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Business Model Innovation: A Contribution to the Industrial Restructuring of the Norwegian Oil and Gas Industry

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Business Model Innovation: A Contribution to the Industrial Restructuring of the Norwegian Oil and Gas Industry

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Acknowledgments

This master's thesis is written in the Spring of 2021 as our final contribution after a two-years master's program in Business Administration at the University of Stavanger. We have specialized in the field of Innovation and the thesis is written with a focus on business model innovation.

The motivation for our chosen research objective is based on the need for restructuring the Norwegian oil and gas industry to comply with the Paris Agreement of 2015 and Norway's climate ambitions towards 2030 and 2050. We consider business model innovation to be a decisive part to succeed in the industrial restructuring of the industry and, hence, we aspire to contribute to the research and development in this field.

To our knowledge, there have not been conducted similar studies exploring how business model innovation can contribute to the industrial restructuring of the Norwegian oil and gas industry. Thus, our study covers a research gap in the literature which made it challenging to find relevant secondary data to support our primary data. However, this allowed us to have an exploratory approach where we were less influenced by potential previous conclusions within the subject we studied. This project has been an educational experience and has provided a solid foundation for the upcoming time as graduates entering a new chapter in our lives.

We would like to express our sincere appreciation to our supervisor Marte Cecilie Wilhelmsen Solheim for valuable and continuous guidance and support during the project. Also, we want to express our gratitude for the collaboration with Innovation Norway.

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Katrine Wangen Jonasmo & Silje Sletten
Stavanger, 15.06.2021

Abstract

The Norwegian oil and gas industry is expected to gradually develop as a future-oriented energy industry on the Norwegian continental shelf as the need for sustainable change has become apparent. This requires an industrial restructuring of the industry where oil and gas companies transition to more sustainable industries including offshore wind, hydrogen, and CCS. Through an exploratory research strategy, this study investigates *how business model innovation can contribute to a restructuring of the Norwegian oil and gas industry to comply with Norway's climate ambitions for 2030 and 2050*. The thesis is a case study on the Norwegian oil and gas industry as it is an in-depth inquiry into a phenomenon where we utilize a mixed-methods approach by integrating primary qualitative data with secondary quantitative data collection techniques and analytical procedures.

Our findings indicate that the need for change differs from the willingness to change within the industry. The production companies' willingness to change is currently low as oil and gas production is still highly profitable, while the supplier companies' willingness is high since it is not profitable for them to expand when the market is decreasing. Furthermore, our findings imply that while there is no perfect business model that can be duplicated from one company to another, the majority of oil and gas companies will need to innovate their customer segments, value propositions, key resources, key partners, and cost structure to succeed in the restructuring. Moreover, our findings indicate that the oil and gas industry landscape significantly influence the need for changing the business model to adapt to external factors. Their business model environment is affected by market forces, industry forces, key trends, and macroeconomic forces through the need for sustainable change, the emergence of new technologies and markets, and changes in market conditions. Lastly, oil and gas companies will face several internal barriers in the process of changing industrial trajectories. This includes particularly challenges with the dominant logic of the company, deficient managerial knowledge, uncertainty and complexity of new business models, and no business model routines or processes.

Keywords: Industrial restructuring, Business model innovation, Exploratory research

Table of Contents

Figures

1. Introduction

1.1 Motivation

Global warming and climate change are one of the biggest challenges facing the world today. A desire for more sustainable ways of doing business has become apparent due to climate and environmental changes. The Paris Agreement of 2015 is an international climate agreement that ought to ensure that all countries contribute to reducing climate change. A key element in the agreement is the responsibility for all countries to create a national plan for how to reduce their greenhouse emissions (Horowitz, 2016). Furthermore, the EU Taxonomy Regulation is recently developed to meet the EU's climate and energy targets for 2030, and reach the objectives of the European Green Deal (European Commission, 2020a). The regulation establishes six environmental objectives that entail that the oil and gas industry in Norway will radically have to cut emissions from oil and gas production to create sustainable changes. This can potentially force restructuring within the industry.

It is reasonable to argue that this issue may result in three different scenarios for the Norwegian oil and gas industry: 1) more environmentally friendly production of oil and gas where companies comply with the sustainability goals, 2) restructuring where oil and gas companies enter sustainable industries, 3) oil and gas companies fail to make sustainable changes resulting in a high number of bankruptcies in the upcoming years. According to Blindheim, the director of the climate and environment in Norwegian oil and gas, the industry will continue to gradually develop as a future-oriented energy industry on the Norwegian continental shelf (Norsk Olje & Gass, 2020b). However, the focus will now be on industrial investments in offshore wind, hydrogen, and CO_2 –capture and –storage (CCS) projects that facilitate large emission cuts in Norway, Europe, and the rest of the world (KonKraft, 2020).

Innovation is usually a means to achieve broader political goals like economic growth, sustainable development, technological development, and industrial restructuring. Thus, innovation will be a central element when managing sustainable change and industrial restructuring of the Norwegian oil and gas industry. Organizations must change more than solely their products and services to succeed. The combination of innovating several areas of the business at the same time result in business model innovation. By innovating several areas of their business, including their customers, offerings, infrastructure, and finance - they will strengthen their strategic position. Accordingly, business model innovation can be crucial to succeed in the restructuring process.

1.2 Research Objective

Studies show that companies that are constantly looking for opportunities to innovate and reshape their business model achieve faster growth and higher market shares than those that do not make changes (Lindgardt et al. 2009; Osterwalder et al. 2005; Sosna et al. 2010). Business model innovation can be described as making simultaneous changes to an organization's value proposition and its underlying operating model to acquire a strategic competitive advantage (Osterwalder & Pigneur, 2010). A survey conducted by the Economist Intelligence Unit (2005) confirmed that 55 percent of the interviewed top executives consider new business models as more important than new products and services as a source of competitive advantage. Moreover, research has shown that while product innovations receive the most attention and the greatest financial investments, the largest return on investments is found in business model-related activities (Keeley et al., 2013). However, despite the prominent advantages of business model innovation, the majority of studies on innovation focus on the development of new products, services, and processes. This can be explained by the complexity of business model innovation, making it more difficult to recognize than product and process innovations.

Business model innovations are becoming increasingly important due to rapid technological development and the need of becoming more agile and will be the main research objective in this thesis. To the best of our knowledge, there has yet not been researched how business model innovation can contribute to the restructuring of the Norwegian oil and gas industry. Thus, we aim to provide novel contributions to the research gap in the existing studies within the field of business model innovation. The research objective in this master's thesis is limited to the second scenario mentioned in the previous section: restructuring where oil and gas companies enter other markets resulting in a decrease in the oil and gas industry and an increase in other comparable industries. We aim to answer the following research question based on our elaborated motivation in section 1.1 and the presented research gap in the literature:

How can business model innovation contribute to a restructuring of the Norwegian oil and gas industry to comply with Norway's climate ambitions for 2030 and 2050?

The following four sub-questions are developed to achieve comprehensive knowledge, and to assure inclusion of the decisive aspects within the research question:

1. How does the need for change differs from the willingness to change in the industry?
2. Which parts of the business model should be emphasized the most in the restructuring?

3. What are external challenges oil and gas companies face that may influence business model innovation?
4. What are the internal barriers oil and gas companies face in the process of change?

The scope of this study is limited to the Norwegian oil and gas industry to achieve a prevailing thesis that can be utilized by the majority of organizations within the Norwegian oil and gas industry. Accordingly, we intend to avoid conducting an organization-specific research paper. The delimitation is made to ensure validity for the next 10 years to observe if the industry can meet the EU's climate and energy targets for 2030 and 2050, and reach the objectives of the European Green Deal. Moreover, we aim to achieve a knowledge-based contribution within business model innovation to organizations that are initiating a restructuring process in the future. Furthermore, the sustainable industries are delimited to offshore wind, hydrogen, and CCS. The reasoning behind the industry delimitation is based on the climate strategies outlined in the new KonKraft's climate roadmap for the energy industry on the Norwegian continental shelf (KonKraft, 2020). The particular industries are argued to be essential to reach the climate targets towards 2030 and 2050, and hence, important in the restructuring of the oil and gas industry.

The thesis is composed of six main chapters and is structured as follows:

1. **Introduction** to the motivation and research objective of the thesis.
2. **Contextual background** of industrial restructuring and the different industries explored: oil and gas, offshore wind, hydrogen, and carbon capture and storage.
3. **Theoretical framework** employed in the thesis defining innovation, business model innovation, environmental factors influencing business model innovation, the process of business model innovation, and barriers in committing to business model innovation.
4. **Methodology** employed, presenting the exploratory research strategy and utilized methods of analyzing quantitative secondary data from Menon Economics and collecting qualitative primary data from the Norwegian oil and gas industry.
5. **Findings** from the data collected concerning the industry status, business models, the oil and gas industry landscape, and changing industrial trajectories.
6. **Discussion** of empirical findings in the context of the theoretical framework with the focus being on the need for change vs. willingness to change, business model innovation, business model environment, and the process of change.
7. **Conclusion** with presented limitations, suggestions for future research, and managerial implications.

2. Contextual Background

2.1 Industrial Restructuring

Industrial restructuring entails changing the activities that companies and industries must carry out regularly to maintain and strengthen competitiveness (Isaksen, 2018). This is particularly important in periods of major changes in markets and technology, including those associated with long economic waves. Norway is currently in the middle of a major restructuring driven by sustainability, digitalization, servitization, and open innovation, which entails that established companies within the oil and gas industry must re-evaluate and change their business models to stay competitive (Saebi, 2016).

The different strategies for downsizing the Norwegian oil and gas industry will have several environmental and financial consequences. First, phasing out the industry will have major negative economic impacts due to the industry's influence on the Norwegian economy. Second, it can affect the state's profits, where expenditures and unemployment may increase and there can be a loss of tax revenue. Third, as the world is dependent on energy the demand will continue to increase. Bjørnland (2020) argues that renewable energy[1] is likely to take up an increasing share of the world's energy consumption. However, the world is not yet self-sufficient, and there are still challenges in storing renewable energy (Bjørnland, 2020). Thus, having a strategy for restructuring the oil and gas industry is vital to maintain value creation, jobs, and income to the welfare state.

The reforms within an industrial restructuring process can cover several aspects including 1) choice of industry design, 2) restructuring and unbundling of the industry, 3) participation of the private sector, 4) regulatory and legal framework, and 5) impact on the security of supply, competition, and market power (DNV, n.d.). Industrial restructuring, with the emergence of new industries, will often require the development of new educational programs, new research agendas, new supplier companies, and new laws and regulations (Isaksen, 2018). The restructuring of the oil and gas industry entails an increased focus on more future-oriented energy industries including offshore wind, hydrogen, and CCS. Due to the need for sustainable change, several oil and gas producers and suppliers will, hence, be transforming from oil and gas companies to energy companies.

[1] "Renewable energy is energy from sources that are naturally replenishing but flow-limited; renewable resources are virtually inexhaustible in duration but limited in the amount of energy that is available per unit of time" (EIA, 2020).

2.2 Industry Background

Norway is a country rich in natural resources, including hydropower, oil, natural gas, minerals, and aquaculture. Norway's wealth is inextricably linked to its natural resources and strong development of prosperity has made the country one of the richest in the world measured in national product per capita (Røvik et al., 2021). Through the extraction and further processing of natural resources, Norway has built up knowledge, technology, and values that have benefited the entire nation (NHO, 2018). For many decades we have exploited our natural resources and reaped the benefits of nature's abundance. However, the impact this has had on nature through overexploitation, pollution, and neglect has now become increasingly apparent. Hence, the need for more sustainable ways of exploiting natural resources and creating new industries in the coming decades is vital. Thus, the restructuring of the Norwegian oil and gas industry is important as the focus shift from the production of oil and gas to more sustainable industries, including offshore wind, hydrogen, and CCS. This requires several offshore energy integration concepts as illustrated in figure 1 below (Maslin, 2020).

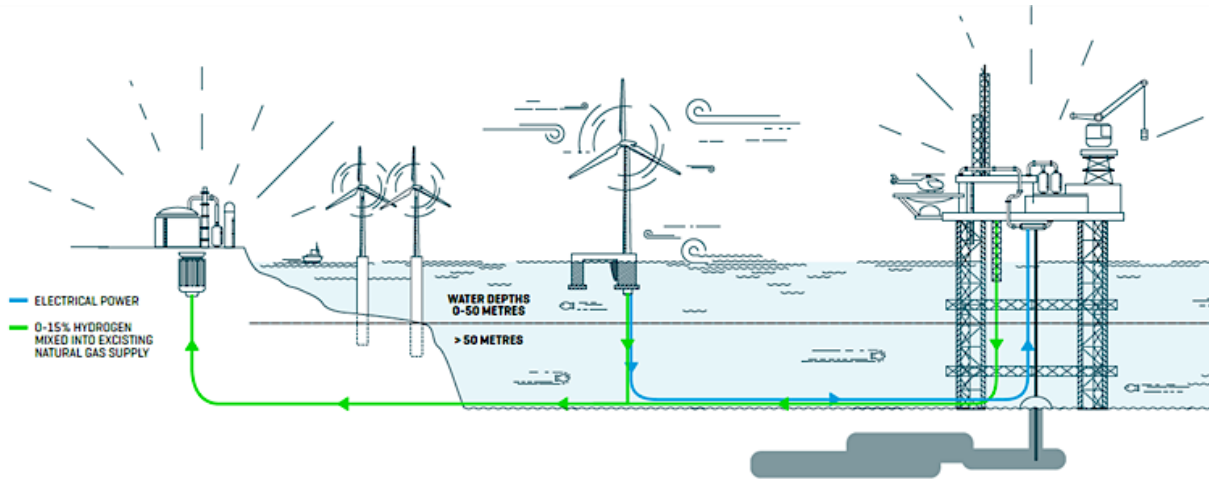

Figure 1. Offshore energy integration concepts. Source: Elaine Maslin, 2020.

Oil and Gas Industry

The oil and gas industry is one of the world's leading industries as crude oil and natural gas is the world's most important source of primary energy. The value chain of oil and gas consists of upstream, midstream, and downstream activities. Upstream mainly focuses on the exploration of crude oil and natural gas fields as well as production and recovery. Furthermore, midstream primarily involves the storage and transportation of oil and gas through a network of pipelines, trucks, rail, ships, tankers, and barges to the downstream sector (Aavos

International, 2017). Lastly, the downstream part of the industry focuses on the refining of crude oil and natural gas to produce different products.

The Norwegian oil history started in 1969 when the Ekofisk field was declared viable for extraction of petroleum. Several discoveries followed, more fields were developed and put into production, and several major international oil players established themselves, obtained licenses, and invested. Norway has for several decades been among the world's largest oil and gas producers due to the large deposits of petroleum on the Norwegian continental shelf. Norway is the world's third largest gas exporter, behind countries such as Russia and Qatar, and supplies the EU with between 20 and 25 percent of the total gas consumption (Norsk Petroleum, 2020a). The industry is a dominant factor in the Norwegian economy and is today Norway's largest industry measured in value creation, government revenues, investments, and export value. However, extraction and consumption of petroleum results in emissions of greenhouse gases, negatively impacting global warming. The Norwegian oil and gas industry is, therefore, expected to reduce its absolute greenhouse gas emissions by 40 percent by 2030 compared to 2005 and further reduce emissions to close to zero in 2050, requiring sustainable changes to be made (KonKraft, 2020).

Offshore Wind

Offshore wind will be central to supplying the world with renewable energy, and the oil and gas industry can be an important part of the development of this industry. The first offshore wind farm was installed in Denmark in 1991 and Europe has been at the forefront of major developments in especially Denmark, Germany, and the United Kingdom. There is also a sharp escalation in offshore wind development in Asia and the United States, and the industry is growing (International Energy Agency, 2019). Due to the great wind resources on the Norwegian continental shelf and Norway's strong positions in the maritime, offshore, and onshore industry; offshore wind has all the prerequisites of becoming a large and important industry in Norway (Norsk Olje & Gass, 2020a). Pure oil and gas companies may become broad energy companies, while supplier companies in oil and gas will increase their shares in renewables. The Norwegian-based industry can potentially take up to 20 percent of the global market, corresponding with value creation of NOK 117 billion and an employment effect of 128,400 man-years in Norway accumulated over a period of 30 years (Menon Economics, 2019).

Hydrogen

The technology behind converting hydrogen and oxygen into electricity appeared as early as 1839. The interest in hydrogen has varied and has shown to increase in various societal crises, such as the oil crisis in the 1970s. Hydrogen became even more prominent at the end of the 1990s, as a response to handle the new climate crisis (Reed Ursin, 2021). Hydrogen is increasingly utilized in power, heating, and transport systems all over the world. Stored hydrogen has multiple benefits that increase its potential to replace fossil fuels, as it can be used directly as fuel or to generate electricity (Equinor, n.d.). Hydrogen has received increased attention these last years since it can be produced and utilized without direct CO_2 emissions (Benjaminsen, 2019). The production of hydrogen will be a vital contribution to sustainable development since it has the possibility of being produced in virtually unlimited quantities while utilizing renewable energy sources (Equinor, n.d.). Benjaminsen (2019) claims that we will experience a significant increase in the utilization of hydrogen technology in the future, however, Reed Ursin (2021) argues that it is not likely that hydrogen will take over as the prevailing energy carrier.

Carbon Capture and Storage

Carbon capture and storage (CCS) became prominent in Norway in the 1990s as a method to continue the utilization of fossil fuel while reducing greenhouse gas emissions. The technology captures, transports, and stores CO_2 emissions from the combustion of fossil energy and industrial production safely under the earth's crust. CCS is the only method to decarbonize some of the world's critical industrial sectors, including cement, metal production, and waste incineration (Sintef, n.d.). CCS is an important transitory technology until the renewable energy industries have advanced to provide reliable base load energy systems. Renewables in combination with CSS can provide stable, clean energy solutions (International CCS Knowledge Centre, 2021). The European Commission has identified CCS as one of the seven areas for action to achieve a goal of climate neutrality in Europe by 2050. Additionally, to the UN Climate Panel, CCS is a key measure in the attempt to reduce the world's greenhouse gas emissions (Norsk Petroleum, 2020b). The Intergovernmental Panel on Climate Change (IPCC) found that to meet the challenging goals of the Paris Agreement, global CO_2 emissions must be reduced by 50-85 percent by 2050. 14 percent of the total emission reduction by 2060 must come from CCS to achieve these goals (Sintef, n.d.).

3. Theoretical Framework

The following chapter presents the theoretical framework that will be at the core of this research project. The main focus in this chapter is on business model innovation with common theories and definitions retrieved from some of the main scholars in the field of innovation. The theoretical framework is structured by five main components: 1) defining innovation, 2) business model innovation, 3) environmental factors influencing business model innovation, 4) the process of business model innovation, and 5) barriers in committing to business model innovation. The chapter starts with defining innovation followed by an overview of different innovation classifications. Further, theories of business model innovation are discussed where the main focus is on the "Ten Types of Innovations" framework by Keeley et al. (2013) and the "Business Model Canvas" framework by Osterwalder and Pigneur (2010). The next two sections explore different frameworks by Osterwalder and Pigneur (2010), reviewing environmental factors influencing business model innovation, and the process of business model innovation. The last section presents barriers organizations must overcome to commit and succeed in business model innovation by introducing an extension of a model developed by Foss and Saebi (2016).

3.1 Defining Innovation

The word "innovation" originates from the Latin *innovare* and can be defined as the process of creating value through converting ideas into desired outputs (Tidd & Bessant, 2014, p.3). Innovations do not have to be new to the world, only to a market or industry, and we often fail to recognize that most innovations are based on previous advances (Keeley et al., 2013, p.20). The political economist Schumpeter is one of the most cited scholars and well known for his definition of innovation from 1934. Schumpeter (1983) defined innovation as new combinations of new or existing knowledge, resources, equipment, and other factors. He also stressed that innovation must be distinguished from invention. While inventions are to a large extent about the generation and creation of new ideas and concepts, innovation is about converting these concepts into commercial use where one can profit from them. Thus, innovation can involve invention but it also requires a "deep understanding of whether customers need or desire that invention, how you can work with other partners to deliver it, and how it will pay for itself over time" (Keeley et al., 2013, p.20).

