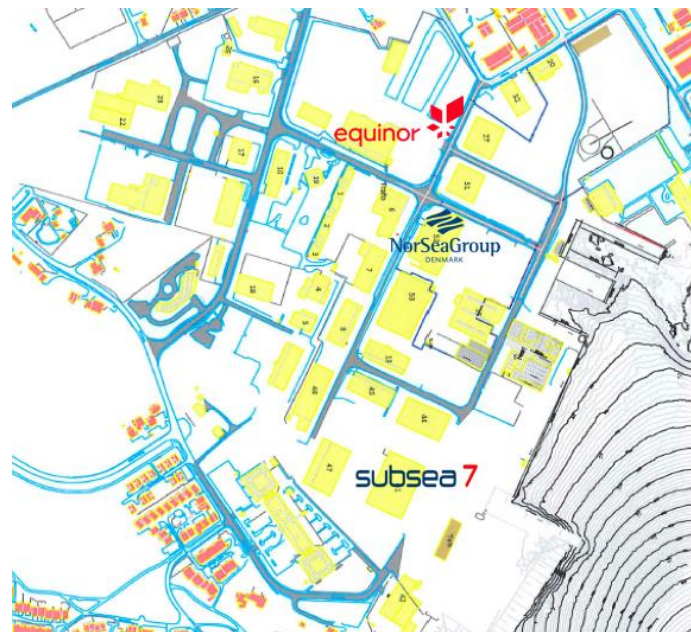


Figure 2. Map of the Dusavik base.

2018. Retrieved from Norse Group.

Figure 2 is a map of the Dusavik base. We have included the representative companies for this case study on the map, with the exception of SAR, which is located at Tananger. Dusavik includes over 60 service companies which specialize in areas like fabrication and workshop activities, drilling, subsea and heavy duty mooring equipment storage. Additionally, there is a high school and a public prison in the area. For the sake of this study, we have set a limitation

of the Dusavik base, which includes 12 companies, to be studied as the cluster. The Norsesea base claims to be a complete service center, as well as holding all resources necessary to meet present and future requirements from firms operating in the offshore oil and gas industry (Norsea, 2018).

In the oil and gas industry, the operators Equinor, Total and ExxonMobil/Point Resources are competitors. However, at the base, they are not direct competitors, and do collaborate on a regular basis. These relations are mostly dependent upon one-to-one contracts between cooperating firms that exist at the base or in the nearby area. Collaboration and competition are both present at the base.

In our case study, we have interviewed four firms that operate at the Dusavik base. One of the companies is Equinor. They are an oil and gas operator and the primary activity at Dusavik base is to supply the oil platforms: Sleipner, DeepSea Bergen, Safe Zephyrus, Haven, Randgrid, Gudrun, Draupner, Grane, Heimdal, Gina Krog, Maersk Integrator, Maersk Interpid, Deepsea Atlantic and Johan Sverdrup as well as exploration operations in the southern regions. In order for the operations to be completed, it involves many external service providers as well as base operations for these activities (Equinor, 2018).

Norsea is the main supplier for the operators at the Dusavik base, including Equinor, Total and ExxonMobil/Point resources. They are responsible for executing all of the logistical services at the base. The base was established in 1965 and have supported the oil and gas activities in the Southern part of the North Sea. Since this, Dusavik has become a major industrial center in the Stavanger area (Norsea, 2018).

Subsea 7's primary activity at the Dusavik base is to provide offshore operational support, as well maintenance and storage of Subsea 7's equipment. Their activity is mainly focused on pipe-laying and pipe-maintenance offshore. The Dusavik base supports operations in the North Sea for both the Norwegian and UK sector (Subsea 7, 2013).

Lastly, SAR is a global supplier of environmental services. They provide complete services of waste chain management, including dangerous waste and drilling waste. SAR and Equinor have been under contract for the past years. This contract involves drilling waste for fields that belongs to the Dusavik base (SAR, 2016).

For this study, we have chosen to incorporate a handful of the major companies that exist at the base, knowing that there are a number of additional firms that are located here. Through our conducted interviews we see that there are many similarities, as well as differences amongst the firms. In our analysis, we will take a closer look at our findings in order to see if it is possible for the Dusavik base to be organized into a cluster to foster innovation.

### **3.4 Data collection**

The data collection for this study is based on semi-structured interviews, observation and documents.

#### **3.4.1 Interviewee selection**

It is important to have an agenda for studying a case. Therefore, an attention to purposive mode of sampling is needed. Further, achieving a variation of relevant dimensions for the case is significant (Seawright & Gerring, 2008). With this, the selected interviewees for this case study has carefully been chosen based on their job position and representative role in each company, as well as the company's role at the area studied.

#### **3.4.2 Interview**

There are different opinions about how many informants should be interviewed, but it depends largely on the purpose and the topic of the research. We contacted several of the 12 located companies at the base, where the response was positive, but lack of time was an issue for some of the potential interviewees. During this time, Total ASA, one of the other operators at the base sold their operating asset (Martin Linge) to Equinor. Therefore, they were no longer relevant for this case study. Also, GE did not respond. This was unfortunate to our study because of their significance at the base. With this, four of the representatives were able to participate in a face-to-face interview.

The reason behind the choice of interviewees in the data selection approach is based on the geographic limitation of the Dusavik base. Here, we selected firms that had potential to

cooperate and become an agglomeration economy. In order to avoid a unilateral analysis based on a single firm's perspective we have chosen to interview one representative from each participating company at the base. To support a broader perspective of innovation at the base, we have also interviewed representatives with different job positions. This includes the leader of Supply Chain-Management and Operations from Equinor, Vice President Digital & Innovation from Norsesea, Logistic Manager from Subsea 7 and the Service Department Manager from SAR.

An interview is an effective way of collecting data and can provide relevant information in a short period of time. Interviews provide a good basis for gaining insight into the informants' experiences, thoughts and feelings, and is considered to be the most dominant method of qualitative research (Thagaard, 2009).

#### *3.4.2.1 in-depth interview*

An in-depth interview is a process which involves an interviewer and an interviewee discussing specific topics in depth. This method is often described as a conversation with a purpose. The purpose is for the interviewer to get insight into certain topics using a more structured interview guide (Hennik et al., 2011). The interviews were conducted with a combination of a semi-structured interview and a conversation, where the tone of the interviews was easy-going. We sent questions to the interviewees in advance. During the interview, we followed the interview guide, topic by topic. The interview guide gave us a comparative basis; however, the questions were asked in a casual setting, which allowed the interview to be less restrictive. This way, the interviewee could speak more freely about the topics without putting words in one's mouth. An in-depth interview is a good "knowledge producing conversation", as the conversation influences how issues are discussed.

#### *3.4.2.2 Audio recorder*

During the interview, we used an audio recorder. This aid is often used as a central aspect during an interview, which allows us to focus on what is being said and also to ensure that there is good communication throughout the interview. In addition to the audio recording, we took notes to highlight the important statements that can help us during the analysis process.