Innovative Organizations

An innovative organization is according to Shepard (1967) an organization that continuously learns, adapts to both internal and external changes in the environment in which it operates, and succeeds in innovating in this environment. Successful businesses are often characterized by their ability to improve and nurture existing resources to maintain a strong strategic position, while at the same time exploring new opportunities that can result in a more lasting competitive advantage (March, 1991). However, organizations daily face the challenge of making explicit and implicit choices of balancing existing capabilities and exploring new opportunities for growth. The explicit choices comprise calculated decisions in competitive strategies and alternative investments, while the implicit choices are deeply embedded in several aspects of organizational forms and customs. Exploration and exploitation are fundamental for organizations, but these activities compete for scarce resources and finding the proper balance is a primary factor for survival (March, 1991, p. 71). The objective is to balance exploring new business models with exploiting proven existing business models – and how to transition the organization successfully between these domains.

Tidd and Bessant (2009, p.74) identify four archetypes of companies that highlight differences in developing innovation management capabilities. Figure 2 illustrates a simple typology, ranging from companies that are 'unconsciously ignorant' and rarely innovate to high-performing companies that have effective systems in place for continuous improvement and development. Type A companies can be characterized as being passive and lacking the ability to recognize the need for innovation and how to change. Type B companies are more reactive and understand the need to change, however, they are hesitant to the process and unable to explore and exploit the necessary resources. Type C companies have a more strategic approach to the process of continuous improvement, but often lack the capabilities for radical innovations. Lastly, type D companies have a more creative and proactive approach to exploiting technological and market knowledge for a competitive advantage, and they have a high absorptive capacity.

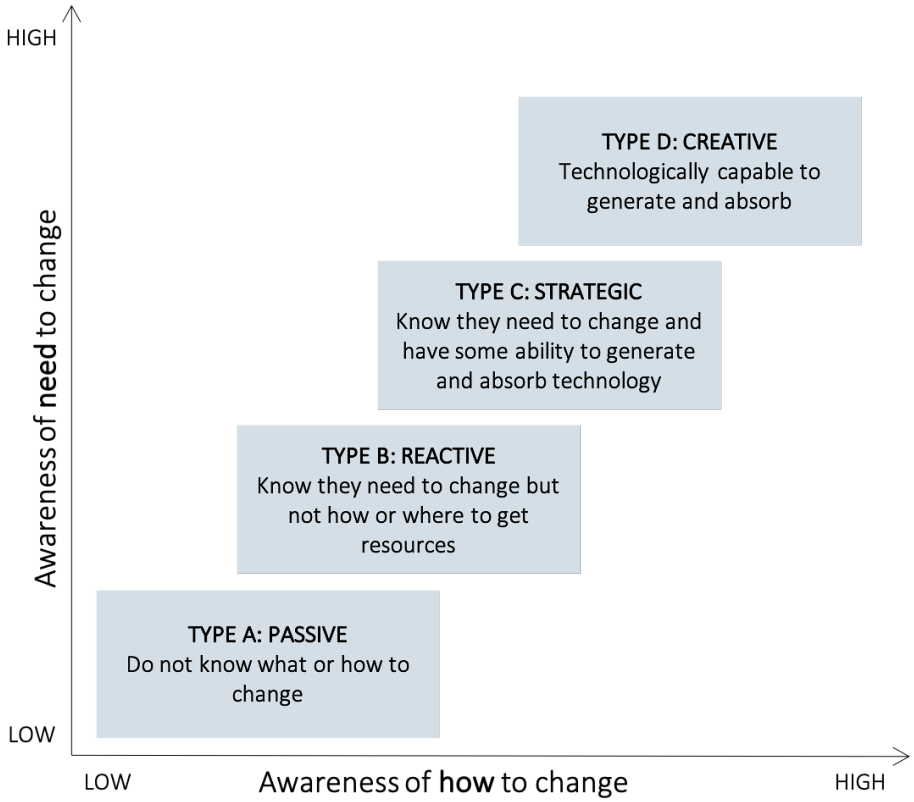

Figure 2. Developing innovation management capability. Source: Tidd & Bessant, 2009.

Miles et al. (1978) define the most innovative organizations as "prospector companies" that focus on technology and development and tend to be the first movers as they continuously experiment with new market trends. This necessitates having dynamic capabilities enabling the organization to achieve new and innovative forms of competitive advantage by addressing rapidly changing environments through integrating, developing, and reconfiguring their internal and external competencies (Teece, Pisano, & Shuen, 1997, p.516). This involves adaptive capabilities to adapt to the changes in the firm's environment (Chakravarthy, 1982); and absorptive capacity to recognize the value of different types of information and knowledge, assimilate it, and apply it to commercial ends (Cohen & Levinthal, 1990). When organizations stop innovating their business model, they stop developing, competing, and differentiating themselves from their competitors, eventually driving the business to destruction.

Innovation Strategy

It is vital to maintain a clear and distinct innovation strategy aligned with the values and aspirations of the firm. A common misconception when thinking of innovation is that it only should revolve around products, services, and processes. Francis and Bessant (2005) argue that innovation takes form along four dimensions known as the 4P's of innovation: product, process, position, and paradigm. Since innovation is about finding new ways of doing business and making money it should involve more than just an organization's offering and how this is created and delivered to a market. Innovating a company's market position involve introducing an established offering that is produced by an established process, in a new context (Francis & Bessant, 2005). This can for instance be to rebrand an organization as green[2] to meet new market demands. Such innovations are particularly influenced by adoption behaviors and technology transfer.

Paradigm innovation refers to changing business models through for instance system-level change, multiorganizational innovation, or servitization (Tidd & Bessant, 2014, p.392). All organizations need a business model that describes how they will create, deliver, and capture value for their customers. According to Osterwalder and Pigneur (2010), "the business model is like a blueprint for a strategy to be implemented through organizational structures, processes, and systems". Business model innovation refers to reframing the current offerings, processes, and market context to gain a competitive advantage by identifying new challenges and opportunities. Francis and Bessant (2005, p.171) argue that "moving beyond the steady state conditions of 'doing what we do but better' to a new set of conditions in which 'doing different things in different ways' becomes the norm" is essential in this work. While product/service and process innovations, arguably, are the most common types of innovation, innovating an organization's market position and business model can be crucial to stay competitive in dynamic market conditions.

[2] Green energy is generated from natural resources as sunlight, wind, or water and do not harm the environment by releasing greenhouse gases into the atmosphere. An energy source cannot produce pollution to be considered as green energy (TWI Global, 2021).

Levels of Innovation

Organizations must continuously search for new opportunities to improve, develop, and find new ways of generating and capturing value to stay competitive (Foss & Saebi, 2015; Osterwalder & Pigneur, 2010; Tidd & Bessant, 2014). There are several ways to do this, and innovation is one crucial part. However, there has yet not been reached a consensus among researchers on how many different levels of innovations that exist, and how these are to be defined. Nevertheless, several researchers seem to agree on the following four classifications: incremental, sustaining, disruptive, and radical innovations (Fagerberg et al., 2006; Kylliäinen, 2019; Satell, 2017; Tidd & Bessant, 2014). As illustrated in figure 3 below, innovations can be defined and classified in terms of their impact on the market and their technology newness. Whether an innovation is incremental, disruptive, sustainable, or radical may change along its life cycle and will ultimately impact the company's competitiveness and strategic position.

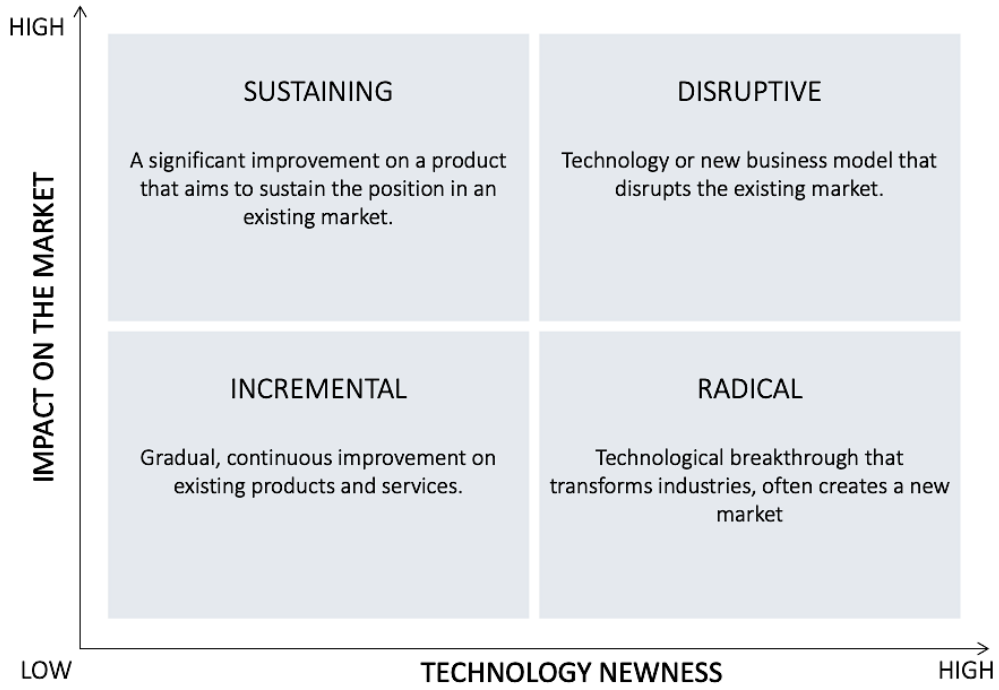

Figure 3. Levels of innovation. Source: Kylliäinen, 2019.

Most innovations can be classified as incremental where organizations constantly make small improvements to their products, services, processes, methods, and other parts of their business. Such innovations are crucial for organizations to meet changes in market needs and can be an important part of acquiring and retaining customers. The main focus in incremental business model innovation is exploiting existing resources to maintain a strategic position. One can argue that there is a low risk connected to incremental innovations due to their low level of technology

newness and they also have a minor impact on the market. On the other hand, disruptive innovations are quite the opposite and they mainly focus on exploring new opportunities. Such innovations have a high level of technological advancements and enable major changes in the market and can even create new markets. Disruptive business model innovation can completely change the way to do business and might be essential for entrants challenging the incumbent companies in an industry.

Furthermore, organizations seeking to impact the market to a larger extent whilst keeping their risk relatively low, tend to focus on sustaining innovations. Sustaining business model innovation requires attention to both exploitation and exploration at the same time. Such innovations focus on improving the existing offering; however, they also impact the market and tend to make a shift towards increasing profits. Some innovations may start as disruptive and transform into sustaining when the organization has acquired a strong position in a market. Lastly, radical innovation is probably the most complex and time-consuming level of innovation as it often requires major changes in the organization and involves high risks. Radical business model innovations can completely transform an industry or even an entire economy, and they provide new solutions to problems that we did not know we had. Radical business model innovation can be crucial in the emergence of new markets and industrial trajectories and require both exploitation of resources, and exploration of opportunities at the same time.

Summary

Innovation can be defined as the process of creating value through converting ideas into desired products or services that are adopted by a market. Innovative organizations continuously learn, adapt to internal and external changes in the environment in which they operate, and succeed in innovating in this environment. This necessitates abilities to exploit existing capabilities while at the same time explore new opportunities. Four archetypes of companies that differ in their ability to develop innovation management have been presented. Companies can be defined as passive, reactive, strategic, or creative in terms of their awareness of the need to change and how to change. Moreover, the importance of having a clear and distinct innovation strategy has been established. Different strategies necessitate different levels of innovation and the differences between incremental, sustaining, disruptive, and radical business model innovation have been explored.

3.2 Business Model Innovation

Tidd and Bessant (2014) argue that business model innovations are one of the most powerful challenges to already established players in an industry. An organization's business model should describe who their target customer is, what they are offering to the customer, how the value proposition is created, and why it is profitable (Foss & Saebi, 2015; Keeley et al., 2013; Osterwalder & Pigneur, 2010; Tidd & Bessant, 2014). In 2014, the Center for Service Innovation conducted a first, comprehensive, quantitative survey that specifically examined to what extent Norwegian companies had driven innovation in their business models over the past three years. The study was based on responses from 284 companies and found that there was the least innovation in elements connected to capturing value with only 3.5 percent, while value propositions received the most focus with 24.6 percent of the companies innovating their products and/or services (Saebi, 2016). Innovating an organization's business model can create long-term, sustainable, competitive advantages and provide a high return on invested capital, and should therefore receive greater attention (Boer & During, 2001; Keeley et al., 2013).

Keeley et al. (2013) argue that there are mainly 10 factors that drive innovation in different organizations: profit model, network, structure, process, product performance, product system, service, channel, brand, and customer engagement. These elements are all part of an organization's business model and they establish the configuration of the organization, their offering to the market, and how the value proposition is experienced by their customers. Depending on which phase the organization is in its life cycle, some of these drivers may be more important and have a greater impact than others. In 2011 Keeley et al. (2013) did a research project studying how the number of innovation types used by two different groups of companies influenced their competitive performance. They found that the "average innovators" used in average 1.8 of the ten types of innovation, while the "top innovators" used in average 3.6 of the ten types of innovation (Keeley et al., 2013, p.88).

Supporting the "Ten types of innovation" framework is the "Business Model Canvas" developed by the Swiss business theorist Alexander Osterwalder. The concept was created to provide organizations with a tool to evaluate their business model and create new strategic alternatives for doing business. As illustrated in figure 4 below, the concept consists of nine building blocks that show the logic behind how an organization intends to make money: customer segments, value propositions, channels, customer relationships, revenue streams, key resources, key activities, key partnerships, cost structure (Osterwalder & Pigneur, 2010).

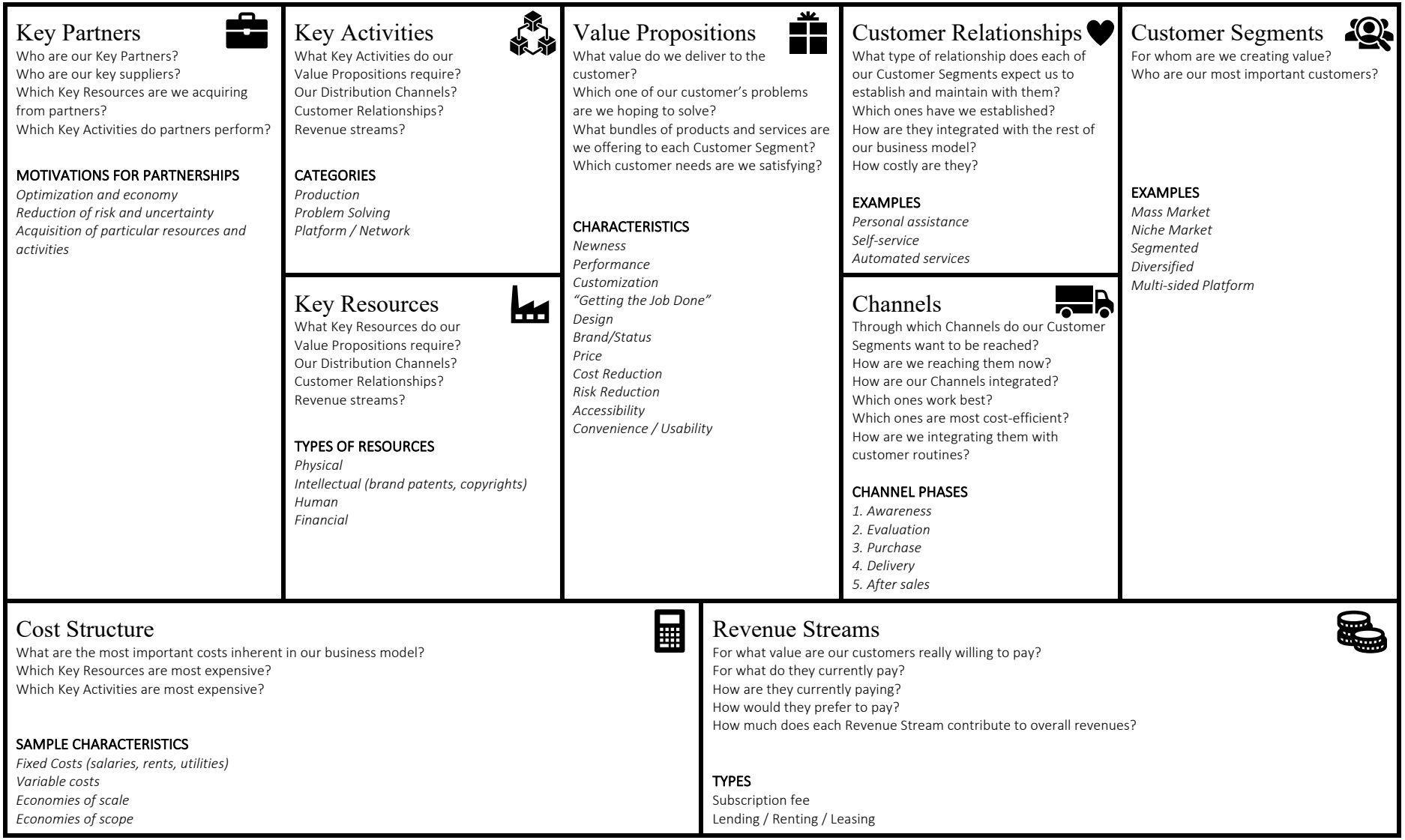

Figure 4. The Business Model Canvas. Source: Osterwalder & Pigneur, 2010.

The “Ten types of innovation” framework and the “Business Model Canvas” are both created to help organizations realize that innovation is more than just creating new or improving existing products and services. While the concepts are quite similar, they also differ in some areas. The main focus in the “Ten types of innovations” framework is identifying the main elements influencing innovation, while the “Business Model Canvas” focuses on how the different elements in an organization’s business model can be subject to innovation. Both frameworks present several different building blocks that covers the main areas of business. The “Ten types of innovation” framework differentiates between configuration, offering, and experience factors, while the “Business Model Canvas” differs between finance, infrastructure, value proposition, and customer factors. Even though they have named the different sections differently they both distinguish between the main elements in an organization’s business model: customers, offerings, infrastructure, and finance. To some degree, the frameworks emphasize the elements differently and they each have their strengths and weaknesses. However, as there are no major differences between the two frameworks they can be combined and work together as shown in figure 5. By combining the frameworks one can utilize the strengths of each theory and get a greater understanding of the importance of the different elements influencing business model innovation.

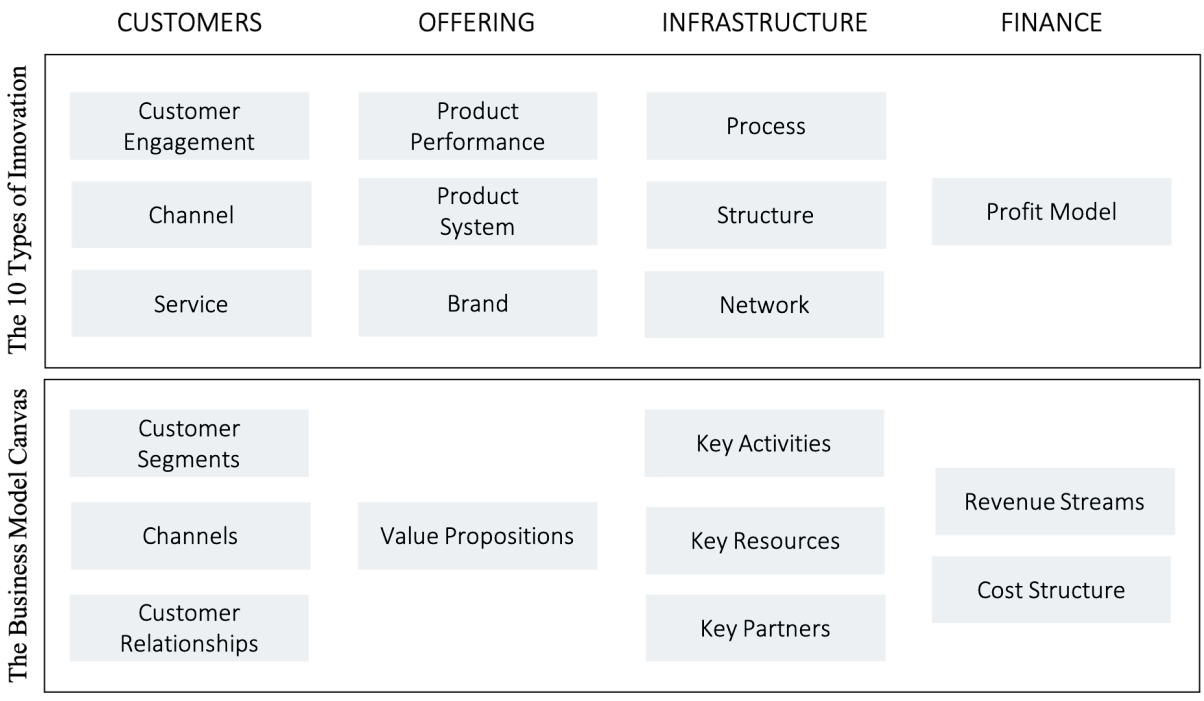

Figure 5. Comparison of the Ten Types of Innovation framework and the Business Model Canvas

Customers

One can argue that customers represent the very heart of any business model as no company can survive for long without profitable customers (Osterwalder & Pigneur, 2010, p.20). An organization needs to know which customer segments to target, how to target these customers through different channels, and how to maintain their relationship and create great customer experiences resulting in loyal customers (Keeley et al., 2013; Osterwalder & Pigneur, 2010). The first step in this process is to identify whom the organization is creating value for, and who their most important customers are. To best serve their customers, organizations should segment them into groups based on common needs, behavior, and other characteristics, allowing them to provide a more customized offer to their target group. Examples of different types of customer segments are mass market, niche market, segmented, diversified, and multi-sided platform (Osterwalder & Pigneur, 2010, p.21). Without defining these segments any further, they do differ in terms of needs, distribution channels, type of relationship, and profitability.

Second, the organization needs to decide how they will communicate with and reach their customer segments to deliver their value proposition (Keeley et al., 2013, p.52; Osterwalder & Pigneur, 2010, p.26). The choice of distribution channels may have a great impact on how the customers perceive the organization's offering and should therefore be chosen carefully. One can distinguish between direct channels, like in-house sales force or webpage, and indirect channels, such as a retail store owned by the organization. Additionally, organizations can reach their customers through their own channels, or channels of their partners (Osterwalder & Pigneur, 2010, p.27). Keeley et al. (2013, p.53) argue that channel innovations are particularly sensitive to customer habits and the industry context in which they are applied. Finding the best combination of channels will, therefore, be crucial in bringing their value proposition to the market.

The last important element is selecting the type of relationship the organization wants to establish with their customers. Central aspects of this are the methods used to acquire and retaining customers (Osterwalder & Pigneur, 2010, p.28). Furthermore, Keeley et al. (2013, p.59) emphasize the importance of supporting and amplifying the value of the organization's offerings through providing service and foster compelling interactions through customer engagement. An essential part of an organization's business model is the ability to identify what creates customer value. Interaction with customers to understand their needs and desires is, therefore, crucial in developing profitable customers and obtaining a competitive advantage.

Offering

The main focus in many organizations is the different products and services they offer to a market and how these can be improved and further developed to gain a competitive advantage. An organization's value propositions, also known as an offering, describe the bundle of products and services that create value for their customers (Keeley et al., 2013, p.30; Osterwalder & Pigneur, 2010, p.22). Values may either be quantitative like price, cost reduction, speed of service, or delivery time; or qualitative such as performance, customization, "getting the job done", design, brand, risk reduction, accessibility, convenience, and usability (Keeley et al., 2013, p.44; Osterwalder & Pigneur, 2010, p.23-25). Important elements when innovating an organization's value proposition are identifying which of their customer's problems they are trying to solve, which customer needs they are satisfying, and what value they are actually delivering (Osterwalder & Pigneur, 2010, p.23). Furthermore, representation of the offering and business is also significant as it can influence customer's purchasing behavior. Innovating the organization's brand may therefore be necessary as it can "help ensure that customers and users recognize, remember, and prefer your offerings to those of competitors and substitutes" (Keeley et al., 2013, p.56).

Keeley et al. (2013) further argue that innovating an organization's value propositions is often driven by product performance, product system, and the service provided in connection to the offering. Product performance is about the value, functions, and quality of what the organization offers a market, typically through a product or a service (Keeley et al., 2013, p.44). This involves both completely new products that are yet not on the market, as well as improvements to existing offers that provide significant value for the customer or user of the offering (Snihur & Wiklund, 2019). Another important driver for product and service innovation is the solution system in which the offering depends on. Solution systems involve complementary products and services that come together to create a robust and scalable offering system (Keeley et al., 2013, p.47). Examples are modular solutions, integration solutions, and other ways that create valuable connections between products or services that are otherwise experienced as different offerings.

Infrastructure

All products and services are results of various internal and external activities and processes, known as the infrastructure or configuration of the business. For an organization to be able to offer its value propositions to a market they need resources, activities, and partners that facilitate this. Organizations require key resources that allow them to create and deliver their value propositions, reach their customers, maintain their customer relationships, and earn revenues (Osterwalder & Pigneur, 2010, p.34). Key resources can be physical, intellectual, human, or financial in nature, and are crucial in an organization's ability to develop and create competitive advantage. Furthermore, the organization should organize and align its talents and assets in a structural manner that creates value in unique ways. Structure innovations include everything from training systems to configurations of heavy capital equipment, and are important in creating productive work environments that promote a level of performance that competitors cannot duplicate (Keeley et al., 2013, p.38).

Organizations will also need different activities and processes to produce their value propositions, solve problems, and work together with their partners and networks (Keeley et al., 2013, p.41; Osterwalder & Pigneur, 2010, p.37). Innovating their core activities are often associated with process innovation which can be defined as the development of new or improvement of existing methods by which products and services are designed, produced, and delivered to a market (Boer & During, 2001; Keeley et al., 2013, p.41). Examples of such innovations are modifications to the equipment and technology used in production to reduce delivery time, lower operating costs, or increase internal and external flexibility (Boer & During, 2001). It is also essential that the organization work as problem solvers, continuously developing new solutions for their customers, as solving problems is at the very core of innovation (Osterwalder & Pigneur, 2010, p.37).

Lastly, an organization's success is highly dependent on how it connects with its network of suppliers and partners to create value. Networks are essential in today's hyper-connected world, and network innovations help companies benefit from other companies' processes, technologies, offerings, channels, and brands, in ways that strengthen their strategic foothold (Keeley et al., 2013, p.35). Partnership and alliances can be both short- and long-term and are usually created to achieve something that would be hard to do alone. Through creating strategic alliances, coopetition, joint ventures, and good buyer-supplier relationships companies can optimize their business model, reduce risk, and acquire valuable resources (Osterwalder & Pigneur, 2010, p.38).

Finance

Financial viability is the last part of a business model and while customers can be argued to be at the very heart of any business model the profit model is its arteries. An organization's profit model describes how the company plan to make money through its revenue streams and cost structure (Keeley et al., 2013, p.31). The revenue streams are to a large extent based on what value each customer segment is willing to pay for and how each of the revenue streams contributes to the business' overall incomes. Business models usually involve both transaction revenues that result from one-time customer payments, and recurring revenues that come from multiple payments over a longer period of time (Osterwalder & Pigneur, 2010, p.30). Examples of different revenue streams are asset sales, usage fees, subscription fees, renting / leasing, licensing, brokerage fees, and advertising. Each revenue stream may have different pricing mechanisms where some are fixed such as list price, product feature-, customer segment-, and volume-dependent; while others are dynamic and influenced by negotiation, yield management, and real-time-market (Osterwalder & Pigneur, 2010, p.33). The choice of pricing mechanism will have great impacts on the organization's revenue streams and financial viability and should therefore be chosen carefully.

The second element in an organization's profit model is its cost structure that describes all costs incurred in operating a business. Cost structures include fixed costs, variable costs, economies of scale, and economies of scope. Acquiring and retaining customers, creating and delivering value, and generating revenue all incur expenses in various degrees. Some business models are highly cost-driven and focus on a lean cost structure, low price value proposition, maximum automation, extensive outsourcing et cetera; while others are more value-driven and emphasize value creation and premium value propositions over reducing costs (Osterwalder & Pigneur, 2010, p.41). Furthermore, Keeley et al. (2013, p.31) stress that "the ideal profit model will vary widely by context and industry" and must therefore always be aligned with the organization's strategy and innovation intent. Innovative profit models provide new ways of transferring organizations' offerings into revenues and tend to challenge an industry's old assumption about how to do business. Innovating the profit model may, therefore, be key for new entrants to attain market shares in an industry or for incumbents to strengthen their position and keep their customers.

Summary

Business model innovation can be defined as making simultaneous changes to different aspects of a business at the same time to gain a strategic advantage. Several theoretical concepts have been introduced to describe companies' target customers, what value propositions they are offering, how they are creating value, and how they are going to profit from it. The "Ten types of innovation" framework and the "Business Model Canvas" has been presented to illustrate the different aspects of a company and consists of different building blocks covering the four main areas of a business. The first aspect is the customer interface which includes their customer segments, channels, and customer relationships. The second aspect is the different products and services they offer to a market known as their offerings or value propositions. The third aspect is the infrastructure and configuration of the business that is surrounding their offerings including key resources, key activities, and key partnerships. The last aspect is the financial elements involving their cost structure and revenue streams, also known as their profit model.

3.3 Business Model Environment

Organizations do not operate in isolated conditions, and it is widely recognized that all business models are affected by several external factors. Developing a good understanding of the environmental factors influencing the company's business model is essential to stay competitive. Osterwalder and Pigneur (2010, p.201) have created a framework to illustrate how the context, design drivers, and constraints influence the generation and development of business models. They argue that all business models are influenced by market forces, industry forces, key trends, and macroeconomic forces, as illustrated in figure 6 below. The environmental factors presented in the framework by Osterwalder and Pigneur (2010, p.201) influence businesses and industries differently and their importance may change during the organization's life cycle. The different aspects of the framework have, to various degrees, been studied and discussed by several well-known scholars in the field (Fagerberg et al., 2006; March, 1991; Osterwalder & Pigneur, 2010; Porter, 1998; Schumpeter, 1983; Shepard, 1967; Tidd & Bessant, 2014).

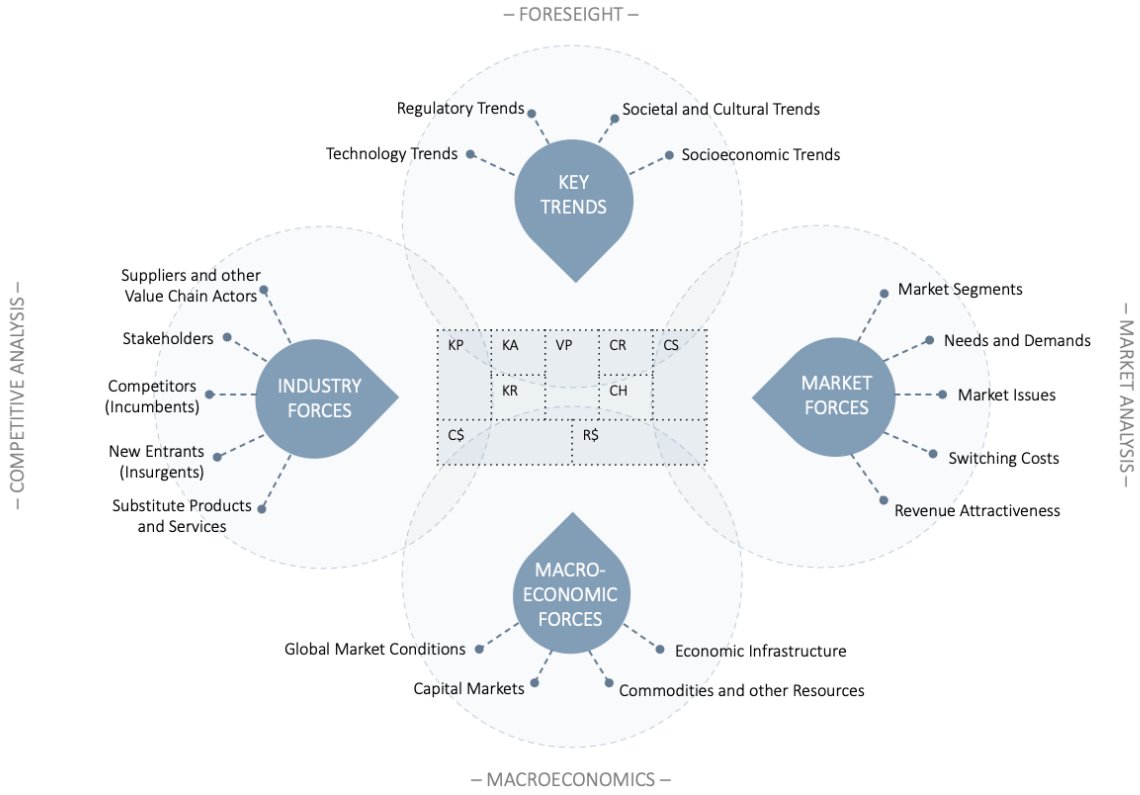

Figure 6. Business model environment. Source: Osterwalder & Pigneur, 2010, p.201.

Market Forces

The needs and demands of customers are constantly changing and as marketplaces evolve, the need for new ways of addressing markets has become apparent. To stay competitive, organizations should identify market issues, market segments, needs and demands, switching costs, and revenue attractiveness, by analyzing the market they are incumbent in or want to enter (Osterwalder & Pigneur, 2010, p.202). The first part of this is to identify, through the customer and offering perspectives, the key issues that drive and transform the market. Important in this work is recognizing factors that affect the customer landscape and identify potential market shifts that are underway and influencing where the market is heading. This requires companies to interact with their customer segments and search for new opportunities through expanding their customer base. Therefore, organizations should identify their main market segments, evaluate their attractiveness, and look for opportunities to spot new profitable ones (Osterwalder & Pigneur, 2010, p.202). A key element in this is to locate the customer segments that provide the biggest growth potential and identify which segments that are declining. Further, companies must decide which customer segments to focus on and how they can adjust their offerings to better serve these.

Companies are required to pay attention to changes in the needs and demands of their customers and adjust their offerings to accommodate the market. It is important to recognize the biggest unsatisfied customer needs and identify what customers really desire (Osterwalder & Pigneur, 2010, p.202). This also entails locating where, when, and why the demand is increasing or declining. Unsatisfied customers may decide to defect to a competitor which makes it increasingly important to keep the customers pleased. However, switching costs may make it undesirable for customers to switch business to competitors. Recognizing what binds customers to a company and its offer, and identifying what may prevent customers from transitioning is, therefore, crucial (Osterwalder & Pigneur, 2010, p.202). It may be hard for customers to find and purchase comparable offers, or the brand of the company may be so important for the customers that they are reluctant to switch to a competitor (Osterwalder & Pigneur, 2010, p.202). However, if customers can easily find and purchase similar products and services at a lower price from a competitor it can make switching very desirable. The last element of the market analysis is, therefore, recognizing the revenue attractiveness and pricing power the company possesses. It is critical to identify what parts of the offering customers are willing to pay for, and where the company can achieve the largest margins (Osterwalder & Pigneur, 2010, p.202).

Industry Forces

The second external force that influences business models is industry factors like suppliers, stakeholders, competitors, new entrants, and substitute products and services. To identify how the industry affects the organization, a competitive analysis can be conducted. Analyzing how organizations are influenced by different industry forces was first recognized by Michael E. Porter in 1979. Porter's five forces analysis examines the competitive landscape of an industry by identifying the threat of new entrants, threat of substitutes, bargaining power of buyers, bargaining power of suppliers, and rivalry among existing competitors (Porter, 1998). The purpose of a competitive analysis is to find opportunities for growth by identifying the strengths and weaknesses of competitors and recognize how they can benefit the organization. To initiate the analysis, organizations should identify their main competitors, both incumbents, and new entrants, and spot the dominant players in the industry. Organizations should identify and compare new entrant's and competitor's customer segments, value propositions, cost structure, revenue streams, and margins to identify opportunities for competitive advantage (Osterwalder

& Pigneur, 2010, p. 204). Moreover, it is crucial to recognize if new entrants compete with a similar business model or not.

A third element in analyzing how the industry influences the organization is identifying substitute products and services. To find how competitors can replace the organization's products and services one must recognize the potential substitutes for their offers, including substitutes from other markets and industries. Additionally, identifying the central and peripheral key players and new emerging players in the industry value chain is essential. By identifying these players, the organization can find which are most profitable and to what extent their business model depends on other actors. Lastly, the organization should identify other stakeholders that have the power to affect the business. Examples of typical stakeholders are investors, employees, the government, customers, and suppliers (Osterwalder & Pigneur, 2010, p. 204).

Key Trends

Companies should also be on the outlook of new trends in technological development, regulations, social and cultural settings, and changes in socioeconomics tendencies (Osterwalder & Pigneur, 2010, p.206). Recognizing new technology trends is crucial as they have the power to threaten an existing business model or to enable it to further improve and evolve (Osterwalder & Pigneur, 2010, p.206). Technology trends can occur both inside and outside the market and industry one operates in. Such trends can provide great opportunities if identified early, or disruptive threats if they go undetected. Other developments that can have great impacts on an organization's business models are regulations and regulatory trends. Laws and taxes are regulatory means that may affect industries differently and make some industries more profitable than others. Some regulations and taxes may also influence customer demand, forcing companies to make important changes to stay competitive (Osterwalder & Pigneur, 2010, p.206).

Furthermore, societal and cultural trends also have the power to influence the business model. Any shift in cultural or societal values may impact the way to do business and may either provide companies with great opportunities or be quite damaging and challenge their existence. Some trends may influence buyer behavior, making it important for organizations to recognize the development and find adequate ways to respond to the changes (Osterwalder & Pigneur, 2010, p.206). Lastly, the organization should detect the main socioeconomic trends that are

relevant to their business model. This may include key demographic trends of population-based factors like age, employment, education, income, birth, and death rates et cetera (Osterwalder & Pigneur, 2010, p.206). Socioeconomic trends may also include the spending patterns in a market, which eventually influence the supply and demand of an offering. The importance of the different trends may differ widely between customer segments and industries. While organizations should pay attention to all of the key trends mentioned above, they will most likely emphasize the development of some more than others. Nevertheless, organizations must recognize that their business model is influenced by several trends and that these must be addressed to stay competitive.

Macroeconomic Forces

The last external force that influences the generation of new business models is macroeconomic factors like global market conditions, capital markets, commodities and other resources, and economic infrastructure. Whether the global economy is in a prosperous or bust phase will highly affect companies and industries due to its influence on the GDP growth rate and the unemployment rate (Osterwalder & Pigneur, 2010, p.208). However, a single organization can do little to affect global market conditions making it crucial to find ways to continuously adapt and develop. Furthermore, access to capital is essential when innovating and changes in capital market conditions will likely influence an organization's ability to ensure access to finance. The availability of seed capital, venture capital, public funding, market capital, and credit may differ between regions and countries and may hamper or encourage innovation. Procuring funds may be costly, affecting the profitability of business model innovation if the need for additional investments is substantial.