### *3.4.2.3 Disadvantages*

Some disadvantages of conducting an interview are that good results depends on asking good questions. This means that the questions can be misunderstood, or the informant answer in such way that he or she believes is expected. It may also be that the informant does not remember correctly. In our case, there are existing contracts between the co-located firms that may keep the interviewees from answering honestly with the fear of ruining relationships at the base. We informed the participants that this study will be available all parties, which may result in partakers withholding information. Our own interpretation of the answers might also be influenced by our pre-existing knowledge regarding this study. Also, during our analysis, we sent an additional question to all the participants over email. Throughout the analysis we noted that one of the topics were vague and lacked significant information. This follow-up question might have made a difference in the previous answers with regards to their general knowledge of innovation.

### *3.4.2.4 Advantages*

The advantage of conducting an interview, on the other hand, is that we have the opportunity to focus directly on the research topic. There is also the opportunity to come up with follow-up questions right away, which can lead to a new reflection on the question or event. Also, conducting a face-to-face interview gives less room for misinterpretation. Because one of the researchers works at the base, we had access to a greater network of informants, which made it easier to get in touch with the “right” representative from each company.

### **3.4.3 Interview guide**

The full interview guide can be found in the appendix. The interview guide entails topics and a sequence, accordingly. The guide contains topics that are very general and simplified, or cover a more detailed sequence that are worded carefully. With a semi-structured interview guide, topics are outlined with related questions with each topic. Whether the questions are predetermined and binding depends on the design of the interview guide, however, we decided to follow the guide with an opportunity to add information that was related to each topic (Kvale, 1996).

### **3.4.4 Participant observation**

Participant observation, is where research is performed through the direct participation of the researcher in a situation of interest (Vinten, 1994). Since one researcher works at Equinor, which is involved in the research, this is also included as a valuable technique of collecting data. Conducting observations in this study has supported the selection of key informants, including internal notes and research, writing up findings, the process of conducting observations, and overall improve the research process.

### **3.4.5 Documents**

To improve the validity of our research, we have included different sources of data to use in our case study. This includes a final report received from Equinor, named “Cluster organization” involving “Norsk Olje og Gass”, an organization for oil and supply companies. It is a report performed by Deloitte, to assess collaborative and efficiency issues that we have used to validate our suggestions for the base.

## **3.5 Data Analysis**

With the process of data collection, we have chosen to use a deductive process method of data collection. This way, we create certain expectations of how reality is, further collect information and data to compare findings with existing theory and see if they match. This process refers to the movement from theory to empiricism (Jacobsen, 2005).

## **3.6 Validity and reliability**

Two central concepts when discussing the credibility of scientific research are validity and reliability (Silverman, 2001).

### **3.6.1 Validity**

With the concern of measuring validity, we refer to the extent the research effort has been critically evaluated and if the research has been successfully measured. There are variables

that are easier to measure than others. Social facts like age, gender and career are relatively easy variables to measure, however, other variables are difficult to measure because of lack of clear definitions and unambiguous meanings that lack observable evidence for measurement (Befring, 2002). Innovation is such a broad and vague concept and is therefore difficult to measure in terms of comparing to other measurement results. Validity often relates to the term “truth”, meaning how accurately an account represents the social phenomenon it is referring to. To validate the research findings, two forms of validation are often used; either compare different data and different methods to see if they confirm one another. The other form of validation brings one finding back to the subject that is being studied to further verify the findings (Silverman, 2001). With the use of qualitative method, we must consider the possibility of threat to validity of the research because of certain constraints on this aspect (Morse & Field, 1995).

In order to enhance validity and reliability, Yin suggests six tools that are applied during the data gathering process; documentation, archival records, interviews, direct observations, participant observation and physical artifacts (Yin, 2015). In our study, we have tried to include as many validity points as possible. Particularity, because we are conducting a single case study. By including several interviewees as a part of the research method, we will further validate the research findings. We made sure to take sufficient notes during the interview, as well as audio recordings to confirm statements. The participants were contacted based on their job positions in the firm with the intention of acquiring knowledge that would support our interview questions. Also, access to internal documentation helped to validate our findings during the interview.

### **3.6.2 Reliability**

Reliability refers to degree to which you can rely on the results. The main issue with reliability is to reduce the possibility of errors to a minimum so that the research is as precise and reliable as possible (Befring, 2002). Reliability in general, is easier to measure when using quantitative method than a qualitative method. With the use of a qualitative method, the information has less structure, thus, the researchers are responsible for the interpretation of the data. Therefore, it is difficult to trace documentation of the data collected (Johannessen et al., 2004). With the semi-structured question guide we have the opportunity to compare answers, so that the answers can be analyzed without possibility of uncertainty. This way,

standardizing the method can help strengthen the reliability of the research (Silverman 2001). From our study, the participants from both Norsea and SAR worked at the Tananger base, but answered the questions on behalf of the work at Dusavik. This could result in a limitation of information. Furthermore, the interviewees have a high job position within the firm. This might result in them emphasizing positive aspects about the company. The reason being a stronger feeling of ownership towards the company and their position in it. The interpretation and degree of innovation within each firm varied, which might result in a different answer towards our questions.

With the use of a qualitative research method, the next chapter will present our findings through the conducted interviews.



## 4.0 Findings

In this chapter, we will use the information and data we have collected through interviews. We will compare and contrast the similarities and differences of the answers from each company, according to the sequence of the interview guide.

In order to answer our research question “How the Dusavik base can be organized into a cluster to foster innovation”, we will use the interview guide (see appendix) to gather our findings, categorized by topic. Furthermore, the company names are used, rather than the representatives’ names, throughout the findings and discussions in order to make it easier for the reader to follow. This way, similarities and differences found in the interviews can be more evident when comparing the answers.

<b>Company</b>	<b>Interviewee</b>	<b>Job title/ Position</b>
<b>Equinor ASA</b>	Trine M. Øfeldt	<i>Leader Supply Chain Management Supply Operations- Dusavik base</i>
<b>Norsea</b>	Henrik Heggland	<i>VP Digital &amp; Innovation – Norsea Group/ Managing Director NSG Digital AS</i>
<b>Subsea 7</b>	Kjetil Roalsvik	<i>Logistic Manager - Dusavik base</i>
<b>SAR</b>	Eirik Wathne	<i>Department Manager - Tananger Service</i>

## **4.1 Defining Innovation**

Because innovation is such a broad and diffuse term, we asked the interviewees to personally define the word innovation and what innovation entails.

Subsea 7 explains innovation as a development of a product, a service and supply. Also, innovation is how they evolve and work together, both internally and externally.

Equinor refers to the definition of innovation used in the OECD handbook. "Innovation is new or substantially improving goods, services, processes, organizational forms or marketing models that are used to achieve value creation and / or social benefit" (2005).

Norsea defines innovation as a radical change. Further, innovation entails valuable activities that are created through human, technological and organizational inputs. Norsea highlights the importance of distinguish between innovation and continual improvements; which focus on incremental improvements and not radical changes.

Because this was a follow-up question over e-mail, we did not get a response from SAR on this issue.

## **4.2 Collaboration**

From our first interview at Equinor, we got the understanding that there has not been much focus on collaboration at the base, and that the base operations have not changed much the past 15 years.