Since business model innovation might require new commodities and resources, the organization should analyze the current prices and price trends for resources required for the specific model. First, the organization should illustrate the current status of markets for commodities and other vital resources to the business model, such as oil prices and labor costs. Second, the organization must find how they can obtain the resources vital to implement the business model, such as attracting prime talents. Lastly, they should find the cost of the commodities and resources, and where the prices are headed (Osterwalder & Pigneur, 2010, p. 208). The last element of the macroeconomic force analysis is the economic infrastructure in which the organization operates. First, the organization must find how beneficial the public

infrastructure is in their particular market. Second, factors as transportation, school quality, trade, and access to suppliers and customers must be examined. Third, the organization should find the level of individual and corporate taxes. Lastly, the organization must consider the quality of public services and their benefits for the business model innovation. By analyzing these aspects, the organization should achieve a comprehensive and beneficial examination of the macroeconomic forces that have the potential of influencing their business model (Osterwalder & Pigneur, 2010, p. 208).

Summary

Developing an understanding of the external factors influencing business is essential to stay competitive as organizations do not operate in isolated conditions. A business model environment framework has been introduced to illustrate how business model innovation can be influenced by market forces, industry forces, key trends, and macroeconomic forces. By conducting a market analysis companies can identify how they are affected by market segments, changes in needs and demands, market issues, switching costs, and revenue attractiveness. Furthermore, through a competitive analysis they can find how suppliers, stakeholders, competitors, new entrants, and substitute products and services influence their strategic position. Moreover, foresight through recognizing key trends in technological development, regulations, social and cultural settings, and socioeconomics tendencies can be crucial for success. Lastly, business model innovation can be affected by macroeconomic forces including global market conditions, capital markets, commodities and other resources, and economic infrastructure.

3.4 The Process of Business Model Innovation

Today's competitive market, characterized by rapid technological change and increased globalization, forces companies to fundamentally reassess their business models since innovation based exclusively on new products and services is no longer adequate to succeed and maintain a competitive advantage. Additionally, intense competition in the global market has reduced the life cycles of established business models (Taran et al., 2015, p.301). Most companies do not attain a secure competitive position solely based on their innovation activities like exclusive technology, intellectual property rights, and unique assets. Therefore, these

companies should risk innovating their business model radically to secure competitive advantage (Taran et al., 2015, p. 302). By incorporating business model innovation, organizations can achieve benefits that are challenging for competitors to imitate (Björkdahl & Holmén, 2013; Chesbrough, 2010; Taran et al., 2015). Osterwalder & Pigneur (2010) propose a framework on the process of business model design which comprises of five different phases: Mobilize, Understand, Design, Implement, and Manage. The model identifies and illustrates the different stages, processes, and activities when innovating a business model as illustrated in figure 7 below.

Mobilize	Understand	Design	Implement	Manage
Prepare for a successful business model design project	Research and analyze elements needed for the business model design effort	Generate and test viable business model options, and select the best	Implement the business model prototype in the field	Adapt and modify the business model in response to market reaction
Setting the stage	**Immersion**	**Inquiry**	**Execution**	**Evolution**

Figure 7. The process of business model innovation. Source: Osterwalder & Pigneur, 2010, p.249.

The model can be utilized to guide organizations' business model innovation process, by mapping the fundamental activities and potential challenges. In most organizations, the business model innovation process is usually cyclical or repetitive (Geissdoerfer et al., 2017), which means that the process will be repeated once completed to adapt or react to market changes. The process consists of sequential phases where the organization follows it step by step. However, the process is not linear as the phases are iterative, implying that the organization can repeat or exclude certain processes based on the organization's requirements and constraints. Particularly, the "Understand" and "Design" phases usually proceed in parallel. Furthermore, the initial planning of the project should cover the first three phases, while the implementation and management must be planned later in the process as they are dependent on the results of the previous activities (Osterwalder & Pigneur, 2010, p. 248).

Mobilize

Organizations initiate business model innovation projects to accomplish some set aspirations. The introducing phase in this process is to mobilize resources and frame the objectives of the project. This often includes establishing the main purpose, scope, and rationale of the business model innovation. The value proposition and first conceptual ideas are considered, and the organization tests the preliminary ideas and plans the project. A key activity is to assemble an appropriate team for the business model design project. Accordingly, one of the critical success factors is to include the appropriate people for the project. Osterwalder & Pigneur (2010, p. 251) recommends assembling a cross-functional team including people with extensive management and industry experience, new ideas, personal networks, and commitment to business model innovation. Overestimating the value of initial ideas is the key challenge of the "Mobilize" phase which can lead to a limited exploration of possibilities due to a closed mindset. Furthermore, top management support is crucial for a successful business model innovation process, except integrating top management from the start is a critical challenge to overcome (Foss & Saebi, 2016). This relates to the motivation levels of managers and employees, like ambition or innovativeness, which is another vital challenge in the first process of designing the business model (Geissdoerfer et al., 2017). Lastly, organizations should establish the Business Model Canvas to create a universal understanding of the design effort, which contributes to creating structure, improving communication, and presenting ideas more effectively (Osterwalder & Pigneur, 2010, pp. 250-251).

Understand

The second phase comprises developing a comprehensive understanding of the context in which the business model will progress. This phase usually has unclear boundaries from research and design which is important to consider. Key activities involve scanning the environment, study potential customers, interview experts, sketching out competitor's business models, collecting ideas, and demonstrate progress (Osterwalder & Pigneur, 2010, p.252). It is crucial to develop knowledge of the potential customers, and this activity needs careful attention. However, in technology-focused projects, this activity is often not considered. A critical success factor in this phase is to look beyond the traditional boundaries defining the target markets, and question established business model patterns and industry assumptions. During this process, organizations should pursue feedback from a variety of sources, including customers, and

search beyond the existing client base. The first key challenge in the "Understand" phase is to over-research when scanning the environment, which is vital to make the team aware of to avoid over-researching. The second key challenge is conducting biased research due to recommitment to a particular business idea. Accordingly, it is especially challenging to question the current business model, as it often is a result of a successful past that is deeply enclosed in the organizational culture (Osterwalder & Pigneur, 2010, pp. 252-253).

Design

The objective of the "Design" phase is to select the best business model by generating and testing viable business model options. Key activities involve brainstorming, prototyping, testing, and selecting (Osterwalder & Pigneur, 2010, p.254). Critical success factors comprise expansive thinking beyond the current business model, co-creation with people across the organization, and exploring multiple ideas. Ideas from the previous phase must be transformed into business model prototypes that can be explored and tested. Prototyping activities during the design phase can lead to new ideas that require further research or even returning to the "Understand" phase. However, a critical challenge during this phase is to generate new models and maintain them. The two key challenges are described as suppressing bold ideas or falling in love with ideas too quickly (Osterwalder & Pigneur, 2010, p.254). Before selecting the business model to implement, team members should assess several options by experimenting with different partnership models, explore the value of several distribution channels, and identify alternative revenue streams. To avoid the suppression of bold ideas, the organization can draw a risk/reward profile of each model option that should address the uncertainties. Since increased boldness draws a higher level of uncertainty, clearly assessed and defined uncertainties can lead to a better prediction of the performance of the business model launched in full-scale. Accordingly, the organization should avoid the short-term focus on ideas with large first-year revenue potential to secure inclusion of future growth opportunities since few business models can accomplish such revenues the first year (Osterwalder & Pigneur, 2010, pp. 254-255).

Implement

When the organization has finalized the business model design, they should convert this into an implementation design. Activities in the "Implement" phase relate to communication and execution by defining milestones and related projects, organize legal structures, and prepare a specific budget and project roadmap. Aligning the old and new business model, quickly adapting the business model, and best practice project management is described as critical success factors (Osterwalder & Pigneur, 2010, p.256). The success of the new business model can significantly increase by proactively managing roadblocks, which means including people from several areas in the organization during the three previous phases. By including this cross-functional participation, the organization becomes able to address concerns about the new business model before completing the roadmap for the implementation. Also, Osterwalder & Pigneur (2010, p.257) suggests utilizing a multi-channel internal communication campaign announcing the new business model, which can be beneficial as it faces the "fear of the new" from the corporate culture. Moreover, managing risk and uncertainty is a challenge that needs particular consideration, which involves monitoring how risk and reward expectations influence the actual results. Thereby, organizations should develop mechanisms that give them the ability to modify the business model to market responses like feedback and complaints. Lastly, the weak or fading momentum is characterized as the key challenge of the implementation phase, where the speed of the process is too slow to succeed (Osterwalder & Pigneur, 2010, pp. 256).

Manage

Since business model innovation is often a repetitive process, the activities continue beyond implementation. Activities in the "Manage" phase involve continuous evaluation, managing synergies or conflicts between models, aligning the business model throughout the organization, and scanning the environment to find how the business model can be influenced over the long term (Osterwalder & Pigneur, 2010, p. 258). Osterwalder & Pigneur (2010, p. 259) suggest assigning the responsibility of long-term evaluation to a specific person or team in the organization, as well as assembling cross-functional workshops regularly to assess the new business model. This can benefit the organization by identifying if the new business model needs adjustments or a completely new process. Critical success factors in the "Manage" phase

are having a long-term perspective, proactiveness to market evolutions, and correct governance of the business model (Osterwalder & Pigneur, 2010, pp. 258-259)

Due to a rapidly changing market, proactive response to market evolutions is increasingly vital to succeed, where organizations should consider replacing the current cash-generating business model with growth models to meet tomorrow's marketplace demand. Additionally, Osterwalder & Pigneur (2010, p.259) suggests establishing a business model governance authority with assigned responsibility to track the evolution of the organization's business models, engage stakeholders, coordinate business models, and launch innovation or redesign projects – which would benefit managing business models across the organization. Another key responsibility would be to exploit synergies, avoid and manage conflicts by aligning business models. It is suggested to create a Canvas document detailing all business models in the organization to achieve better alignment (Osterwalder & Pigneur, 2010, p.259). By preserving the beginner's mindset and keeping a continuous assessment of the business model, organizations can avoid the danger of becoming victims of their own success and failing to adapt (Osterwalder & Pigneur, 2010, pp. 258-259)

Summary

Organizations can innovate their business model by following the different stages in the process framework presented. Thus, figure 7 can be utilized as a tool to recognize important activities and address the potential challenge that may arise. First, the mobilization phase includes the preparation for the new design, where organizations form the purpose, objectives, and scope of the business model. The second phase involves developing an understanding of the context in which the business model will evolve, including analyzing the environment, potential customers, competitors, et cetera. Third, the organization must generate and test viable options to determine the most appropriate business model. The fourth phase involves communication and execution by defining milestones and related projects, organize legal structures, and prepare a specific budget and project roadmap. Lastly, business model innovation is a repetitive process where the activities will continue after the implementation. Hence, activities in the last phase comprise evaluation, managing synergies or conflicts between models, aligning the business model throughout the organization, and identifying how the business model can be influenced over the long term (Osterwalder & Pigneur, 2010, p. 258).

3.5 Barriers in Committing to Business Model Innovation

While business model innovation is often prompted as the new way of achieving competitive advantage, it is a complex process that requires several factors to succeed including organizational support and successful implementation (Foss & Saebi, 2016). Research shows that most businesses are not able to initiate nor achieve business model innovation due to several challenges and barriers (Björkdahl & Holmén, 2013; Chesbrough, 2010; Foss & Saebi, 2016). Foss and Saebi (2016) argue that the main barriers pose five key challenges that organizations must overcome to succeed in committing to business model innovation. The following section presents a framework developed as an extension of Foss and Saebi's (2016) model on barriers of business model innovation with two additional challenges marked in grey color as illustrated in figure 8 below. The new framework covers the current literature base on barriers of business model innovation and the key challenges (Björkdahl & Holmén, 2013; Chesbrough, 2010; Foss & Saebi, 2015, 2016; Taran et al., 2015).

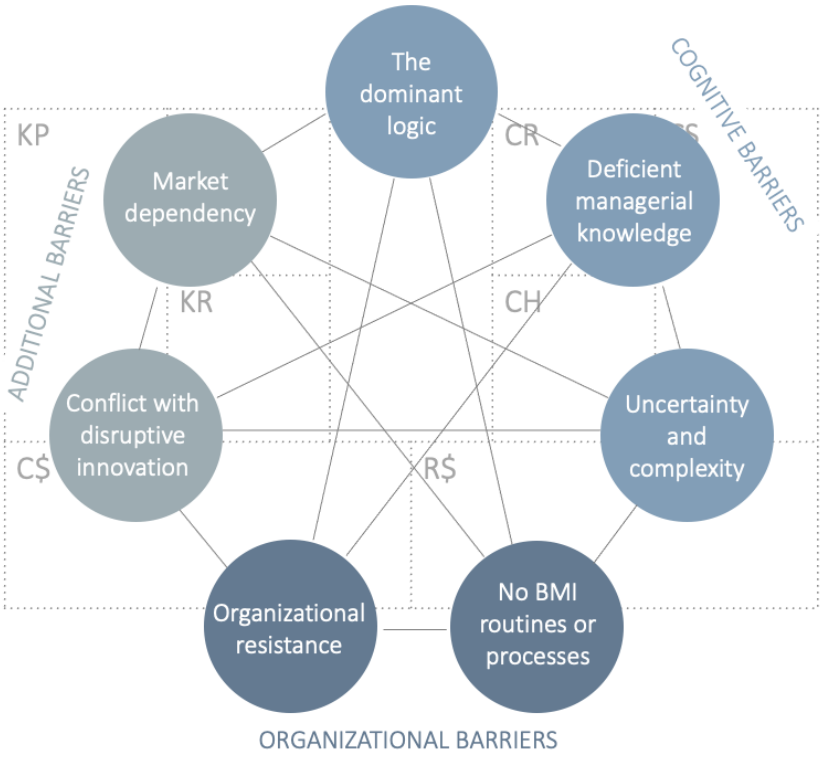

Figure 8. Challenges of business model innovation

The first category is of cognitive character and is disclosed as a human inability to recognize new opportunities. The cognitive barrier relates to managers who are unaware of their current business model or reluctant to change the current conditions, which leads them to miss opportunities to improve their current business model. The second category of challenges relates to organizational barriers like organizational structures and processes. Accordingly,

resources, incentives, and autonomy have a strong connection to the motivation and willingness to experiment with new business models. An example of organizational barriers is managers interested in changing the current business model but lack the required knowledge and organizational support to initiate and manage the process (Foss & Saebi, 2016). Lastly, we added two additional barriers found in other literature involving conflicts with disruptive innovation and market dependency.

The dominant logic

According to Foss and Saebi (2016), the dominant logic is the first cognitive barrier that organizations must overcome to achieve business model innovation. The dominant logic refers to the "mental maps" organizations have developed through experience from the core business. However, the dominant logic can limit the management's capability to manage a diversified organization. As illustrated in figure 9 below, managers' previous experiences determine the repertoire of tools they utilize to identify, describe, and make decisions (Prahalad & Bettis, 2000, p. 491). Hence, information is usually interpreted, processed, and responded to in the same manner over years. Managers tend to use this approach as it reduces costs from handling new information while ensuring predictability and accountability for the organization's stakeholders. This means that managers tend to reject information that challenges the dominant logic, which is the core rigidity of the organizations. Foss and Saebi (2016) describe this challenge as the "bias of the current business model", where managers cannot identify opportunities outside their dominant logic of business.

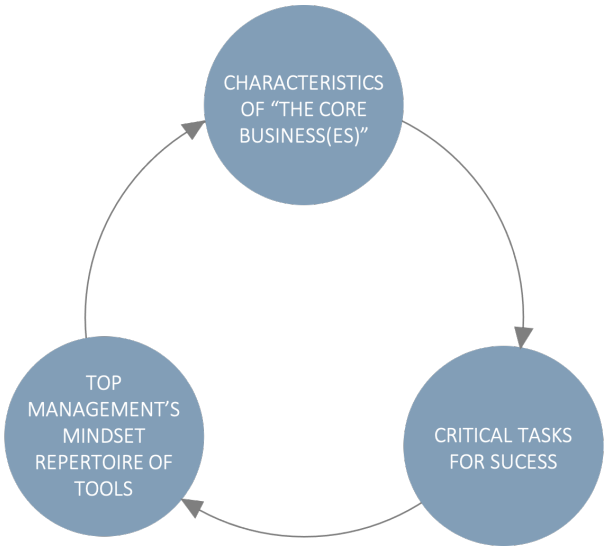

Figure 9. The dominant logic. Source: Prahalad & Bettis, 2000, p. 491.

The challenges of dominant logic can be related to the issues of single-loop learning which originates from a theory on organizational learning developed by Argyris et al. (1978) as illustrated in figure 10 below. Organizations often modify their actions in reference to the difference between the expected outcomes and the actual results, which is described as single-loop learning. The main challenge of single-loop learning is that the organization only fix the symptom while the root causes remain, which is problematic since new problems will always emerge. Most organizations practice single-loop learning excellent but have great difficulties in double-loop learning. Instead of solely fixing the current symptoms, the organization should find the root causes by challenging the underlying assumptions, which relate to the dominant logic of the company. Additionally, organizations tend to assume that problems and solutions are close to each other in time and space which is generally not true. This issue leads the organization to make minor modifications in particular practices or methods which is based on what the organization has experienced to not work in the past (Argyris & Schon, 1978).

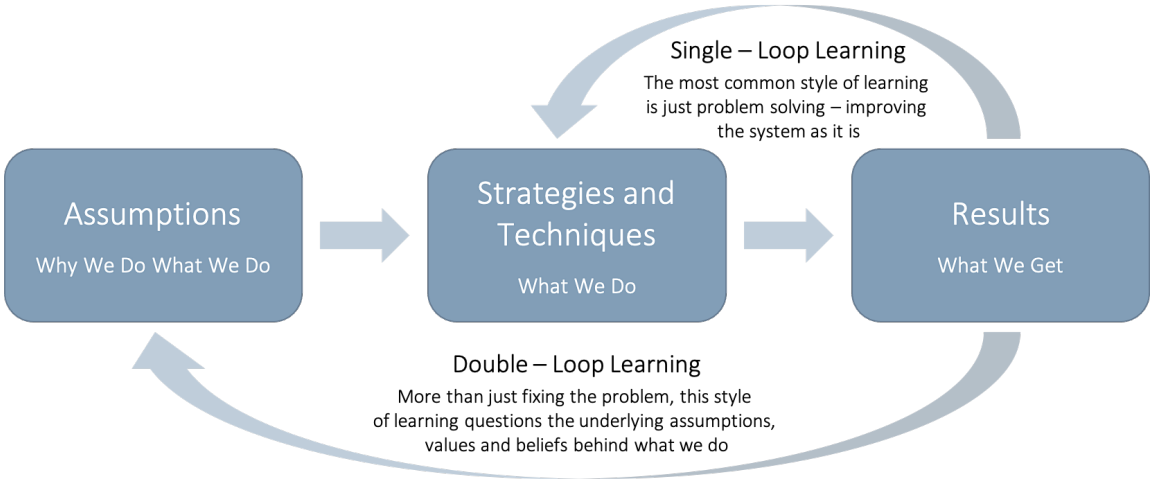

Figure 10. Single- and double- loop learning. Source: Argyris et al., 1978

Instead of solely changing actions to fix or avoid earlier mistakes, organizations can challenge and change the underlying assumptions and causes behind the problematic situation, which is described as the double-loop learning process. There can be several underlying causes in the organization that is often deeply embedded in the core business, such as policies, norms, methods, motives, and practices. When challenging the fundamental assumptions behind actions and behavior, organizations can achieve organizational learning by deepening the understanding of their patterns and achieve improved decision-making.

Deficient Managerial Knowledge

Although business model innovation has received increased attention, the majority of companies never question their business models (Taran et al., 2015, p.301). This can be explained by unclear definitions concerning what constitutes business model innovation and how it differentiates from product innovation or an upgrade of an old business model (Björkdahl & Holmén, 2013, p. 219). Furthermore, deficient managerial knowledge occurs when information that is routed into, or filtered out of, corporate decision processes is influenced by the success of prevailing business models. This may benefit companies when operating in uncertain markets including chaotic R&D activities. However, it can also lead companies to lose valuable usage of their technology in situations where it does not fit noticeably with their current business model (Chesbrough, 2010, p. 358).

Another barrier occurs when the management is unable or unwilling to recognize the company's need for change. This can lead to a problematic situation where managers do not detect the need for change in time and fail to exploit great opportunities (Foss & Saebi, 2015, p. 159). Managers lacking the ability to understand the organization's current business model and its underlying assumptions are the second cognitive barrier from N. Foss and Saebi's (2016) model. Innovative business model ideas are usually not evaluated or implemented efficiently due to managers lacking knowledge on how to evaluate the current business model, and how to experiment with alternatives. By implementing managerial training and developing suitable analytical tools, the organization's ability to initiate, manage, and implement the business model innovation process can be strengthened (Foss & Saebi, 2016).

Uncertainty and complexity of business models

Foss & Saebi (2016) argue that the complexity and uncertainty of the business model innovation process pose as a third cognitive barrier. The process of changing the business model is usually perceived as risky as it is difficult to predict the outcome or put probabilities on outcomes. Radically changing the organization's business model can be perceived as a major step into the unknown. Additionally, it is a challenging task for managers to assess the current business model and evaluate new ideas while handling everyday managerial tasks. Since managers often work under short-term time pressures, the problem is aggravated by impeding managers to think beyond profit margins. Due to the complexity of business models and the uncertainty of initiating the business model innovation process, the existing business model stays

unquestioned and never becomes challenged on its competitive standpoint or new markets (Foss & Saebi, 2016).

No business model innovation processes, routines, or resources

Sufficient routines and knowledge on how to organize the process are vital to succeed with changing the business model. Due to low consideration for business model innovation, there are often no prepared routines or operational processes since companies are often reluctant to allocate the required resources (Björkdahl & Holmén, 2013, p. 221). Successful business model innovation requires collaborative efforts from the company's management team (Foss & Saebi, 2015, p. 13). However, in contrast to innovation related to technological development, there is usually no assigned person or department in charge of business model innovation, which is a challenge for most companies. The first organizational barrier in Foss and Saebi's (2016) model describes this challenge as the leadership gap, where no individual has the effective authorities or capabilities to change the business model, especially when the changes are radical or connected.

Complex business model innovation often involves several functions of the organization, requiring considerable adjustments and integration. Therefore, a designated management team or a significantly powerful top leader is beneficial to avoid leaders who can counteract the process if they disagree with the proposed changes. Accordingly, the majority of companies do not undertake business model experimentation (Björkdahl & Holmén, 2013), due to a lack of routines for business model innovation. Experimentation usually involves uncertain performance prospects (Foss & Saebi, 2015, p. 12), which can further explain why most companies do not initiate changing their business model. The challenge is to find ways where companies can test new business models in effective ways without taking too much risk (Björkdahl & Holmén, 2013).

Organizational resistance and lack of motivation

Counteract and resistance from the corporate culture constitutes the second organizational barrier from Foss and Saebi's (2016) model. Changing the current business model can intimidate the established power positions, entitlements, privileges, and endowments. Since the process of business model innovation can change the roles, functions, and processes; employees

may experience uncertainty or mistrust. These experiences have a significant impact on the corporate culture resulting in demotivation or conflicts which can hinder the business model innovation process (Foss & Saebi, 2016). Additionally, a study by Björkdahl & Holmén (2013) found that organizations that appoint the responsibility for the business model innovation process often choose the chief technology officer. However, individuals in this position often lack the motivation and ability required to innovate the company's business model, which can highly affect the success of the process (Björkdahl & Holmén, 2013).

The conflict between the existing business model and disruptive innovation

Another crucial barrier that keeps companies from initiating business model innovation is the conflict between the new business model, and the current business model and assets. Key aspects of business model innovation often conflict with the traditional configurations of the firm's assets, such as efficiency and novelty. Managers often tend to resist experimenting with these traditional configurations as it may threaten the ongoing value creation of the company. Therefore, a potential barrier to business model innovation may be caused by underlying asset configurations (Chesbrough, 2010, p. 358). The conflict between the current business model established for the existing technology and the new business model, which may be required to exploit the disruptive technology, is a challenge for several companies. Accordingly, the gross margins are significantly lower for the disruptive technology compared to the established technology. Also, the customer segments and the distribution channels tend to differ from the disruptive technology. The established technology is often immensely favored since the firm allocates its resources to the most profitable technologies. Thus, disruptive technologies usually end up with little to no resources (Chesbrough, 2010, p. 358).

Market Dependency

Managers usually favor changes they see implemented by other companies in the same industry, and the business model can be viewed as a "part of the industry recipe in which managers operate and respond to a shared set of ideas" (Björkdahl & Holmén, 2013, p. 221). This barrier can be described as a market dependency, where companies do not initiate business model innovation because they are dependent on the changes being implemented by other actors in the industry first. Additionally, as competitiveness is affected by frequently changing customer

needs, it is crucial to detect and respond rapidly to changes in customer preferences. When operating in highly competitive markets, it can be challenging for companies to discover and anticipate new market demands, which can impede business model adaption and innovation (Foss & Saebi, 2015, p. 158). Thus, developing organizational agility and responding to customer needs are crucial factors for successful business model innovation. Organizational agility comprises of two complementary dimensions – the first dimension involves sensing and responding capabilities, manifested in the organization's ability to scan, learn, and interpret market and competitors' activities; while the second dimension involves the ability to mobilize the organization's existing resources and processes to quickly respond to the market (Foss & Saebi, 2015, p. 158).

Summary

There are several barriers that organizations may face in the process of changing their business model. The first cognitive barrier is described as the dominant logic where managers often tend to reject information that challenges the traditional way of thinking. Second, deficient managerial knowledge refers to managers lacking the ability to understand, evaluate, and experiment with the organization's business model. Third, the uncertainty and complexity of changing the business model can lead the current business model to never be challenged on its competitive position or within new markets. Furthermore, organizational barriers describe the challenges of lacking business model innovation routines or processes, as well as how organizational resistance and lack of motivation can hinder the process. Moreover, the first additional barrier explains how the new business model required to exploit the disruptive technology may conflict with the organization's existing business model. Lastly, market dependency relates to how organizations are dependent on changes being implemented by other actors in the industry before they consider changing their business model.

4. Methodology

The following chapter presents and justifies the applied methodical approach by describing each element of our research strategy. Since there is currently little research on business model innovation in the Norwegian oil and gas industry as clarified in section 1.2, we utilize a combination of primary and secondary data to reach our objectives. Hence, we employed both quantitative and qualitative methods of data analysis to answer our research question: *How can business model innovation contribute to a restructuring of the Norwegian oil and gas industry to comply with Norway's climate ambitions for 2030 and 2050?* This chapter is structured by four main sections: 1) research strategy, 2) secondary quantitative data, 3) primary qualitative data, and 4) quality of research design. We describe the specific research strategy in the first section, justifying our utilization of data collection, case study, and method design. In the second section, we explain how we handled and analyzed the secondary quantitative data retrieved from Menon Economics. Further, in section three, we elaborate on how we collected the primary qualitative data through semi-structured interviews with oil and gas companies and relevant cluster networks. Lastly, section four comprises a review of the quality of our research design including an assessment of the study's reliability, generalizability, and validity.

4.1 Research Strategy

The research strategy is particularly chosen to ensure methodological coherence throughout the research project as each element in our research design is based on the research questions and objectives of the thesis as particularly illustrated in Appendix 1. The thesis is conducted with a mixed methods research design integrating both quantitative and qualitative data collection techniques and analytical procedures. The data collection and analysis is conducted with a double-phase research design that leads to a sequential exploratory research design strategy, where qualitative data is followed by quantitative data to expand and elaborate on the initial set of findings (Saunders et al., 2019, p.182). We have collected qualitative data through semi-structured interviews with companies in the oil and gas industry and relevant cluster networks. Additionally, to provide an overview of the current industry status, we utilize published secondary data from a study by Menon Economics on the restructuring of the Norwegian oil and gas industry. We also utilize secondary data from the Energy Information Administration (EIA) on the historical development of the oil price. When considering the nature of the research objectives, we give the qualitative methodology the dominant role as we are investigating

highly qualitative questions. Subsequently, the quantitative methodology plays more of a supporting role in the analysis by allowing searches for contexts and deviations with the qualitative data.

The applied research strategy is a case study on the Norwegian oil and gas industry as it is an in-depth inquiry into a phenomenon (e.g., a process of change such as industrial restructuring) within its real-life setting (Yin, 2001). We decided on using case study research as we found that the boundaries between the phenomenon being studied (business model innovation), and the context within which it is being studied (the Norwegian oil and gas industry) is not apparent. Thus, understanding context is vital in case study research (Yin, 2001). By utilizing the case study strategy we intend to generate insights from intensive and in-depth research into the research topic, leading to valuable, empirical descriptions, and development of the theory (Saunders et al., 2019, p.197) The strategy of the case study can be described as an emergent case study where we chose a specific environment, the Norwegian oil and gas industry, to conduct the research while allowing the focus of the research to emerge through our engagement and with the relevant literature (Saunders et al., 2019, p.198).

There are several reasons for our decision on utilizing the mixed methods design that we will further explain by emphasizing six arguments from Saunders et al. (2019). First, by using a mixed method we can achieve complementarity in which meanings and findings can be enhanced, confirmed, elaborated, or linked in our analysis. Second, we apply results from the qualitative method to help interpret relationships between variables emerging from the quantitative results, as well as the other way around. Third, the mixed methods contribute to establishing the generalizability and importance of our study as we desire to write a prevailing thesis for the Norwegian oil and gas industry, which helps us prove credibility and producing comprehensive knowledge. Fourth, since we are utilizing different data from both methods, it facilitates a greater diversity as we get quantified information from the secondary data, as well as qualified perspectives from the primary data. Fifth, the qualitative method focuses primarily on micro aspects such as competence and experiences, while the quantitative method focuses mainly on macro aspects such as the oil price and investments. Thus, the method provides simultaneous focus on several attributes. Lastly, the utilization of a single method would make it impossible to ascertain the nature of the issue that findings can be affected by the specific method. Hence, we can achieve greater confidence in our conclusions as we eliminate this impact (Saunders et al., 2019, p.185).

4.2 Secondary Quantitative Data

To identify how business model innovation can contribute to a restructuring of the Norwegian oil and gas industry, we have applied a quantitative empirical approach utilizing secondary data from Menon Economics. Secondary data is data that has already been collected through primary sources by someone else in the past and made available for others to use, which can result in unforeseen discoveries and new insights (Saunders et al., 2019, p.352). However, secondary data may be difficult or costly to access, aggregations and definitions may be unsuitable, real control over data quality may be lacking, and the initial purpose of the data may affect how data are presented (Saunders et al., 2019, pp.353-354). Nonetheless, one of the main advantages of using secondary data in this research project is the enormous savings in resources, as it is generally less expensive and time-consuming than collecting all primary data ourselves. The data have originally been collected for another purpose and the use of secondary data allows for further analysis of already obtained data "to provide additional or different knowledge, interpretations or conclusions" (Saunders et al., 2019, p.338).

Menon Economics

Menon Economics is a consulting company that analyzes financial issues and provides advice to companies and authorities. Menon Economics is a well-known organization and is considered a reliable and trustworthy source of data. Accordingly, Menon Economics is clearly acknowledged to be the source for this secondary data, fulfilling expectations regarding the responsibility concerning the analysis of data and reporting of findings (Saunders et al., 2019, p.258). Menon Economics' analyzes form the knowledge base for public investments or priorities, and they have a framework agreement with the Norwegian Ministry of Finance within the quality assurance of public investments (Menon Economics, 2021). In 2020, they did a study on the restructuring of the Norwegian oil and gas industry on behalf of Norwegian Oil and Gas, Innovation Norway, GCE Node, GCE Ocean Technology, and NCE Energy Technology. The study has identified some key aspects of the current restructuring of the Norwegian oil and gas industry that will be beneficial for reaching our research objectives. Menon Economics' (2020) analysis includes:

1. To what extent the decline in oil prices from 2014 has led the oil and gas supplier industry to transition to other industries.
2. The companies that have been most prosperous after the oil crisis in 2014.

3. In which markets the supplier industry expect growth in the next 3-5 years, and what significance the competence from the oil and gas industry has for growth opportunities in new industries.
4. The role that the oil and gas industry will play in the low-emission society of the future.
5. How the Covid 19 pandemic is expected to influence companies' turnover in 2020 and 2023.

Sample

For many years, Menon Economics (2021) has developed a database that covers accounting and activity information for all companies in Norway and Sweden. The database covers almost half a million companies and contains detailed information on profitability, growth, debt, exports, employment, and ownership (Menon Economics, 2021). The strength of Menon's accounting database compared to similar databases established by other organizations, including Norce, Rystad, and EY, is that it is complete, meaning that all companies in Norway are categorized according to which value chains they deliver to (Menon Economics, 2020, p.83). Menon Economics is thus in a unique position to perform analyzes of competition, profitability, growth, and financial structuring in companies, groups, and industries. Their oil and gas population is divided into the following six sub-groups of companies (Menon Economics, 2020, p.83):

- ***Operators***: companies looking for and extracting oil and gas, including SDFI.
- ***Drilling and well***: products and services directly related to exploration and production activities like seismic, reservoir, drilling, well service, and equipment deliveries.
- ***Maritime business***: offshore-related parts of the maritime industry including offshore shipping companies, rig companies, equipment suppliers, and shipyards.
- ***Platforms and onshore facilities***: design, construction, upgrading, and maintenance of on- and offshore production facilities, as well as associated equipment deliveries.
- ***Subsea production plant***: design, construction, upgrading, and maintenance of subsea production plant, as well as associated equipment deliveries.
- ***Support function***: subcontractors to the above, including general equipment suppliers, bases/logistics, and support services.

To identify how the restructuring of the oil and gas industry has developed in recent years, Menon Economics distributed a survey among companies in the industry. They collected

quantitative primary data from 112 respondents, covering 60 percent of the industry if measured in turnover (Menon Economics, 2020, p.87). Additionally, they conducted nine interviews with a selection of relevant companies from the industry, hence, also using qualitative methods of collecting data.

Data Collection

Menon Economics (2020) utilized both quantitative and qualitative methods of collecting primary data to ensure representativeness and quality of their research. To supplement the data, they already possess from previous surveys and analysis of annual and quarterly reporting, they sent out a survey to companies in the industry. While we do not have access to the specific survey, Menon Economics has accounted for the content in the survey through their final report in 2020. The purpose of the survey was to identify some key issues related to value chains including how the share of turnover in 2014, 2016, 2018, and 2020 was distributed in the following markets: oil and gas, fisheries and aquaculture, maritime industry, clean energy and other markets (Menon Economics, 2020, p.87). Furthermore, the survey aimed to detect which markets the companies predict expanding within the next three years. Lastly, the survey intended to identify how the proportion of employment can be linked to the various industries, issues related to investing in environmentally friendly technology, and how profitability is within the various segments (Menon Economics, 2020, p.87). Their findings were then linked to their accounting data, as well as information from annual reports, to show the development in the restructuring that has taken place in the industry in recent years.

Furthermore, Menon Economics conducted nine interviews with a selection of companies in the oil and gas industry. The interviews were conducted to ensure representativeness along all relevant dimensions, including the size and sub-segment of the industry (Menon Economics, 2020, p.88). While we do not have access to any interview guide or transcripts from the interviews, Menon Economics argues that the interviews were exploratory in nature. While no personal information of their interviewees has been revealed, Menon Economics state that their interviewees mainly were either the CEO or CFO of the respective companies (Menon Economics, 2020, p.88).

4.3 Primary Qualitative Data

In addition to the secondary quantitative data, we have applied a qualitative empirical approach by collecting primary data to further explore our research topic by obtaining more detailed data to investigate our research objective (Saunders et al., 2019, p.489). The qualitative research includes semi-structured interviews which are utilized to test theoretical propositions. The semi-structured interviews have several advantages that strengthen our exploratory study, and collecting qualitative data through interviews allows us to obtain rich and highly detailed data including insights specific to the industry (Saunders et al., 2019, p.444). First, it provides us with the convenience to probe responses where interviewees can explain and build on their previous answers. Probing interviewees' meanings adds depth to the data, which can lead our discussion into areas we had not initially considered. However, these meanings are significant for our research which will contribute to addressing our research objectives and answering our research questions (Saunders et al., 2019, p.445).

Sample

Due to time and resource constraints, we decided to collect data from a representative sample from the oil and gas industry as opposed to achieving consensus by collecting data from the entire population (Saunders et al., 2019, p.294). Moreover, using a sample can provide higher overall accuracy than a census and allows us to collect more detailed data of higher quality (Saunders et al., 2019, p.295). To reach our research objectives, we decided to undertake an in-depth study that focuses on a small number of cases to gain a particular insight. We used a non-probability sampling technique, more specifically purposive sampling, where we selected cases that would best enable us to answer our research question (Saunders et al., 2019, p.321). Our sample consists of organizations that are considered to give valuable information and insight into the researched objectives.

For our sample to be representative of the Norwegian oil and gas industry, it was important to collect data that represent different parts of the industry. While the industry can be divided into multiple sub-groups we decided to focus on oil and gas producers and suppliers. The population, hence, consists of the 37 oil and gas exploration- and production companies, and over 1100 companies from the oil and gas supplier industry. As our research objective concerns restructuring of the Norwegian oil and gas industry, we wanted our sample to constitute companies that, to various degrees, have or consider transitioning to renewable energy

industries. The target population can, therefore, be described as companies in the Norwegian oil and gas industry with a focus on sustainable development and industrial restructuring.

Norwegian Innovation Clusters is a state-funded cluster program that aims to contribute to value creation through sustainable innovation. Involvement in cluster networks with a focus on innovation and sustainable development is, thus, considered to be an indication of companies' willingness to change. There are currently a total of 44 innovation clusters in Innovation Norway's cluster program (Innovasjon Norge, 2021). We valued 8 of these cluster networks as particularly representative for oil and gas, offshore wind, hydrogen, and CCS-related industries. Due to the size of the oil and gas supplier industry, and how well-presented this part of the industry is in the cluster networks, we decided that the clusters were representative of this part of the industry. Furthermore, we identified which of the 37 oil and gas producers were part of one or several of these 8 cluster networks. As we wanted the clusters to also be familiar with the exploration and production part of the industry, we removed the two cluster networks with the least involvement from oil and gas producers. While still ensuring that both the oil and gas industry and the renewable energy industries were represented. Furthermore, we eliminated the oil and gas producing companies that were only involved in the cluster with a focus on the oil and gas industry. This resulted in a sample of 12 organizations: Innovation Norway, 6 cluster networks, and 5 oil and gas companies.

While the objective was for our sample to consist of 12 organizations, we were only able to collect data from 10 of these. However, we were still able to reach data saturation since the last couple of interviews provided little, if any, new information (Saunders et al., 2019, p.315). The sample size is, thus, considered sufficient for our research objective. The names and positions of our interviewees will not be revealed due to ethical considerations, but the sample consists of individuals in the different organizations that are considered to have valuable knowledge and expertise regarding the research topic. The companies and clusters constituting our sample are illustrated in figure 11 below. Due to Aker consisting of multiple subsidiaries we decided to include Aker Solutions in our sample, as opposed to Aker BP, as they are considered to have a significant focus on transitioning into new industries. For more information regarding the different organizations' main activities and overall strategy, see Appendix 2.