All the interviewees have, to some extent, a relationship with at least one of the firms that we have interviewed. These relationships are mostly in terms of contracts. Because Norsea is the main contractor at the base, it is natural that the other co-located sub-contractors are dependent upon leasing the space, equipment and even employees in order to complete services. Norsea says that the Dusavik base is a "gathering point" that has attracted a number of firms. The reason for this is the benefit of being located near the coast, as well as benefitting of co-located service and operating firms.

There seem to be many different occasions where a firm had the need to collaborate with others at the base. Norsesea mentioned an instance where a well drilling project dependent on several sub-contractors collaborating in order to conduct the drilling operation. If the companies decided to perform this operation individually, the number of wells would not be substantial enough for it to be rewarding. Therefore, it was necessary for the companies to collaborate. Common transport service was another instance where companies benefitted from collaborating with the other co-located companies at the base. Here, supply boats moved from base to base along the Norwegian coast, from Stavanger to Hammerfest. A number of companies contributed with the logistics, moving goods when sharing transportation. For such projects, Norsesea highlighted that it is important to be open in the process of finding a common solution that works for all parties, because of the uneven distribution of stops and goods along the way. Another point mentioned is the potential marketing and efficiency opportunities through collaboration amongst the firms that can create an attractive base. Lastly, SAR also mentioned that they collaborate with Norsesea on a regular basis.

Subsea 7 says that they have had collaborations with co-located firms, but claimed that the location of these collaborative parties was insignificant as long as it was regionally located. Equinor points out that collaboration is not always needed, and is dependent upon the objective; that the potential is there, but the frame conditions are sometimes limited. Contractual regulations might limit collaboration opportunities. SAR's dependency on collaboration is customer based, and does not depend on customers being located at the base. However, Equinor is one of their biggest customers, and they will therefore have to follow Equinor's locations.

#### **4.2.1 Multi-company collaboration**

Norsesea said that a motivation for a collaboration between multiple companies was the ability to create solutions for operations they cannot complete by themselves. They also emphasizes that a collaboration model would make them more attractive. This would also create market opportunities and increased efficiency. What motivates Equinor in a multiparty collaboration is mainly to reduce costs, but greater efficiency and improvements of technology are also aspects they see as beneficial. SAR says that by coordinating processes, they create efficiency through collaboration by creating similar industry standards and working towards common goals.

### **4.3 Competition**

The oil and gas industry is a highly competitive industry. However, this competition is not necessarily between the firms located at the base. SAR says the competition is often lead by an extreme price focus; being able to deliver the cheapest service. However, they say that there are good relations with the competitors, where they fulfill certain services they don't offer and vice versa. Norsesea says that they have a desire to collaborate, but in some situations, it is difficult because of commercial conditions that regulates the collaboration. Further they say that the relations are good in terms of improvement initiatives. This is driven by a shared interest between both parties, creating a win-win situation. For instance, SAR mentions that similar lean improvements between them and Equinor have created a closer relationship. Equinor says that there is more collaboration across the industry today, than before. An example that s brought up is where ExxonMobil/Point Res.....ource.s calls Equinor regarding their experience in several areas, to exchange knowledge.

### **4.4 Sharing of knowledge**

Equinor does not see Dusavik to be a complete cluster, rather, a geographical area where individual firms are co-located, where the relations between firms will vary on all levels (tactical and strategical). However, when looking at collaboration at the base in terms of its ability to increase knowledge, Equinor says that there is potential, but it is difficult to predict. Norsesea also see a potential of benefitting from collaboration with increased knowledge on all levels. SAR claims that collaboration would not benefit them in terms of increased knowledge because of their high market share in the area, but competitors and smaller firms would benefit from SAR's knowledge.

At the base, there are several operators with different areas of expertise, where the only common objective is to physically cross the dock. With this, Equinor says that a shared value system where multiple companies have access to information, would be beneficial at an operating and strategical level. However, an effort of creating a forum for all the lessees has previously been attempted, but failed to sustain. This was because of a lack of ability to follow up the forum. This may be because the companies involved did not share the same value of the forum. However, Norsesea and Equinor shares the vision and see the benefit of sharing and creating new knowledge. The importance of creating a standardized solution,

where a common place of gathering sources would be more efficient. Though, such system would also be difficult to operate, because all firms are different.

When looking into what type of knowledge the individual firms need in order to maintain their competitive advantage, Equinor points out that they focus on digitalization, analytical skills, collaboration; highlighting that building relations is very important. Norsesea shares some of these aspects, like having a more open mindset by incorporating the younger generation in order to create new perspectives. They also emphasize digital competence and strong logistic knowledge. Further, SAR and Subsea 7 is dependent upon certain certificates related to the industry in order to deliver their services.

The aspect of sharing knowledge and the fear of stealing knowledge between companies at the base is found to somewhat unevenly distributed, where Norsesea mentions that the sharing of knowledge is not always equal. As mentioned earlier, the base operation has barely changed the last 15 years. This is also something that Equinor has noticed being prevalent in the aspect of sharing knowledge, characterizing it as an “old-fashioned business approach”. This is an important issue that Norsesea has met and tries to challenge with including younger staff.

#### **4.4.1 Protecting knowledge**

The balance between sharing and protecting knowledge depends the type of project or the type of research for each firm. For instance, Subsea 7 says that contractual rates are secret and products that are sold to a client are not to be resold, rather destroyed. However, a lot of market information is available for international customers. The same goes for SAR, where information must be available for customers. Equinor focus on open innovation, however, like Subsea 7, contractual rates and pricing is secret. Furthermore, Norsesea, as well as the others, keeps some information internal, but consider themselves to be open with regards to innovation.

## **4.5 Innovation**

When asked whether they characterized themselves as an innovative company, Equinor says that the company, overall, is very innovative, however, the base is not and has not been a priority in this regard. On the same line, Subsea 7 see themselves as an innovative firm overall, but is not necessarily very prevalent at the base. Norsesea says that “innovation” is something they have incorporated more the past three years; for both radical and incremental innovations in the oil and gas industry. SAR does not consider themselves as very innovative, where “value” in terms of innovation was the area at SAR that scored the lowest, on a feedback on the intranet.

Furthermore, all the interviewees say that they, to some degree, continuously work with innovation. SAR focus on incremental innovations, where Equinor also focus on continuous improvements at the base, but not actively engage towards innovation. On the other hand, Norsesea has dedicated resources towards innovation, both towards step changing innovations with regards to technology in the oil and gas industry, and incremental steps of continuous improvements. Subsea 7 does not solely work on innovation at the base, but has included “innovation days” as a way to invite and meet clients.

### **4.5.1 Sources of innovation**

Norsesea uses both internal resources, as well as strategic partnerships from the industry to gather new ideas and new perspectives towards innovation. Equinor says that because of the minimal change at the base the past years, sources like network and existing suppliers are good means of finding new knowledge. SAR focus mainly on internal sources of innovation, as well using suppliers as an innovative source.