	Innovation	Oil&Gas	Offshore Wind	Hydrogen	CCS
Companies					
Aker		*Aker BP*	*Aker Offshore Wind*	*Aker Solutions*	*Aker Solutions*
Equinor		•	•	•	•
Total		•			
Vår Energi		•	*Vårgrønn*		
Innovation Norway	•	•	•	•	•
Clusters					
Arena Ocean Hyway Cluster	•			•	
GCE Node	•	•	•	•	
NCE iKuben	•	•			
Norwegian Energy Solutions	•	•	•		•
Norwegian Offshore Wind Clusters	•		•		

Figure 11. Interview sample and their field of expertise.

Data Collection

To reach the research objectives we collected primary data through semi-structured interviews. According to Saunders et al. (2019, p.445), a semi-structured interview is the most appropriate approach in the three following circumstances: 1) a large number of questions, 2) complex or open-ended questions, and 3) the order and the logic of questioning may need to be varied. This is highly related to our research project as we planned a total of 18 questions, where some of them can be perceived as complex, as well as the order of questioning was occasionally changed. In the semi-structured interviews, we started with a predetermined list of themes including related questions to guide each interview. Further, to achieve semi-structured interviews, we formulated the question to open for discussions by using terms such as "what, when, why, and how". We also allowed our participants to probe their responses where it was necessary to explain or build on their previous answers (Saunders et al., 2019, p.444). This can lead our discussion into new areas we initially did not consider but which are important for our research.

Moreover, all interviews were conducted within a two-week time frame to keep the data fresh in mind. The interviews can be defined as synchronous electronic interviews (Saunders et al.,

2019, p.476), as they were conducted in real-time using the communication platform Teams due to the Covid-19 pandemic restrictions. As we were both present during the interviews, we had one being responsible for collecting data while the other managed the interview. The data was collected through personal notes during the interviews and was organized in relation to the different parts and questions in the interview guide. The elements of the interview guide are derived from the existing theory presented in the theoretical framework. The interview guide (Appendix 4) consists of five main components, each containing three to five questions regarding the particular topic: 1) background information, 2) business model innovation, 3) business model environment, 4) the process of change, and 5) EU's taxonomy, oil price, and Covid-19. In this matter, the theoretical framework provides a focus for the research and boundaries to its scope by ensuring appropriate delimitations (Saunders et al., 2019, p.181).

To attain coherence between our research objective and collection of data, the structure of the interview guide was aligned with our sub-questions. Accordingly, the first part of our interviews aimed to identify the current situation in the industry and relates to sub-question 1: *How does the need for change differ from the willingness to change within the industry?* We collected background information through introductory questions to map which industries the organizations were currently operating in, and how they work and focus on different types of innovation. The second part of the interview concerns business models and relates to sub-question 2: *Which parts of the business model should be emphasized the most in the restructuring?* We aimed to identify when and how the organizations make changes to certain aspects of their business model including their customers, offerings, infrastructure, and finance.

The third part aimed to map the oil and gas industry landscape and relates to sub-question 3: *What are external challenges oil and gas companies face that may influence business model innovation?* We wanted to find if organizations realize how they are influenced by different environmental factors including market forces, industry forces, key trends, and macroeconomic forces. The fourth part of the interview was constructed to identify different challenges organizations face in changing industrial trajectories and relates to sub-question 4: *What are the internal barriers oil and gas companies face in the process of change?* The objective was to find what routines organizations currently have to evaluate their business model, what opportunities and challenges this can bring, as well as their dependence on their competitors' development. Lastly, we finished the interviews by collecting additional data concerning three specific external factors where we wanted to identify how the industry is affected by the EU's taxonomy, changes in the oil price, and the Covid-19 pandemic. These aspects were found

particularly interesting to investigate as they contributed to compare findings from Menon Economics' (2020) study.

Data Analysis

Due to our exploratory research strategy, we conducted an inductive thematic analysis of the collected qualitative data. We conducted a thematic analysis as it is useful in "capturing the complexities of meaning within a textual data set" (Guest, MacQueen, & Namey, 2014, p.10). This allows for analytical categories to be derived from the data itself as opposed to being predetermined. Thematic analysis entails identifying and describing both implicit and explicit themes and ideas in the data to construct meaningful patterns from the data material. As this is an exploratory study we initially examined and reexamined the data, looking for key words, trends, and themes in the data that would help outline the analysis prior to the analysis taking place (Guest et al., 2014).

To ensure coherence with our research objective we fragmented and structured the collected data into analytical categories where each was linked to one of our four sub-questions. We organized and coded the material and categorized and grouped aspects with similarities. Through an inductive analysis, we looked for aspects related to the current situation regarding the restructuring of the industry, current business models, external factors influencing the industry, and potential challenges in the process of change. Emphasis was put on statements, examples, and text on how business model innovation can contribute to a restructuring of the Norwegian oil and gas industry. On this basis, four themes were constructed:

1. Industry Status
2. Business Models
3. The Oil and Gas Industry Landscape
4. Changing Industrial Trajectories

While most of the interviews were conducted in Norwegian to eliminate any language barriers preventing the respondents from giving elaborate answers, the findings will be presented in English. This necessitated translating the data from Norwegian to English which were done before the analysis. Thus, the data set could be analyzed as the complete qualitative data material was presented in the same language. We can ensure that the value of the data is kept

intact as we understand both languages fluently and the content is reproduced accurately and authentically (Saunders et al., 2019, p.467).

Ethical Considerations

To ensure that our research was conducted in an ethical way we made sure to overcome or minimize some of the potential ethical issues with collecting and using primary data, before starting to collect the data. We keep the privacy of those taking part by ensuring informed consent and emphasizing the voluntary nature of participation and the right to withdraw. This was done through a request of participation letter, see Appendix 3, which was issued to all participants prior to the interviews. The information sheet fulfilled its requirements by covering the nature of the research, requirements and implications of taking part, the use of the data collected and the way it will be reported, the rights of those taking part, and whom to contact to raise any concerns and questions about the research (Saunders et al., 2019, p.267).

Furthermore, we ensured confidentiality of data and maintained the anonymity of those taking part. The individuals participating in the study have not been published and the data they provided have been processed to make it non-attributable (Saunders et al., 2019, p.258). We have not collected any personal or sensitive data and have not asked any of the participants to reveal any information that can be harmful to neither themselves nor their organization. To comply with the General Data Protection Regulation legislation and the guidelines of the Norwegian Center for Research Data (NSD) the data was collected through personal notes during the interviews, and we did not use any type of recording device. While the participating organizations have been made known in section 4.3 Sample, the published data cannot be traced back to any particular company or cluster network. All interviewees were assigned a random number from 1-10, and the data was treated as a collective database. Furthermore, the transcripts of the interviews will not be provided or attached to this master's thesis as a complete presentation of all collected data can make it possible to identify its source. Moreover, this contributes to enhancing the reliability of the data as confidentiality and anonymity are assured (Saunders et al., 2019, p.258).

We have also taken the responsibility of analyzing data and reporting findings correctly. Due to most interviews being conducted in Norwegian, we had to translate the collected data into English. As we have no intent to alter any of the primary data and intend for our findings to be reported fully and accurately, we proceeded with a direct translation of the findings after the

interviews were conducted. Lastly, we have processed all information in an inaccessible manner preventing others from accessing the data. Also, all collected data will be deleted when censorship has been finalized on the thesis

4.4 Quality of Research Design

Having a clear research design can strengthen the quality of the study and ensure that the collected data will accurately address the chosen research topic (Yin, 2015, p.83). In this section, we discuss the quality of our research design by assessing its reliability, dependability, generalizability, transferability, validity, and credibility. There are several data quality criteria that should be considered in qualitative analysis and that will influence the overall value of the work conducted (Moser & Korstjens, 2017; Saunders et al., 2019). Hence, we have applied a number of different quality criteria to evaluate the value of our collected primary data. While we will not specifically evaluate the quality of the secondary data collected by Menon Economics, the data will be part of evaluating the triangulation criteria of our research design.

Reliability and Dependability

In qualitative research, reliability is a method of assessing whether other researchers would reach similar findings (Saunders et al., 2019, p.447). The industrial restructuring of the oil and gas industry is believed to accelerate in the years to come, and therefore, the situation of our case study is subject to change. Hence, our findings reflect today's reality and it might be that other researchers would reach different conclusions in the future. Saunders et al. (2019, p.447) argue that it is not realistic or feasible to ensure that qualitative research could be replicated by others without undermining the strength of this specific research. Thus, we evaluate that this issue does not affect the quality of our research design.

Bias can arise from the researchers' personal background, motives for doing the research, and their categories or filters that may influence the understanding of field events and actions (Yin, 2015, p.130). Thus, it is not possible to completely avoid bias as the research can be affected by the researchers' underlying assumptions. However, identifying potential bias and taking appropriate measures can significantly reduce their impacts (Shah, 2019). First, participant bias can arise when the interviewed sample responds to the questions based on what is believed to be the correct answer or what is socially acceptable (Shah, 2019). We tried to avoid participant

bias by phrasing open-ended questions as well as asking in a way that allows the participants to feel safe to provide honest answers. We used a nondirective practice by letting our participants express their meanings and follow their own sequences which can result in significant insights (Yin, 2015, p.144). Furthermore, we argue that we reduced response bias where respondents provide only a positive image of their organization and hide sensitive information (Saunders et al., 2019, p.451) as we informed all interviewees about their anonymity in our thesis. Second, researcher bias can arise when researchers interpret data to reach their hypothesis or only include the data they believe to be relevant for their research objective. This can also happen when researchers ask leading questions that may draw a specific response or phrase questions in a way that may impact the participant's response to the next question (Shah, 2019). To avoid researcher bias, we assured to ask neutral questions by not including our thoughts or opinions when formulating the questions and interpreting the collected answers. We also continuously re-evaluated the collected data and ensured that we excluded our pre-existing assumptions from the analysis.

Dependability is a parallel criterion to reliability and relates to the aspect of consistency of findings. Researchers can establish dependability by transparently describing all research steps from the initial phase to the development and presentation of findings (Moser & Korstjens, 2017, p.121). As illustrated in figure 12 below, we developed a model on the specific research process to increase the dependability of our study where we illustrate the different activities from the initial phase of identifying our research objective to presenting our findings and writing the thesis. Dependability is important to consider since the research focus often changes as the project progresses, and describing the emerging research focus can ensure that it is understood and assessed by others (Saunders et al., 2019, p.217). Our research focus has not changed much since the initial phase, as we processed comprehensive theoretical research before collecting data from our case study. We did initially collect and analyze quantitative data retrieved from Innovation Norway (Appendix 5). However, we found this data to exceed our research objective as it concerned innovation systems and initiatives, necessitating another type of theoretical framework and data collection. Hence, we chose to extract this data from our analysis and suggest it for future research in section 7.2.

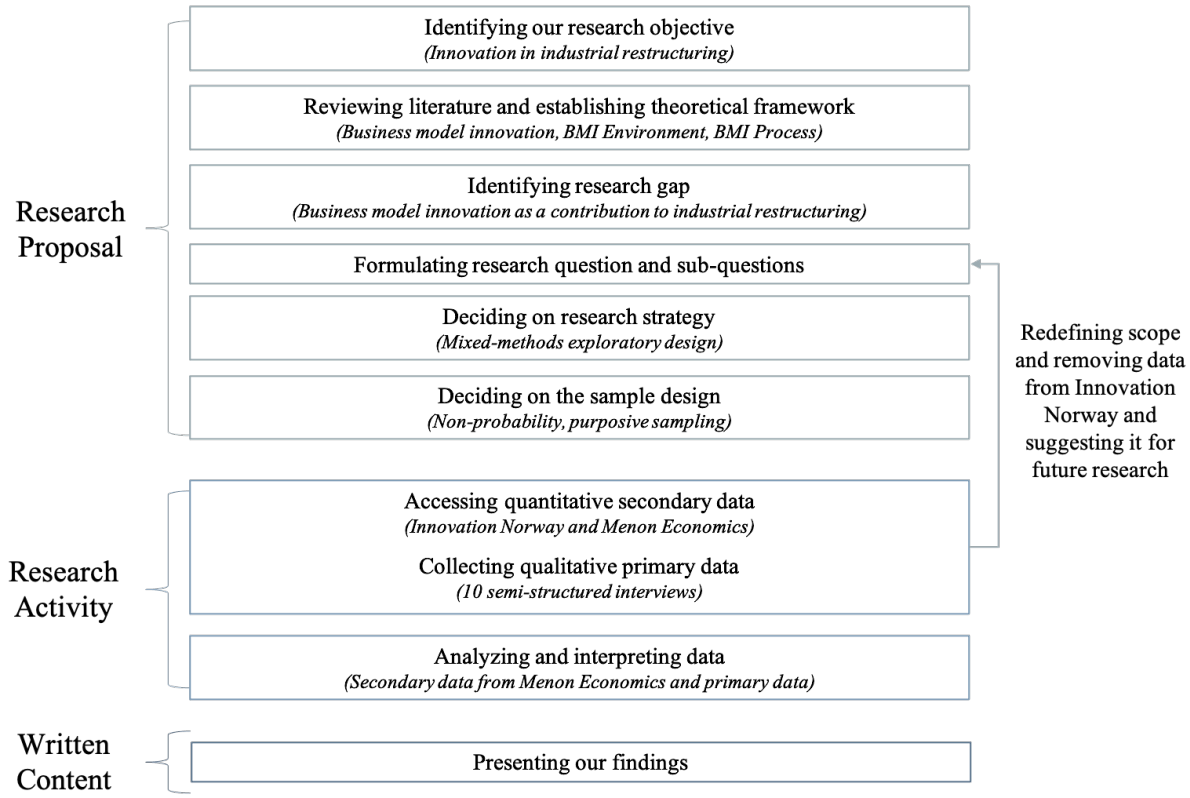

Figure 12. The research process of our master's thesis.

Generalizability and Transferability

Generalizability measures how the findings from qualitative research can be generalized to a broader set of conditions beyond the elements of the immediate study. The importance of generalizability in qualitative studies has been widely discussed, and some argue that the intention of utilizing case studies is based on unique cases which deserve to be exclusively studied (Yin, 2015, p.103). We argue that our study can be applied by any Norwegian oil and gas company corresponding to our targets of achieving a prevailing thesis for the industry. Although we based our research on a single case study, business model innovation in the Norwegian oil and gas industry, we interviewed a wide cross-section of participants from the industry including companies and cluster networks. Therefore, we evaluate that our study can be generalized within the Norwegian oil and gas industry since we interviewed a representative sample within our case study setting. Furthermore, the findings or results from a single case study follow a process of analytic generalizations (Yin, 2015, p.105). First, we show how our findings are probable to inform a specific set of concepts, theoretical constructs, or hypothesized sequence of events. Accordingly, there are questions of generalizability based on the ability of the qualitative research to be utilized in testing existing theory (Saunders et al.,

2019, p.451). As we establish how our findings are related to existing theory in the discussion, we demonstrate the findings' broader significance which allows us to test the applicability of the theoretical framework of business model innovation in the Norwegian oil and gas industry. Accordingly, our discussion demonstrates how our findings support and challenge the theoretical framework. Lastly, we aimed to find patterns within our case study and to utilize analytical generalization to extract conclusions.

Furthermore, transferability describes how qualitative findings can be applied to other situations while acknowledging the uniqueness of the specific conditions in the initial qualitative study (Yin, 2015, p.106). We evaluate the transferability of our research design as high since we present a full description of the research question and sub-questions, design, context, findings, and results in the introduction and the methodology chapter. Hence, the transferability of our study enables the reader to evaluate whether our findings are transferable to their setting and allows other researchers to design a relatable research design that they can apply in another research setting (Saunders et al., 2019, p.451). However, the final decision of whether our findings are transferable will depend on other researcher's opinions and the settings in which they are applied (Moser & Korstjens, 2017, p.122).

Validity and Credibility

Validity is a method of strengthening the credibility of a research design, and a valid study reaches conclusions that reflect and represent the real situation in which the study was conducted (Yin, 2015, p.88). No study can achieve complete validity, however, we aim to strengthen the validity of our study by assessing several concerns and challenges. Maxwell (2013) suggests different strategies for addressing the validity challenges of a qualitative research design. It is the researchers' decision on which strategies to apply since not all strategies are suitable for every qualitative research project (Moser & Korstjens, 2017, p.121). Thus, we apply different strategies explicitly chosen to be appropriate to our study in evaluating the validity of our research project.

Intensive long-term (field) involvement relates to the production of a total and in-depth understanding of field situations which includes making repeated observations and interviews (Maxwell, 2013). To assure that we achieved detailed data and in-depth knowledge, we explored responses from a variety of perspectives as we conducted interviews with several production companies, a supplier company, and different cluster networks. We made no field

observations since the process of business model innovation are probable to vary between the different companies. Hence, specific field observations would not provide value to our research project as we intended to study the oil and gas industry as a whole. Also, we did not make repeated interviews with our respondents as we evaluated that our initial interviews provided a sufficient amount of in-depth data.

'Rich' data describes to which extent the researcher covers the field observations and interviews with detailed and varied data (Maxwell, 2013). To increase the level of validity and assure that we collected rich data, we explained and clarified our questions to assure that our respondents fully understood the questions. For example, we explained the definition of business model innovation and the different types of innovation as some respondents found these concepts confusing. Additionally, we formulated the questions to open up for discussions by using terms such as "what", "when", "why", and "how". We also allowed our participants to probe their responses where it was necessary to explain or build on their previous answers (Saunders et al., 2019, p.444). This can lead our discussion into new areas we initially did not consider but which are important for our research.

Respondent validation relates to how the researcher collected feedback from the respondents to decrease the misinterpretation of their self-reported behaviors and opinions (Maxwell, 2013). To achieve respondent validation, we summarized the respondents' answers before proceeding to the next question to assure that we had a complete understanding of their answers. Additionally, we asked if the respondent would add additional information to their answers before completing the interview.

Intervention measures the use of the presence of the researcher and how they observed their participants' reactions as an additional method of corroborating field patterns (Maxwell, 2013). It was challenging to observe participants' reactions as the interviews were conducted online over video calls. However, we perceived that participants found some questions to be more diffuse than others as they used longer response time and requested if we could repeat the question. This indicated that several respondents were not familiar with aspects such as "revenue attractiveness", "switching costs", and "business model innovation".

Triangulation includes collecting converging evidence from several sources (Maxwell, 2013). As we have applied a mixed methods research design, we were able to triangulate some of our data material. While we are covering a research gap, we were able to use Menon Economics' report to confirm the credibility of our collected, analyzed, and interpreted data from part one

and five of our interviews (Appendix 4). We were able to confirm research data concerning the current status of the industrial restructuring, and how the industry has been affected by the European Union, the oil price, and the Covid-19 pandemic. Thus, while we were not able to find equivalent quantitative data on part two, three, and four of our interviews due to our study covering a research gap, we were able to triangulate data on part one and five. By using triangulation, we have added depth, breadth, complexity, and richness to our research and enhanced its validity (Saunders et al., 2019, p.218).

5. Findings

The following chapter presents the findings which will be the basis of the discussion. The findings are mainly primary data from our interviews supplied with secondary data retrieved from Menon Economics (2020). The findings from the primary and secondary data are combined and presented in the following chapter which is structured by four sections: 1) industry status, 2) business models, 3) the oil and gas industry landscape, and 4) changing industrial trajectories. Our findings are presented in the specific order to ensure coherency between the theoretical framework, findings, and discussion. We present arguments from the interviews by referring to "interviewee X" to secure the anonymity of our interviewed sample. However, we do not always refer to specific interview objects as there are multiple common arguments stated by several interviewees. Additionally, to further secure anonymity the given number to the interviewees is randomly assigned which means that it has no context as to whether the statements/arguments come from the respective companies or clusters. It is also important to mention that most of the interviews were conducted in Norwegian, therefore, most arguments presented are translated into English.

5.1 Industry Status

The Oil and Gas Industry

The oil and gas industry consists of mainly two types of companies: oil and gas producers and oil and gas suppliers. There is currently a total of 37 exploration- and production companies on the Norwegian continental shelf: 24 oil and gas producers and 13 as licensees in production licenses (Norsk Petroleum, 2021). This includes a large diversity of different companies, creates competition that promotes efficiency, and ensures interest in various projects and implementation of new and cost-effective technology (Norsk Petroleum, 2021). However, the supplier industry is substantially larger, consisting of over 1100 companies that supply equipment and services to the oil and gas industry (Norsk Petroleum, 2020c). While some argue that the industry will stay as one of the biggest industries in Norway, many see the need for more sustainable ways of doing business. Most of our interviewed sample argue that the companies within the oil and gas industry actively work with innovation and sustainable development to stay competitive. This includes development and innovation within the industry, as well as other markets like renewable energies. However, some dispute that even

though many of the companies in the oil and gas industry understand the importance of sustainable development they are unsure of what they can do about it and how to change (Interviewee 9, 2021).

It is argued that the main types of innovation that companies within the oil and gas industry focus on are product and process innovation. The emphasis is on improving existing solutions through small changes as opposed to large quantum leaps (Interviewee 9, 2021). But there is also a focus on services in relation to operation and maintenance on the system side (Interviewee 5, 2021). Within service innovation, there is a particular focus on digitization, artificial intelligence, 3D printing, and ways of collaborating more effectively. It is also evident that new products and services may require new business models that are different from the ones they already have (Interviewee 6, 2021). While some companies have a lot of capital that drives innovation (Interviewee 10, 2021), others depend on external funding.

The interviewed sample wants to contribute to reaching 50 percent emission cuts by 2030 and work actively with technology development to make processes less environmentally damaging. Menon Economics (2020, p.50) found that a quarter of the companies in their study had obtained revenues from energy efficiency of oil and gas production, and 21 percent had sales associated with the electrification of oil and gas installations. Such technological solutions can contribute to emission reduction in the oil and gas industry by reducing the need for gas. The industry ranges from companies that develop environmental technologies themselves to those that mainly serve as users of the technology. Some work with innovation in all of their research projects by constantly looking for disruptive technologies and new opportunities that disrupts the existing paradigm (Interviewee 2, 2021). This can involve having a separate R&D department where the focus is on energy efficiency (Interviewee 8, 2021), or a research center where they "continuously look outwards into the Norwegian technology ecosystem, looking for new opportunities and expertise" to support their existing technologies (Interviewee 2, 2021). While others have little technology that they own themselves and only patent technology to ensure their own usage in different markets and countries.

Renewable Energy Industries

Most of our interviewed sample argue that their main value creation originates from oil and gas production/supply while they are also working in or entering renewable energy industries such as offshore wind, CCS, and hydrogen. The renewable energy industry will play an important role in the restructuring of the Norwegian energy system and of the Norwegian economy (Energi Norge, 2020, p.44). Some of the big oil and gas companies are now transforming into energy companies where shifts in industrial trajectories are becoming apparent. In particular, Equinor, Shell, and Total have been argued to be at the forefront of this shift (Interviewee 4, 2021). Large suppliers to the oil and gas industry must contribute to the shift, and research and development will have an important part in driving that process. Aker is a good example; they were a pure oil and gas company that has now moved into both offshore wind and carbon handling.

Many start-up companies are active towards clusters where there are people who have worked for many years in the oil and gas industry who are now coming up with ideas for starting new companies in renewable energy sources (Interviewee 4, 2021). Companies in the oil and gas industry currently have significant investments in new market areas like offshore wind and technologies such as CCS and hydrogen. It is emphasized that "almost without exception, companies have invested in new industries, typically in offshore wind and several other industries such as fish farming, hydrogen, and CCS" (Interviewee 6, 2021). Menon Economics (2020, p.15) found that Norwegian oil and gas companies invest heavily in renewable energy; Total was a traditional oil and gas company but is today one of the world's largest investors in solar energy. Accordingly, Equinor seems to be leading the transition to renewable energy, and its investments in clean energy exceed Norway's total investments in power generation (Menon Economics, 2020, p.15). As companies move their value creation to new renewable industries, several actors do not want to be identified with oil and gas (Interviewee 6, 2021).

Over the last decade, offshore wind has developed from a niche activity to an important energy source that covers the energy needs of millions of European housings. The cost of energy from this sector has fallen dramatically, leading to a rapidly growing market. Many predict a strong growth within floating offshore wind, which is currently in the start-up phase (Menon Economics, 2020, p.40). Menon Economics (2020, p.39) found that 60 percent of the companies expect increased growth and turnover in the offshore wind industry towards 2023. The International Energy Agency (IEA) estimates that 10,000 billion NOK will be invested in the

offshore wind industry towards 2040, providing the Norwegian continental shelf, and the Norwegian supplier industry with new opportunities (Menon Economics, 2020, p.69).

It is argued that the overall ambition of developing the offshore wind industry in Norway should be to develop a profitable and competitive industry, which is attractive to national and international investors (KonKraft 2020, p.33). Interviewee 5 (2021) states that there are opportunities for different technologies in different sea areas where, for example, there is shallower water or where there are no suitable installations. However, there is a great need for innovation to succeed in floating offshore wind.

Menon Economics (2020, p 4) emphasizes Norway's leading technology in several areas that are considered crucial, such as the country's competence and willingness to invest in CCS. Accordingly, CCS is perceived by the EU as crucial to achieving the climate goals. The technology for capturing and storing CO_2 is still in the development phase. With the uncertain technology that exists today, it is not commercially interesting for Norwegian companies to invest without sharing risk with public authorities. Aiming to facilitate achieving the climate goals, while facilitating future business activities, the Norwegian Government has proposed to allocate over 20 million NOK to projects within CCS (Menon Economics, 2020, p.111). The realization of a full-scale project for CO_2 management, and thus the establishment of a value chain for CCS, can provide significant industrial opportunities in Norway (Menon Economics, 2020, p.111). However, Menon Economics (2020, p.50) found that just 10 percent of the companies in the study have revenues related to CCS. Whether CCS will be a key technology for reducing emissions in the future will depend on the cost of CCS and other competing technologies, which industrial sectors can utilize this infrastructure, and the market developments in Europe (Menon Economics, 2020, p.111). Thus, the Norwegian oil and gas industry is argued to be crucial for such a development of CCS.

In today's situation, it is not possible to electrify everything; examples are long-distance sea transport between countries and continents, as well as heavy transport by land. Hydrogen is highlighted for these sectors as an alternative when emissions must be reduced. Similarly, hydrogen is cited as a solution for the power-intensive process industry (Menon Economics, 2020, p.75). Menon Economics (2020, p.50) found that 12 percent of the companies have revenues associated with hydrogen and the amount is expected to increase in the upcoming years. However, just 36 percent of the respondents expect increased growth and turnover in hydrogen towards 2023, while 60 percent expect it to be unchanged (Menon Economics, 2020, p.12).

Summary

This section describes the current status of the oil and gas industry, and the renewable energy industry. There is currently a total of 37 exploration- and production companies on the Norwegian continental shelf, while the supplier industry is significantly larger consisting of over 1100 companies. The industry's main focus is on product and process innovation, as well as services including operation and maintenance on the system side. Our findings indicate that most companies have their main value creation within the oil and gas market, where some are slowly entering renewable industries. Moreover, findings from Menon Economics imply that 60 percent of oil and gas companies predict an increased growth in the offshore wind industry. Menon Economics (2020) found that CCS is still in the development phase and whether it will be prominent in the future depends on the cost, other competing technologies, industrial sectors, and the overall market developments in Europe. Lastly, Menon Economics (2020) found that only 36 percent of their sample expects increased growth in hydrogen towards 2023.

5.2 Business Models

Recognizing some of the key aspects in the current business models is vital to identify how they can be innovated and how that can contribute to a successful restructuring of the oil and gas industry. Customer needs and competitors often develop in a direction that continuously gives companies new opportunities to change and strengthen their position (Interviewee 7, 2021). Some of the main drivers for oil and gas companies to change their current business model is to survive, strengthen their competitive position, and contribute to sustainable change. It is also argued that companies can achieve a steadier revenue stream and capture more of the value created with their products and services by innovating their business model (Interviewee 6, 2021). The combination of competence, organizational, and capital conditions is argued to be crucial in this process (Interviewee 8, 2021).

According to our interview sample, oil and gas producers rarely make any changes to their customer segments, distribution channels, or customer relationships. They have a few large customers who buy their product on the world market, and they have well-developed processes for this (Interviewee, 8, 2021). However, new technological development can change within their customer segments, forcing them to think differently (Interviewee 1, 2021). On the other hand, many oil and gas suppliers have had to find new customer segments simply out of necessity because the number of traditional oil and gas customers has decreased in size

(Interviewee 6, 2021). The need for new markets and industries has, therefore, increased. Some argue that they will continue to maintain their position as one of the leaders in oil and gas projects, while at the same time grow in renewable energy.

It is emphasized that it is important to continue the activities one has today and make them more environmentally friendly, while at the same time develop new renewable solutions. The market for renewable solutions is growing, but it is still much smaller than the market for traditional oil and gas solutions. There are both new and existing customer segments within renewable energy, and we see that customers take on new roles – the end customer may own the plant that produces the new energy (Interviewee 7, 2021). This differs from the traditional oil and gas industry, resulting in substantial changes in the customer segments and customer relationships for those oil and gas companies that want to transition to renewable energy. For instance, in the offshore wind industry, there are completely new customers and suppliers, enforcing involvement from customers as expertise early in the process (Interviewee 10, 2021). Changes are forcing their way into the market, the authorities are beginning to impose stricter guidelines, and society is now demanding other solutions than those that already exist today (Interviewee 4, 2021).

Part of the process of changing the business model is to look at what kind of values the company creates today and identify new ways of capturing value (Interviewee 3, 2021). Compared to earlier, there is now a greater focus on software- and service-based solutions within the oil and gas supply industry. The focus is to increase the efficiency of the equipment and physical machines that are already in use. However, it is argued that companies are sitting on expertise that allows them to produce completely different products today, but that they are not able to capture that value due to lack of exploration (Interviewee 3, 2021). It can for instance be products or services that when put together deliver increased value to the customer than if offered separately. On the other hand, oil and gas production is effectively linked to delivery and supply agreements through the pipelines or the export route, making it hard for oil and gas producers to change their offerings (Interviewee 2, 2021). Several of the interviewed companies state that they do not make significant changes to what they offer the market, but that their products and services have been significantly improved with a focus on zero-emission solutions. It is argued that it is not necessary to change the offering but to focus on decarbonized solutions that reduce the CO_2 emissions from the activities that produce the offering. Customers are willing to pay more if they get products that are developed with a low CO_2 footprint (Interviewee 10, 2021).

Furthermore, oil and gas companies transitioning to renewable energies will have to make changes concerning their key partners, key activities, and key resources. There will be more players involved in the value chain of renewable energies compared to the oil and gas industry. Furthermore, it is an increased focus on fully digitalized value chains where all are connected and linked into a production unit that comes much closer to both customers and suppliers (Interviewee 3, 2021). This allows for more input in decisions that make it possible to assess whether the company's offering is what the market desire. It is argued that there will be a shift in focus from building physical products made of steel to software solutions, where many of those who were key partners in the past get another role now (Interviewee 6, 2021). This will result in an increased demand for partners with competence related to software development, and a decreased demand for traditional suppliers and factories. However, some companies are part of constellations that have worked together for a long time and that change and adapt in the same manner (Interviewee 5, 2021). They may be able to use several of the same partners that they already have and continue the cooperation into new markets and segments.

Lastly, companies have to adjust their cost structure and revenue streams to adapt to changing market conditions. Traditional industrial companies are now to a greater extent also service providers, even though they still produce a product. Revenue streams have changed dramatically in the oil and gas industry as it previously came from the sale of steel products and typically large drilling packages where there is now more revenue from services such as small upgrades, spare parts et cetera. For instance, 10 years ago barely 25 percent of the turnover was service-based while today it can typically be 65-70 percent (Interviewee 6, 2021). Furthermore, there are high return requirements for oil and gas due to the risks associated with production and the need to compensate for high CO_2 taxes. There is constant pressure to drive down costs in the oil and gas industry to remain competitive regardless of the oil price. On the other hand, savings must be significant before appropriate measures are considered implemented - if a company earns 10 million but affects another risk element, then they drop it (Interviewee 9, 2021). Hence, it is argued that there is no correspondence between a stated willingness to invest in new technology and the actual willingness for implementation.

Summary

Our findings suggest that the main drivers for oil and gas companies to change their current business model are to ensure survival, strengthen their competitive position, and contribute to sustainable change. Central elements in their business models have been identified where some aspects are particularly crucial to innovate to succeed in transitioning to other industrial trajectories. First, our findings imply that oil and gas companies rarely make changes to their customer segments, distribution channels, or customer relationships. Second, it is now a greater focus on software- and service-based solutions within the oil and gas supply industry than before, strengthening their value propositions. Third, oil and gas companies will have to make changes concerning their key partners, activities, and resources as there will be more players involved in the value chain of renewable energies compared to the oil and gas industry. Lastly, while there is constant pressure to drive down costs in the oil and gas industry their cost structure and revenue streams will change due to changes in their market conditions.

5.3 The Oil and Gas Industry Landscape

Market Forces

The interviewed sample argues that companies in the oil and gas industry are highly affected by market forces. Value thinking is emphasized as fundamental, where one can have an offer but lack demand. It is therefore important to help create perfect market conditions where there are many buyers available, and enough suppliers to supply the demand (Interviewee 1, 2021). Some argue that there have been large fluctuations on the demand side and that the oil and gas markets are not as attractive as they once were, especially among investors. It is also a shortage of capital in those markets, and it is becoming increasingly difficult to get finances to develop products in the oil and gas market (Interviewee 6, 2021). However, others emphasize that there is still a great demand for oil and gas and that it may have an effect on the issue that some companies do not have an equally strong desire or motivation to enter new industries (Interviewee 1, 2021). On the other side, there has always been strong global competition and overcapacity in the oil and gas supplier industry, resulting in high pressure on the supply side (Interviewee 7, 2021).

One of the biggest drivers for change is development in market needs where customers have different requirements than before (Interviewee 3, 2021). Furthermore, the increase in the demand for more sustainable industries has been a driving factor for oil and gas companies to

move into renewable energies and for new technology to emerge (Interviewee 4, 2021). It is argued that it is important to balance the relationship between appearing sustainable and actually changing, as a too one-sided focus on appearing sustainable can prevent a real transformation (Interviewee 1, 2021). However, many still have their main activity within oil and gas as it is their primary source of income and vital to be able to move into more sustainable energies like renewable energy.

As illustrated in figure 13 below, Menon Economics (2020, p.12) found that 62 percent of the companies in their study expect an increase in revenue from offshore wind. Norway has currently a power surplus and the development of offshore wind farms on the Norwegian shelf cannot solely be based on a national need for wind power. The long-term goal is, therefore, argued to be to export the power to the European market, creating new markets and customer segments for Norwegian companies (KonKraft, 2020, p.34). The industry is seen as prosperous and several of the large oil and gas companies already have activity in this market. Furthermore, nearly 60 percent of the companies also expect an increase in their main market, oil and gas. Menon Economics (2020, p.12) states that the high proportion indicates that the so-called "oil package" has had a beneficial effect in the form of accelerating investments on the Norwegian shelf.

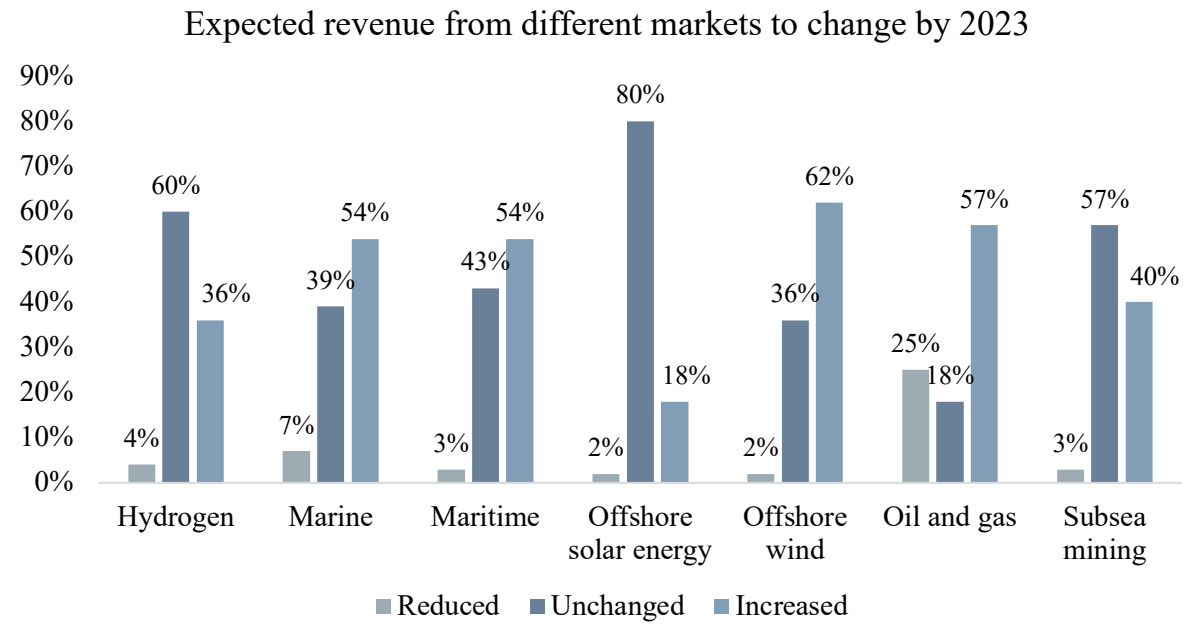

Figure 13. Expected change in revenue in different industries. Source: Menon Economics, 2020, p.12.

Lastly, 36 percent suggests that expected revenue from hydrogen will increase by 2023, while most of the companies expect it to be unchanged. When the EU launched its hydrogen strategy in July 2020, they stated that the ambition for hydrogen is to increase its share in the EU's

energy mix from 2 to 14 percent by 2050 (European Commission, 2020, p.1). Norwegian oil and gas companies are currently participating in several large industrial projects in Europe that are developing value chains for hydrogen, which will have great effects on the construction of the hydrogen market (KonKraft, 2020, p.26). However, although the revenue from markets other than oil and gas is expected to increase, the share of companies' total turnover is still relatively small (Menon Economics, 2020, p.39). While marine, maritime, solar energy, and subsea mining markets also are of great interest for a lot of oil and gas companies they will not be further analyzed or discussed due to the delimitation of this thesis.

Industry forces

Most of our interviewed sample argue that industry factors such as suppliers, stakeholders, competitors, and new actors have a strong influence on the oil and gas industry. Suppliers can create a basis for participating in the development of renewable energy industries while building up their knowledge and expertise from the existing oil and gas market (Interviewee 1, 2021). The supply chains are much more competitive today, which means that they can deliver more cost-effectively than before (Interviewee 8, 2021). Also, the suppliers aim to be involved in influencing changes in the rules of the industry. However, interviewee 6 (2021) argues that suppliers have relatively little power since there are so many suppliers in relation to the oil and gas producers. Moreover, interviewee 3 (2021) states that changing the business model or the company's core product will affect the entire value chain. Therefore, the use of new technology can mean that the company gets a completely different type of supplier than before.