When asked if they utilize the co-located firms at the base in order to be more innovative, Equinor says that a collaboration with Norsesea has previously been helpful in order to be more efficient and come up with good solutions that promotes long term rewards. Norsesea says that it is important to include external actors in order to foster innovative ideas, but this is often used in later stage because of competition related to risks in the early phase. Subsea 7 have also collaborated with Norsesea for innovation. SAR recognizes that they have not fully taken

advantage of the co-located firms in order to be innovative, and see this as an area of improvement.

Looking at whether the firms experience pressure to innovate because of cluster conditions, Equinor says that they do not experience much pressure from other actors in the cluster, and further questions whether the base is, in fact, a cluster. At the base, Norsesea explains that they feel a pressure in terms of staying innovative because of their contract with Equinor. Further, they feel a pressure to stay innovative because of the market changes. SAR does not feel pressure to be innovative, mostly because of their service and because they see themselves as a big company in their sector.

#### **4.6 Open/closed innovation**

Trying to see if a greater accessibility to a shared pool of knowledge would be useful for the firms, Equinor says that all knowledge is good knowledge, when it relates to the base operations. Norsesea, on the other hand, says that new knowledge is not shared at the beginning of the development phase, rather, input and “pilot testing” when the product/service has matured. An example of this is the IT software “Liveload”, which is now used by Equinor to give updates on the loading process at the base; a development that Equinor were not included on until the end-phase. SAR sees the sharing of knowledge as a good way of being challenged, where competitors learn from each other. Though, SAR considers themselves as a large actor in their industry sector, and therefore fear that competitors would benefit more from their knowledge than SAR would gain from others. They also highlight the importance of creating industry standards, which would be helpful in a knowledge sharing process. Subsea 7, however, does not see the importance of having a greater access of shared knowledge at the base.

When asked how much of the R&D towards innovation is held internally, Equinor says that overall, the firm is a very open company and shares a lot, however, very little innovative activities happen at the base. Subsea 7, on the other hand is very closed in general, and majority of their innovations happen internally. SAR says that the balance between internal and external R&D is a ratio of 60/40, but explains that this is purely an estimate.

## **4.7 Rivalry**

We asked if the firms see Dusavik as a “complete cluster”, and Equinor states that they do not identify the area as a cluster, rather a geographical location where firms are co-located; sharing services, roads, etc. However, they do see a potential of Dusavik to become a complete cluster. Norsesea says that, in comparison with Tananger base, Dusavik is not necessarily a complete cluster, and lacks certain actors and service providers from a market perspective. Subsea 7 says that the local area is important, and the relations are good, however, the base itself is not considered as a cluster. SAR is an external actor located at Tananger, providing services at Dusavik and does by this, not see the importance of Dusavik being a cluster.

All firms say that there are no direct competitors at the Dusavik base, and does not compete for the same license. However, SAR and Norsesea says that they both have competitors at the nearby base in Tananger, which affects the competition.

When asked if there are occurrences where the firms have gotten into disagreements or conflicts because of their co-location and “sharing of dock”, none of the firms says that there have been big conflicts. Rather, smaller disagreements. These instances often relate to the availability of the dock because of unpredictable conditions regarding scheduling of the arrival time of the boats.

## **4.8 Risk**

When asked what consequences the firms would face if they were the only firm located in Dusavik, Norsesea says that they would be ousted by Tananger, a nearby located base. Additionally, pricing of services would be difficult to sustain. Equinor says that the costs would be significantly higher as a single operator in the area. Because SAR is an external service actor, they are dependent on the location of other operators. Hence, they attract to areas where operators are located. Subsea 7, on the other hand, says that they would not face much differences, and the business would stay more or less the same.

We also asked the firms what benefits they would miss out on if they moved to an area without similar industry firms. Subsea 7 says that with the certain qualifications they need,



there are not much other areas in the region that would be optional for them. SAR says that, in such case, transportation would be a major cost. Norsesea says that moving is not an option, because the Dusavik base and the terminals is a natural location that creates value. Further, they state that Norsesea facilitates the base for other related firms, creating a potential cluster. Also, in such case, they would fear that other related firms would not “follow”.

This chapter presented our findings from the interviews. We will use these findings in the next chapter, where we discuss our findings with the theoretical framework.

## **5.0 Analysis and Discussion**

In this chapter, we will use our findings from the interviews from the previous chapter to compare and analyze them with the theoretical framework. This is to see if there are any causality between theory and empirics. Based on the previous chapter, we have chosen to follow the same structure as the interview guide subjects. The summaries of the interviews will be connected to the research question and the theory in order to draw a conclusion on dissertation.

### **5.1 Innovation**

The participating companies each have a different approach to innovation. Though, the focus of innovation is something that has gotten more attention within all firms in recent years, there have been little active changes regarding the base operations the last 15 years. There are several changes a firm can utilize in order to become more innovative. Because the companies at the base perform different tasks unrelated to each other, but uses the dock and share many of the services available at the base, the potential of collaborating towards innovation is present. Based on the four types of innovations from the Oslo Handbook (2005), the types that are most prevalent at the base is process innovation. Though we see a potential of using organizational innovations at the base.

When looking at the two dimensions of a cluster, Dusavik portrays characteristics of a vertical cluster dimension. This is seen by the connection through a network that involves suppliers, services and customer relations that creates a type of cluster dimension, consisting of different entities that utilize a number of the same offers in the area (Bathelt et al, 2004).

#### **5.1.1 Incremental innovation**

Though there seem to be different interpretations of what innovation entails, it seems that there are mostly incremental innovations, in terms of continuous improvements that is present at the base. The value of assembled incremental innovations are known to create radical innovations (Fagerberg, 2013). Where some firms underestimated the value of such innovation, continuous improvements are often what sustains competitive advantage and

keeps a firm relevant. All the interviewees say that they do include continuous improvements on a day to day basis, but this is not necessarily realized as an innovative action. On the other hand, Noresea has dedicated resources towards radical innovation, where they use internal resources to possibly create step-changing innovations for the oil-and gas industry. As the base operator, it is important that Noresea continues to work on innovation, especially considering their relevance in the area. In fact, clusters have the tendency to emerge at locations characterizes by supportive activities that nurture the industry (Serra, 2008). This idea highlights the important role of Noresea in the area; in order for Dusavik to be seen as a cluster, Noresea is an essential participant that attracts assorted firms to the area where close and frequent interactions of resources merge.

### **5.1.2 Innovation developments**

The development “Liveloan”, created by Noresea is an example of innovation that has been utilized by other firms, like Equinor, at the base. This exemplifies the aspect of the sharing of technology and common inputs that are often found within a cluster (Porter, 1998). However, as mentioned, Noresea did not include any other external actors until the development was mature and ready for a pilot testing. This reflects the common barriers, based on Hansen’s theory, especially where companies often use internal resources for research (2009). With this, we can question whether the project would have had a different, or even better result if Noresea had involved other companies in an earlier stage of development. This example reflects a traditional closed innovation of acquiring internal resources and in-house exploitation within Noresea’s process of development (Inauen & Schenker- Wicki, 2012). With that said, a movement towards a more open philosophy is seen through the sharing of the innovative process, where the entire development is not entirely within a single firm (Huang, 2013). The Dusavik base carries characteristics of a traditional business model, where innovation often is conducted in-house with the use of internal resources. However, examples like “Liveloan”, and sharing of developments are aspects that promotes an openness towards collaboration in certain areas they have in common.

## **5.2 Open/closed innovation**

From our interviews, we learned that all the participants consider themselves to have an open mindset towards open innovation. Based on Chesbrough (2014), the term, “open innovation” is a popular source of knowledge creation, where many firms strive to use this method in the risk of falling behind. All the interviewees feel like the relations between the co-located firms are good, and the willingness to collaborate is there. Furthermore, the idea that both parties are rewarded through a collaborative effort seem to be a motivating factor, however, in terms concrete innovative projects, the interviewees did not share any clear indication of such collaborations amongst the co-located firms. The reason why companies might not choose to collaborate more, may be because the companies do not share the same objective, that they lack a common strategy or that they lack knowledge with regards to the potential value of collaboration.

### **5.2.1 Risk of openness**

Equinor mentioned that “all knowledge is good knowledge”. Because Equinor is the biggest oil and gas company in the Nordic region (E24, 2018), it might be easier for Equinor to be open towards a shared source of knowledge. They have a competitive advantage, and thus, more to gain than to lose. Equinor’s major market share in the industry minimizes the risks of being open. In the concept of open innovation, the motivation towards being open seem to be greater with bigger firms, like Equinor, than smaller firms that have a greater risk of losing internal knowledge. Theory states that smaller firms would often merely adopt open innovation to sustain value creation, rather than sharing knowledge (Park et al., 2012). SAR and Equinor share the advantage of being major actors in their industry segment. SAR also sees sharing knowledge as a good way of being challenged, and sees open innovation as an opportunity to get an insight of what competitors do, where they could possibly learn from this openness. Huang (2013) proposes that the generation of innovative outputs is, in fact, facilitated by more openness towards external sources of knowledge. However, as a large actor in their industry sector, SAR also highlights the risk of losing knowledge to smaller sized competitors as greater than the opportunity to gain knowledge from these small-medium enterprises. This attitude reflects one of the barriers for collaboration, “keep it for ourselves” that characterized the fear of losing knowledge to competitors. By keeping information, companies may face critical barriers, where a lack of willingness to share knowledge can also

hinder innovation (Hansen, 2009). Yet, theory says that openness inspires the flow of knowledge between firms (Huang, 2013). Also, small to medium sized enterprises are important because of their contribution to innovation in almost all economies (Juyeon et al., 2017). Based on these different statements from SAR, we see that these contradict each other where the fear of losing valuable knowledge seem to defeat the opportunity to pursue efforts of sharing knowledge.

It is evident that the co-located firms at the base do not always share much of the same business activities, though they facilitate similarities on an industry basis. Subsea 7 is one of the co-located firms that do not see the benefit of a greater access of shared knowledge at the base. Though, theory states that merely changing ones' attitude towards open innovation has shown significant impact of incorporating external knowledge to a firm's benefit (Muller, 2013). The traditional process of closed innovation is highly costly and time-consuming, however, as a big firm in the industry, this might not be a limitation to Subsea 7.

### **5.3 Rivalry**

#### **5.3.1 Competition**

SAR mentioned an example of where a previous customer took over a contract related to tank cleaning. This previous customer also delivers services to other actors, and is in some areas, acts as a competitor to SAR. This case illustrates Porter's theory (1998) regarding the risk firms have with regards to losing their competitive advantage due to unforeseen or changing circumstances. Here, activities that occur within a cluster are often due to collaboration and interactions from both internal and external forces. Many times, firms overlook the ability rivalry has, with regards to stimulating innovation (Ferrari, 2010). With the case of SAR, they lost a customer due to their customers' innovative abilities and development of a similar service, which is now used as a competing service. Rivalry can make a difference in a firm's effort to improve production and development. A cluster might include both strong competitors and collaborating parties. Because of the sub-contractors' various services, a competitor can in some cases be a customer, and vice versa. The combination of both allows for knowledge sharing and innovation creation based on these interactions. Such interaction keeps competitive advantage to present at all times (Serra, 2008).

### **5.3.2 Contracts**

In situations where a contract between two sub-contractors arise, a competition between them will sometimes occur. Once a sub-contractor and a contractor establish a contract for a given period of time, the sub-contractor that offers the “best” service will be sheltered from competition as long as the contract is effective. With this, a result of spatial proximity between firms, like Dusavik, can turn into exploitation of knowledge produced by one company, and further adopted and applied by another (Storper and Venables, 2004).

Relationships, whether they are strong or weak ties, are crucial for to a firm’s potential to stay ahead in a competitive market (Fagerberg, 2013). Because the contracts are time limited, it is crucial for the sub-contractor to maintain their existing contract. In such relation, trust is an important issue, in order to create meeting points and having a shared vision (Morgulis Yakushev and Sölvell, 2017). However, this spark competition between the other co-located sub-contractors to possibly re-sign a new contract once it is close to its end date. Because the contracts have an end-date, it is important for all competing sub-contractors to continuously work on improvements and innovation in order to get a chance of signing a new contract.

### **5.3.3 Regional competition**

Compared to the nearby located base at Tananger, Dusavik is smaller and has less sub-contractors located at their base. All the interviewees stated that not all services they need are present at the base. Specifically, SAR, is located at Tananger, but performs many services at Dusavik, as well as other locations. A cluster often represents firms that that affect both the upstream and downstream of the value chain in a given location (Serra, 2008). Subsea 7 mentions that they collaborate with external sub-contractors that are located in the region, but do not necessarily depend on them being located at the base. It is important to actively engage amongst the involving partners, to build relations on trust to achieve the best possible performance (Monsef et al., 2012). With this, some sub-contractors face competition from outside the base, and some sub-contractors are willing to collaborate with external parties, independent of their location. The relationship between two sub-contractors are therefore an important factor in deciding upon a contract, and deciding to go with a sub-contractor located at the base, or an external sub-contractor off the base.

## 5.4 Risk

### 5.4.1 Spillover due to location

In terms of the location of the base, we found that the specific placement was originally chosen due to oil discovery in the North Sea. With this, Dusavik was established with a need for a supply base in connection with offshore operations. Further establishments of sub-contractors at the base was also due to merging of companies. Norsea also highlights the fact that being centralized around a pool of competence and skillful resources is a benefit of being located at the base. From this, an industry area was built up over 50 years ago, and has today attracted many other related sub-contractors to the area. Locations that are characterized by related and supportive activities has a tendency to become a cluster to further nurture the industry. A benefit of close proximity makes sharing of resources, knowledge and skills more accessible, which can also create knowledge spillover (Serra, 2008). For instance, Equinor mentioned in their interview that ExxonMobil/Point Resources, a related industry company, could contact Equinor to share information and experience regarding an earlier job they performed. Such tendency of knowledge spillover which is a consequence of clustering, is beneficial and can encourage competitive advantage through sharing of knowledge between firms (Crespine-Mazet et al., 2013). Though this was a good example of sharing knowledge, we found little evidence of this being typical at the base. This reflects one of the barriers Hansen (2009) mentions for collaboration with regards to “transfer barriers”, where it is challenging to transfer knowledge.

Certain sub-contractors are not necessarily dependent upon being located at the base. However, SAR, for instance, is dependent upon being located relatively close to where there is work. Alongside, Equinor is reliant on services like SAR provides at the base. Overall, SAR offers services which is needed at the base. Though they are not located at the base, there are no limitations of this. The regional distance does not affect the collaboration between firms at the Dusavik base. This is an example of how the operations at the base can be successful without being dependent upon sub-contractors’ presence at the base. This shows that not all companies are dependent on being located at the base, but do so because of its advantages.

### **5.4.2 Proximity**

In a situation where the firms were to operate as a single firm in the area, all interviewees saw potential risks and unsustainable business performance. One of the major drawbacks of this was the high costs this would cause of being a single company, as well as high transportation costs due to longer distances between sub-contractors. Li and Nguyen (2017) says that by collaborating, a motivational factor is often the intention of reducing high costs, as well as maximizing profit. One example of where several sub-contractors reduced costs by collaborating was the subsidy program “base-base-sea” which was a result of good cooperation with 12 local actors, including Equinor and Norsesea, with a political will to invest in maritime transport (Solvik-Olsen, 2018). The boat, Hannah Kristina transported goods for several operators along the coast, moving from base to base. Such collaboration efforts transcend agendas of competing forces in order to achieve a win-win outcome (Thomas, 1992). In the given situation, the alternative of shipping goods individually would be costly. However, in the process, the collaborating parties had to compromise with regards to the requirements of others. The route became longer in distance and time. But overall, the new route strengthens short sea shipping, gives environmental benefits, and reduces costs (Solvik-Olsen, 2018).

In situation where a firm were to move to a new location, Norsesea, as the main contractor, would see this as a threat to their current performance. Norsesea would not move because service companies would not necessarily have followed. Further, by doing this they would easily be ousted by Tananger, as a nearby located base. The Dusavik base is a natural space to be located that gives value in terms of shipments and offshore operations, where there is a threat and risk that other sub-contractors would choose to locate somewhere else.

### **5.5 Collaboration**

At the Dusavik base, Norsesea is a “gathering point” that has attracted a number of firms based on their valuable location near the coast and offshore operations. As the main operator, majority of the sub-contractors uses Norsesea as an intermediary in order to deliver efficient logistics support to the offshore activities in the North Sea. Network plays an important role in the outcome of successful innovation and development of clusters (Vitasek, 2015). Despite one-to-one interactions because of contracts, there is little interaction between the co-located



firms. Though the firms are centralized around a base with similar interest, the little interaction creates limited innovation opportunities.

### **5.5.1 Characteristics of a cluster**

Clusters are significant for innovation because when there is a critical mass in a location of an industry or sector, the various actors can support each other, where new ideas are developed in both planned and unplanned meetings and interactions. With this, a cluster organization can gather different types of actors to overcome the “seven innovation gaps” (Lindquist et al., 2013). From our findings, we can see that Dusavik lacks some of the characteristics of a cluster; where an ideal cluster includes multiple actors. At Dusavik, we can find industry related firms, capital providers and government involvement. However, with an “ideal” cluster, a research- and educational institution needs to be present. Many of the firms at Dusavik does their own R&D, where most of such research are done internally. Though, majority of the firms are large-scale companies within the oil-and gas industry, the research activities are not targeted at the base, rather, at other areas off the base. Furthermore, there are no existing educational institutions at the base, however, there are a lot of both research-and educational institutions in the region, which alternatively could have been involved in order to create a cluster. Because Dusavik lacks ideal actors of becoming a complete cluster, they fall into gaps for innovation.

### **5.6 Gaps for innovation at the base**

The gaps by Lindquist et al. (2013) provide meeting places and activities where common issues can be discussed and acted upon. With innovation, firms tend to ignore the obvious gaps or fail to recognize them. Here, we will discuss which gaps Dusavik falls into in terms of innovation. With the different gaps, there will be areas that are more apparent than others and also varies depending on what and who are being analyzed. However, we have identified gaps in all areas, where some of them are more obvious than others. The following five gaps are internally within the base.

1. There is a gap of research between firms and research organizations at Dusavik. There are no separate research organization at the base that are used for R&D. The

innovation initiatives that are present at the base are rather performed in-house, within the individual companies. This is also reflected through the little innovation activities that are present at the base.

2. Because there is no form of educational institutions within the base, the base naturally falls into a gap barring between firms and education organizations. Though, Randaberg High School is located in the nearby area, there is no form of collaboration between the institution and the base. From observations, there are employees from several of the companies at the base that has studied while working, but this is also an internal activity within each firm.
3. The capital gap barring interaction between education organization is present at the base, where educational organizations do not seem to be prioritized at the base. This is an area that could have been invested in, but has not been given much attention to.
4. With the government gap barring between the firms and public bodies we see that all companies at the base are privately owned. With the exception of Equinor that has the Norwegian state as the main shareholder, with a 67% stake in the company (Equinor, 2018). With this, the Ministry of Petroleum and Energy is indirectly affecting the decisions that are being made. Alongside, NOFO, a member organization for operating companies on the Norwegian continental shelf, constitute, with the government and municipal resources, the oil conservation contingency (Norsea, 2010).
5. With the firm-to-firm gap barring innovation among firms in the cluster, firms seem to collaborate with each other, however, from the interviews this is mostly present when working on projects together.

Furthermore, we will discuss the remaining two gaps that are external to the base.

6. The interaction between Dusavik and Tananger shows a relationship that is an example of a cross-cluster between two bases. The cross-cluster gap barring interaction with firms in other clusters/technologies is present in terms of the lack of collaboration. With such similar interests at the bases, there are potential of learning from each other and exchanging valuable knowledge and resources. SAR is one of the

firms that provides services to both bases, but is located at Tananger. As Tananger is a larger base and more “complete cluster”. Though, this has not been studied in detail, and is only based on our case study. Dusavik would benefit from cross-cluster interaction.

7. With the global market gap barring interaction with global markets and value chains it is evident that there is potential for innovation, as the operations at the base has not evolved much the last 15 years. However, the oil-and gas industry is rapidly and continuously changing, with both radical and incremental innovations.

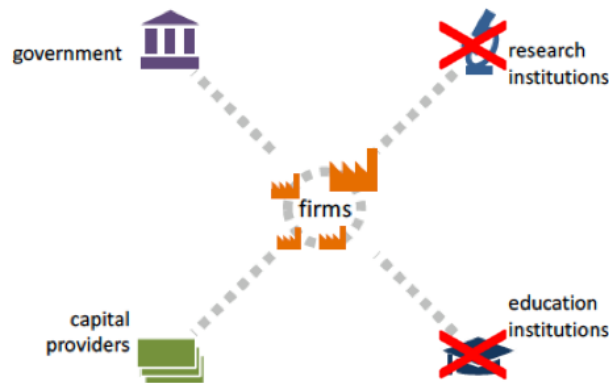


Figure 3. The Gap model – types of actors in a cluster.

Retrieved from “The Cluster Initiative”, by Lindquist et al., 2013. p. 37.

When looking at the seven gaps for innovation (Lindquist et al., 2013), we find that some areas are more noteworthy than others. Gaps involving educational and research institutions are two of the gaps that seem to miss important attributes at the base, as illustrated by figure 3.

## 5.7 Cluster initiatives

Though Dusavik falls into certain gaps for innovation, there are innovative initiatives that can be done in order to overcome such problems. In order to bridge the gaps, found at the base, we can use cluster initiatives that is proven to enhance innovation within clusters (Lindquist et al., 2013). We will use the six cluster initiatives to fill the gaps in order to boost innovation.

1. Dusavik has many aspects of general cluster networking that can be utilized for innovation. First and foremost, the co-located companies at the base shares many services, resources and similar work activities. This itself creates opportunities for knowledge spillover. The sub-contractors can benefit from sharing and exchanging valuable knowledge and learn from each other. Not only can Dusavik use their internal companies, but they can identify strengths and weaknesses by relating themselves to other clusters, like Tananger. Where typical activities of general cluster networking include sharing of information through different channels, we found that Equinor previously initiated a “sharing-forum”. Here, all tenants at the base were able to share HSE issues and related information. However, this forum did not succeed, but is a good initiative towards collaborating through shared resources. One issue reflected here, based on Hansen’s theory (2009), is the “transfer barrier” that hinders knowledge from being transferred.

This cluster initiative of general cluster networking can help bridge gap nr. 5, 6 and 7.

2. With human resource upgrading, Dusavik can ensure a future supply of skilled labor. The opportunity to take additional education was something we found to be present at Dusavik. However, such initiative is not promoted at the base by the companies, but something the employees would have to initiative on their own. By incorporating educational opportunities to the already existing employees, it would give the base the opportunity to shape the employees according to the needs they require. Further, vocational training is something Dusavik base could utilize by collaborating with the nearby school, Randaberg High School. This is an initiative that would be beneficial for both the base and the school.

This cluster initiative of human resource upgrading can help bridge gap nr 2, 3 and 4.

3. A cluster expansion often happens through inwards investments. Recently, Total ASA sold their operating asset (Martin Linge) to Equinor (Solberg, 2017). This opens for new operations for existing business at the base. Compared to Tananger, Dusavik is a smaller base. With this, we can see that Dusavik could benefit by increasing the number of companies at the base. Through the interviews we found that there are many service providers the base is missing to be complete. Also, because we found

major gaps in terms of missing education and research institutions, these are areas that could be expanded.

This cluster initiative of cluster expansion can help bridge gap nr. 1,2, 5, 6 and 7.

4. The initiative of business development is something Dusavik already does, but this is an area that requires attention in order to be more efficient and promote innovation. Because this area does not seem to get the attention it needs, it might explain the little growth the base has faced the past 15 years. Because the co-located companies share the dock, the service providers, equipment and staff this initiative is important to constantly work on, and has much potential to evolve.

This cluster initiative of business development can help bridge gap nr. 1,5 and 7.

5. Innovation and technology that target product process and service innovations are initiatives that could help Dusavik to become more innovative. As we have seen, several of the companies does not prioritize innovation at the base. By endorsing technology and R&D, the companies have a lot to gain. For example, the lack of a simple thing like bar codes at the warehouse is one thing that is brought up in the interview that shows how far behind the base is with technology.

This cluster initiative of innovation and technology can help bridge gap nr. 1,5 and 7.

6. By enhancing conditions for the business environment, Dusavik could further improve their infrastructure. For instance, NOFO ensures that oil conservation contingency is always dimensioned in accordance with operators' needs and contingency plans (NOFO, 2018). Further, all employees working on the dock, have to take an ISPS (International Ship and Port Facilities Security) course to operate at the dock. The base is regulated by law, to ensure a safe work environment.

This cluster initiative of innovation and technology can help bridge gap nr. 4 and 7.

The theory states that the overall goal for these cluster initiatives is to promote growth and competitiveness in a cluster. There are several cluster initiatives that can potentially enhance

innovation. These initiatives can be used either individually, or collectively, depending on the situation. What is found to be challenge with incorporating these initiatives is ability to use them to be sustainable (Lindquist et al., 2013).

This chapter presented different viewpoints from each of the companies. Here, we can see that they have many similarities that they can use to organize the base into a cluster. We also see areas with potential for improvements. By incorporating cluster initiatives to fill the gaps that the Dusavik base falls into, we can see that in many cases, collaboration is essential. Sharing knowledge, resources and development processes would make it easier to incorporate the initiatives. The next chapter will cover suggestions we have made from our discussion.

## 6.0 Empirical Implications

We received an internal report from Equinor, performed by Deloitte relatively late in our case study (Deloitte, 2017). This report looks at efficiency improvements for oil and gas logistics on the Norwegian continental shelf, including supply bases, supply vessels and onshore transport. The report highlights many similar traits and improvement areas that we uncovered through our research and interviews. This helped us to validate our findings. We will make suggestions that operators can benefit from, to eliminate barriers and become more collaborative.

We found that when the companies at the base collaborate they thrive. However, such collaborative initiatives seem to happen when they are working on a specific project. In order to work more efficiently as a cluster, we suggest that the companies at the base need to invest more effort into interacting and collaborating with each other on a regular basis, and not only for a specific task or project.

Firstly, two significant initiatives companies at the base could benefit from to overcome collaborative barriers are: common principles and a shared process for how to collaborate. The base lacks standardized models of processes, since most of the companies have individual models. Creating common processes at the base is an area we found to have a lot of potential, and has already proven to be successful with some of the companies. Process innovation is a type of innovation we suggest that the base should prioritize in the future.

Secondly, a suggestion is a development of a common system solution of shared information. This is also something we found to be well-liked by a lot of the companies to improve efficiency and collaboration. Though a previous attempt of establishing a forum failed, we see this development as a relevant proposal that would benefit several companies at the base. As digitalization has been a stagnant area at the base the past 15 years, we suggest that this area gets prioritized by creating a shared system of information.

Thirdly, the report suggests establishing a “NCS” collaborative model. This model intends to facilitate a more holistic and efficient cooperation on the Norwegian Continental Shelf. It is a model that has the same principals as the gap model we have used to identify whether the

base is a “complete cluster”. This indicates that there is a similarity between collaboration and cluster theory. As proposed in our research question, we have tried to establish how the base can become an ideal cluster. We suggest that the base needs to involve the missing actors of an ideal cluster. This identified to be the research- and educational institutions. Though, companies also need to take advantage of their co-location for collaboration in order to act as a cluster.

These empirical implications are areas that we see having most potential for improvements in order for the base to operate as a cluster providing an agglomeration economy. This way, companies can economically benefit from being geographically concentrated at Dusavik to take advantage of the cluster effects.

## **7.0 Theoretical implications**

Because of the broad use of the term cluster, literature on the subject does not present one single explicit cluster model that can be applied for all clusters. Therefore, we have collected as much relevant cluster theory to try to establish factors of a complete cluster that can be applied for our specific case study. Based on the existing theory, we can draw general lines to support the establishment of a specific cluster. Further research would be needed in order to create a model that can be applicable for any cluster, and not just on a general basis.



## 8.0 Conclusion

The goal for this case study was to study if and how the Dusavik base can be organized into a cluster to foster innovation. By doing this, we have analyzed the base to see whether Dusavik can be identified as a “complete cluster”, and what potential the base has to promote innovation, as a geographically concentrated industry area.

One main conclusion is that the base does not work with innovation on a regular basis. Secondly, we have not recognized that this get prioritized by any of the companies. This is a crucial element and reason for the small changes and slow evolvement at the base for the last 15 years. Based on OECD (2005), there are many areas a company can innovate at, though the most present types at the base is related to process changes. With this, we see a potential for companies at Dusavik to foster this type of innovation through collaboration with co-located companies. Earlier collaborations, like sharing transportation, has proven to be a successful. Also, we see that if the Dusavik base becomes more cooperative, they could benefit from organizational innovation.

All of the companies said that they do not actively work on innovation at the base. We discovered that majority of the companies work on continuous improvements, regularly. It is important to remember that these continuous improvements can be identified as incremental innovations, where this type of innovation is often underrated. Incremental innovations can be beneficial for existing co-located companies, to exploit existing knowledge. Spillover is one externality of geographically concentrated area that the base should take more advantage of, because the companies are industry related. Innovation grows where knowledge spillover and geographical concentration of production is prominent (Audretsch & Feldman, 1996).

Though the successful product development by Norsesea, “Liveload”, was developed by incorporating both internal and external knowledge, we see barriers of sharing knowledge. This can resolve as a hinder for the potential of innovation through collaboration. Majority of the companies see a benefit of having access to a shared pool of sources, though this is not something they use. Companies at the base reflects an attitude that is willing to work on open innovation, though their initiatives/actions suggest that the companies are more closed. With

earlier collaborative success stories, companies at the base should be hungry for more sharing of knowledge, information and data.

Maintaining a competitive advantage is crucial for all the companies at the base. We have already seen instances where competitors get ahead. We see that contractual relations are one aspect that motivates sub-contractors at the base to be innovative. Trust, good relations, pricing and good products/services are what make a sub-contractor at the base attractive. It is not just the co-located firms that are competitors, but also several external contractors in the region. This shows that Dusavik does not have all the necessary services to successfully work on their own. We also found that Dusavik could potentially be ousted by the nearby base, Tananger. Tananger can be identified as a more “complete cluster”.

When analyzing the gaps for innovation in clusters at the Dusavik base, we found that two trivial components were missing in order to be identified as an ideal cluster. Both educational- and research institutions can be found in the region, but need to be utilized at the base to be seen as a “complete cluster”. The base has industry-related companies, government involvement and capital providers. With this, we can see that the base has the ability to use their resources to organize themselves into a cluster.

By identifying the gaps that the base falls into, we can further use cluster initiatives that the base holds to overcome and bridge the gaps. We found that the companies have the willingness to be more open and cooperative, but the ability to incorporate and actively use the mentioned initiatives in a sustainable manner is found to be one of the major challenges.

Based on our case study, our conclusion is that the Dusavik base is not a “complete cluster” but has the potential of becoming one, if implementing the missing actors. Also, we see that the base can benefit from collaborating on a regular basis, and not only for a specific project, which has proven to foster innovation.

## **9.0. Limitations**

This case study is limited to the Dusavik base alone. This means that the results can only be valid for this specific base. Assumptions drawn from similar bases can only be used in a general manner, as our findings cannot say something about the relations of other bases or perception of similar clusters.

In order for the case study to be valid on a greater aspect, we would have to incorporate a greater pool of respondents from more companies than the four that participated in our interviews. Though, our sample of interviewees was significantly large enough for our research of the Dusavik base, since it is a “small” cluster with few companies. Here, the interviewees were also carefully chosen based on their representative role in their company.

Due to a limited amount of time, we were not able to interview more representatives at the base, nor did we have the ability to follow up questions in a second interview.

Lastly, our research may be prone to selection bias, because one of the researchers worked at one of the participating companies, as well as one having workplace-relations with one of the interviewees.

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# Appendix

## Interview Questions

### General information

- Name:
- Organization:
- Number of employees:
- Turnover:
- Location / headquarters?
  
- Please describe the main product / service your company delivers / performs.
  - What is your firm's primary activity?
- What factors made your firm choose this location?

### Cooperation:

- Do you feel that the other firms at Dusavik share the same values like yourself?
- Have you found yourself in a situation where you had the need to cooperate with other firms at Dusavik?
- How do you experience competition and cooperation in the industry (oil / gas) in general? What kind of cooperation are there? In what areas?
- Do you think that all firms rely on cooperation between firms located at Dusavik?
- What do you see as a motivation for multi-party collaboration?
- What type of relationships currently exist at the Dusavik? Certain areas?

### Knowledge sharing

- How would you describe the relationships at Dusavik? (Formal, informal? (from the management, from other firms, between the firms ...))
- Do you want to say that the cooperation at Dusavik generates increased knowledge and expertise for your firm?
- If yes, in what way? What kind of knowledge are we talking about?

- What value would a system for processing and using information from other actors have for you? (sharing knowledge between firms)
- Do you experience the sharing of knowledge between the actors as mutual or do you think someone might fear talking about own projects, etc. at the risk of copying?
- Do you hold these ideas for yourself or do you actively share ideas with other businesses and / or clusters?
- From previous cooperation, do you experience trust as mutual?
- Where is the balance between sharing and protecting knowledge?

### **Innovation**

- Do you consider yourself as an innovative company?
- If yes, how? In what field?
- Does your company work regularly work with innovation?
- What sources do you use to come up with new ideas?
- Do you benefit from other localized actors in Dusavik to become more innovative?
- If yes, do you have an example of how cooperation between one or more actors contributed to innovation? (previous projects, etc.)
- Do you experience pressure to innovate because of high firm concentration at Dusavik?

### **Open/closed innovation**

- With open innovation, all firms have access to a greater source of (shared) knowledge, how would this be beneficial for your firm?
- In such case, do you think you would benefit the most from sharing knowledge, or do you think you would lose, by sharing and not getting much in return?
- How much of your R&D are completely closed “internal”?

### **Rivalry**

- At Dusavik, do you want to describe the "cluster" as complete?
  - That is to say; Are all activities represented in the value chain of your business, located in the local community?

+ What are missing?

- Are any of the other firms (cluster companies) direct competitors to you?
- If yes, how/do you work together? Against each other?
- Are there sometimes disagreements or conflicts in the cluster (Dusavik)?
- If yes, in what situations does this happen? How often?

### **Risk**

- What consequences do you think your company would suffer from if you were the only business in this area?
- If you had moved to an area without any other related companies, what would you have missed?