Furthermore, it is argued that stakeholders in terms of customers can in several ways reduce the margins of oil and gas companies' offerings (Interviewee 6, 2021). Customers are an important influence since oil and gas companies ought to adapt to customers' demands – the greatest loyalty is between the company and customers (Interviewee 9, 2021). According to interviewee 7 (2021), they always compare offers from other competitors and invite their customers to tender. Competitors usually have a different price picture and delivery offer. Hence, we found that competitors have a powerful influence on oil and gas companies. Interviewee 6 (2021) argues that a single company does not need more than 2-3 competitors before they risk getting into a spiral where they drive all profits down. As the oil and gas industry is decreasing in volume, the competition will only become tougher. Also, interviewee 9 (2021) states that companies are weakened without their competitors since it is easier to make changes that

competitors have implemented. However, a Norwegian oil field is often owned by several competing players together, which means that oil and gas companies are also affected by how these competitors act together (Interviewee 8, 2021).

Lastly, new actors are argued to have a positive impact on the oil and gas companies as they can create new business opportunities. Several new actors are entering the oil and gas industry, challenging the traditional mindset with renewable thinking (Interviewee 5, 2021). Norwegian labor is generally expensive; therefore, it is argued that the development of automated processes can increase Norwegian oil and gas companies' competitive position compared to other countries that have low-cost labor (Interviewee 4, 2021). Meanwhile, interviewee 6 (2021) states that there have not been many new players in the industry, as oil and gas companies have consolidated globally and are decreasing in volume. Another argument is that sustainability does not mean anything when the industry experiences crises; in difficult times the development stagnates; in positive times the development increases (Interviewee 10, 2021).

Key Trends

Saebi (2016) argues that we are now transitioning from simple digitalization to innovation based problem-solving that has forced companies to reconsider their traditional business models. Based on research from the Center for Service Innovation (CSI), one can expect that four emerging trends will become more important in the years to come: 1) sharing economy, 2) servitization, 3) open innovation, and 4) sustainability (Saebi, 2016). This is supported by our interviewed sample, where servitization and sustainability trends are argued to have significant effects on the oil and gas industry. More specifically this includes technology, regulations, social and cultural trends, and socio-economic trends. First, the traditional oil and gas companies are highly affected by the increasing focus on technologies to reduce climate change. The green shift is argued to bring new opportunities, new industries, new products, and new processes by utilizing the technology and expertise the oil and gas industry possesses today (Interviewee 4, 2021). The development of technology is increasingly adapted to sustainable projects. We found that technology such as digitalization, automation, robotization, and artificial intelligence have a particularly strong impact on oil and gas companies.

Furthermore, regulations influence Norwegian oil and gas companies and have provided a strict set of rules for the last ten years (Interviewee 6, 2021). The Paris Agreement and the EU's taxonomy is argued to be governing for how companies think. The Paris Agreement has a strong

impact on the industry as it requires companies to reduce their environmental footprint. These new regulations can now be linked to climate change and major global international agreements (Interviewee 7, 2021). Most of our interviewees state that regulations such as the EU's taxonomy will significantly affect the industry and how they organize both strategically and in the daily operations. It will create an even greater basis for sustainable companies which will speed the development of sustainable industries (Interviewee 1, 2021). Moreover, the EU's taxonomy can make companies attractive for investors as the taxonomy ensures that certain criteria are met for activities to be considered sustainable or green. This way, the taxonomy helps investors make green investments, securing them that for instance, the developers of offshore wind do not use slave labor in low-cost countries. Accordingly, many investors only invest in renewable energy companies which greatly influence oil and gas companies' portfolios (Interviewee 4, 2021). Additionally, "modification of the rules in the taxonomy can change the market and can have a rapid effect" (Interviewee 2, 2021).

According to interviewee 10 (2021), the EU has been funding several projects in the last years, creating a strong signal of the desired direction for the oil and gas industry. However, the EU's taxonomy is also claimed to create uncertainties regarding how it will affect Norwegian business (Interviewee 1, 2021). It is argued that the taxonomy will give the industry a greater degree of common ground which will make it fairer for those who bear the cost of the restructuring. However, it is also argued that a significant part of Norwegian gas goes to electricity production and as this will be phased out; the market for Norwegian gas will disappear gradually towards 2050. The fact that Norway ought to be carbon neutral by 2050 creates strong effects for oil and gas companies as the market simply disappears (Interviewee 5, 2021). Additionally, regulations including various tax schemes are becoming more adapted to renewable thinking (Interviewee 1, 2021). It is no longer profitable to expand all oil and gas fields due to CO_2 taxes which have a major impact on the industry. These regulations create opportunities to offer new solutions to allow customers to expand fields with zero or greatly reduced CO_2 emissions (Interviewee 7, 2021). Therefore, these regulations can create new business areas that oil and gas companies can benefit from. However, interviewee 2 (2021) states that these are usually not the main drivers for oil and gas companies' strategy.

On the other side, some of the interviewed sample argue that the EU's taxonomy does not affect the oil and gas industry today based on three arguments. First, there is a breach of the taxonomy rules when a 100 percent electric driven ship carries oil. This creates challenges in the development of positive changes in the oil and gas industry since companies get expensive

capital regardless as their activities are classified as ‘brown’. The taxonomy will have a major influence on capital as it becomes more expensive for the oil and gas industry, and correspondingly cheaper for sustainable industries. When companies do not fall into the sustainable categories, they will still be able to borrow capital but at a higher interest rate (Interviewee 6, 2021). Second, the oil and gas companies will continue their value creation as they are judged by the EU’s taxonomy regardless. Interviewee 8 (2021) argues that most companies are scared of losing their ability to make money when they change. Hence, companies must be reassured that they can profit from sustainability and preferably as much as before.

Third, the EU’s taxonomy is a shocking discovery for many companies. These companies are concerned with figuring out how to change, but they do not proceed with the process of changing before they absolutely have to. The objectives of the taxonomy are so strong that it forces sustainability and new industries, and those who do not participate will disappear. Everyone in the industry must relate to the taxonomy for the EU to reach its objectives (Interviewee 9, 2021). Lastly, several of our interviewees argue that it is not obvious how the taxonomy will affect the oil and gas industry as it is not finalized. However, the taxonomy will probably have an impact in the future, as it will make capital more expensive for the industry (Interviewee 8, 2021).

According to interviewee 8 (2021), social and cultural trends can strongly influence companies’ reputations. Social and cultural trends can also relate to access to expertise which is argued to affect companies. The oil and gas industry is perceived as an industry in decline that affects the supply of new labor. Acquiring competence is also affected by whether the market one operates in corresponds with markets in which new employees want to work (Interviewee 6, 2021). It is not easy for the oil and gas industry to get young employees unless the company has taken a stand concerning sustainable development as the new generation is much more aware of what type of company they want to work in (Interviewee 3, 2021). Thus, it is more difficult to recruit high competence to a market that is perceived to be in decline. Lastly, interviewee 10 (2021) argues that social and cultural trends create a debate on how we want to live in the future. The earlier generation has learned more about environmental challenges growing up. While the older generation might not see the value of renewable restructuring as they may be too heavily invested in the oil and gas industry that has provided the country great prosperity (Interviewee 10, 2021).

Macroeconomic Forces

According to Interviewee 10 (2021), the world is moving more towards nationalist attitudes and becoming more independent where countries leave trade agreements, ex. The United States under Trump, which will have great macroeconomic impacts. A lot of oil and gas companies have to a large extent been export-oriented, and the interviewed sample argues that the industry is highly influenced by global market conditions. The economic infrastructure of Norway is well developed and is argued to not have any impact on the Norwegian oil and gas industry or the development of more sustainable industries. However, access to raw materials and resources influences the oil and gas industry to some degree. For instance, the price of steel fluctuates and is currently high and affecting to some extent (Interviewee 6, 2021). Furthermore, it is argued that there are no prominent challenges with the international capital market and that it is mostly the smaller companies that are affected by the national capital market (Interviewee 6, 2021). However, investors want to be more involved in projects that can be classified as sustainable, resulting in more favorable financing for companies with a green profile. This will make financing more expensive for those who do not change and contribute to sustainable development.

Globally, the pressure in relation to pollution and reduction of emissions is great. This represents huge market opportunities for oil and gas companies due to Norway's valuable knowledge and expertise from the industry that can easily be transferred to other market areas. The global demand for sustainable change has a great impact on where we will deliver energy solutions and technology for the future (Interviewee 4, 2021). For instance, Portugal is more intensive in its hydrogen strategy, India is working on implementing new zero-emission solutions, and China is a leading player in terms of reducing emissions (Interviewee 1, 2021). It is argued that if we are to have a real impact from a renewable transformation, we must ally with other countries and enter into partnerships with those for the implementation of the technology we develop (Interviewee 4, 2021). International cooperation provides a large business market for the Norwegian energy industry and is, thus, important.

Traditionally, the oil and gas industry has always been preoccupied with other industries when the oil and gas market is struggling. However, the moment the oil price has increased, and earnings are much higher than in alternative markets, they go straight back to their old markets and customers (Interviewee 6, 2021). On the other hand, there has been a change in the last 4-5 years where the oil and gas market is not growing at the same pace as earlier. It is argued that oil and gas companies will continue to serve the oil and gas market, but that they will also

prioritize investing in new products and processes for sustainable industries because they are the future and will be vital in the long term (Interviewee 6, 2021).

The oil and gas industry, especially the suppliers, is sensitive to changes in the oil price (Menon Economics, 2020, p.97). As illustrated in figure 14 below, there has been a lot of fluctuations in the oil price over the last years, ranging from $9.44 in December 1998 to $141.07 in July 2008 (EIA, 2021). Three of the greatest events in the history of the oil price are the financial crisis in 2008, the global oversupply situation in 2014, and the Covid-19 pandemic in 2019. Demand is determined by activity and exploration activity in offshore oil and gas extraction. The demand has so far been increasing after the oil crisis in 2014, but there has still been a focus on keeping costs down (Menon Economics, 2020, p.97).

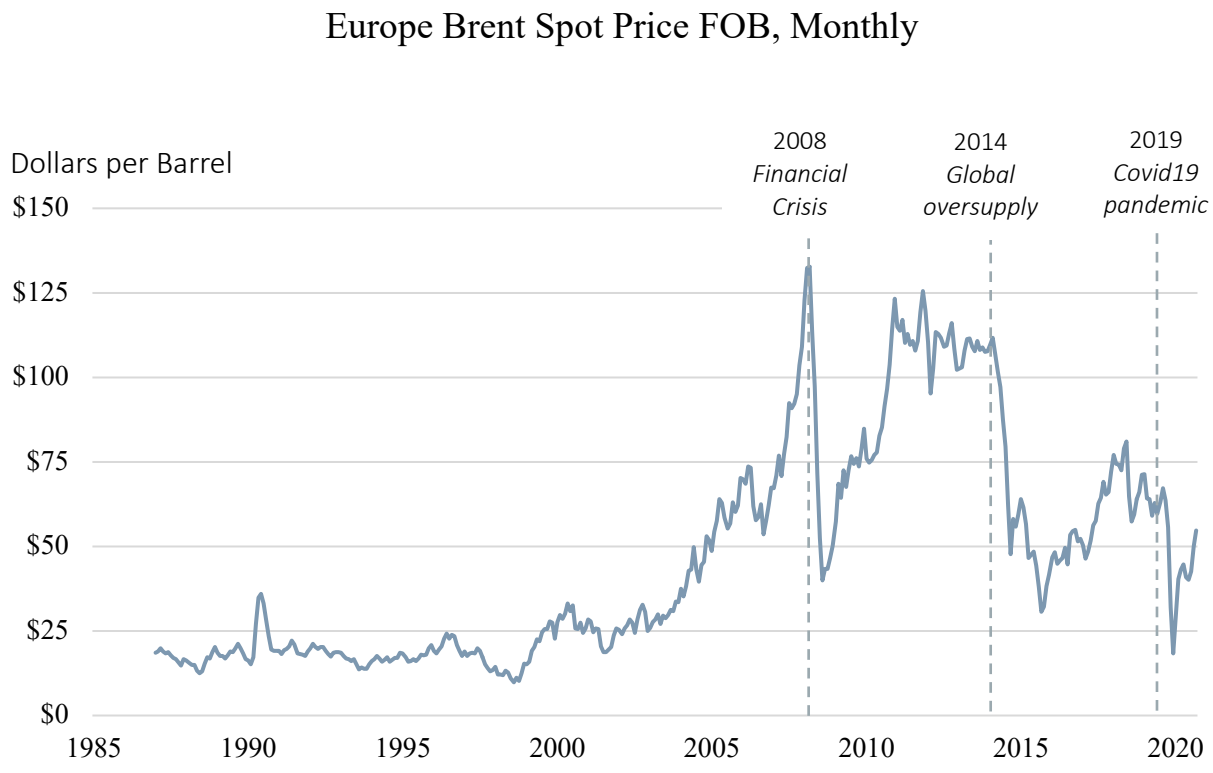

Figure 14. Fluctuation in oil price. Source: EIA, 2021.

Our interviewed sample argues that the fluctuations in the oil price influence oil and gas companies' focus on sustainable development. While oil and gas producers cannot abruptly turn off the taps for oil extraction, the market and the price heavily influence the way companies work and what they focus on. "When the oil price is high it allows us to work in deep water areas where the cost of extraction is higher" (Interviewee 2, 2021). Furthermore, we depend on a profitable oil industry to be able to achieve the goal of sustainable development as it requires heavy investments. When the oil price is high, companies have more funds to invest in

sustainable development. It can also result in companies becoming more confident and ambitious in their transition (Interviewee 2, 2021). However, this may also result in a decreased focus on renewables or restructuring, as a high oil price means that companies are doing very well in the oil and gas market, and it is becoming more attractive to find more oil. On the other hand, a decline in oil prices means that oil and gas companies are forced to cut costs to survive, making sustainable development and new markets the least of their concerns. Low oil prices will also make it harder to ensure access to finance from the capital market for new projects (Interviewee 2, 2021). When the price was $30 a barrel oil and gas companies cut where they could, while when the price was $100 a barrel, they had the greatest development they have ever had in wind power (Interviewee 10, 2021). To summarize, the interviewed sample agrees that the restructuring of the industry requires high and consistent oil prices to keep pace.

The impact the Covid-19 pandemic has had on business is argued to be different from all other crises that have affected Norwegian business (Menon Economics, 2020, p.97). The unique aspect is that this crisis has simultaneously affected both the supply side and the demand side, at the same time as the price of Norway's most important export product, oil and gas, has fallen markedly since the beginning of March (Menon Economics, 2020, p.97). As illustrated in figure 15 below, nearly 80 percent of the companies in the study predict that their turnover in 2020 has been reduced as a result of the Covid-19 pandemic. Almost 50 percent responded that it will also be reduced in the next three years as a result of the pandemic. Only 4 and 5 percent of the asked companies are predicting an increase in revenue in 2020 and 2023. Furthermore, the fact that so many of the companies predict that the activity will be unchanged is an indication that the so-called "oil package" has contributed to increasing the activity level compared to what it would have been without the package (Menon Economics, 2020, p.97).

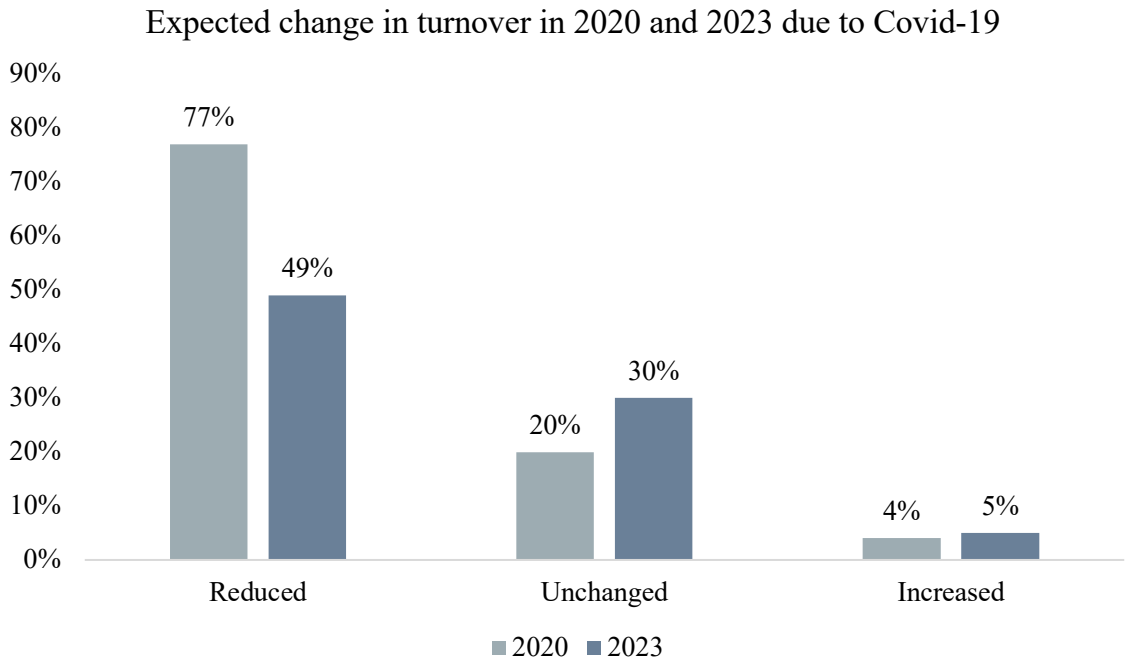

Figure 15. Expected change in turnover in 2020 and 2023. Source: Menon Economics, 2021, p.97.

On the other hand, our interviewed sample argues that the pace of innovation and focus on sustainable development has never been as high as we experience now. However, it is difficult to say whether the Covid-19 pandemic is the cause of this. When the world shut down it resulted in a substantial shock on the demand side for oil, as illustrated in figure 14. The market fell 20 percent overnight, which may to a great extent have stimulated companies to come up with products in new and more sustainable markets (Interviewee 6, 2021). The pandemic has led us to have to do things differently and has shown that companies can no longer have a business model where they depend on traveling across the globe to do a job. Many innovative solutions have been forced to emerge and we have taken quantum leaps concerning digital solutions with, among other things, remote monitoring and maintenance of operating equipment (Interviewee 2, 2021). The fundamental business processes, including how oil and gas companies work with partners and global operations, have also been positively affected by the digital working method (Interviewee 7, 2021). Additionally, the crisis has also freed up an enormous amount of funds from the public sector and initiated many new sustainable projects that accelerate development and growth (Interviewee 9, 2021).

Summary

Our findings indicate that the oil and gas industry landscape is highly influenced by market forces, industry forces, key trends, and macroeconomic forces. There have been large fluctuations on the demand side of oil and gas and generally a strong global competition and overcapacity in the oil and gas supplier industry, resulting in high pressure on the supply side. As a result of this, many oil and gas companies expect an increase in revenue from other industries including hydrogen and offshore wind. Furthermore, our findings suggest that stakeholders have a strong influence on oil and gas companies and that competitors will have a higher influence as the industry is decreasing in volume. Moreover, the traditional oil and gas companies are highly affected by key trends through the increasing focus on sustainable development to reduce climate change where the importance of the EU's taxonomy has been particularly discussed. Lastly, oil and gas companies have to a large extent been export-oriented making them highly influenced by global market conditions including the oil price and the Covid-19 pandemic.

5.4 Changing Industrial Trajectories

Continuously assessing and adjusting the business model is crucial for survival. It is argued that oil and gas companies are not part of the problem but part of the solution in the restructuring process. Oil and gas companies can evolve, adapt, and develop the new technologies that are required in the new industries. These companies can use the revenues they are currently generating to finance the huge investments required for moving forward in the low carbon businesses (Interviewee 2, 2021). Oil and gas companies state that they continuously reorganize and change their business models to become more agile since the market is rapidly changing. However, it usually includes small adjustments and there are rarely considerable changes (Interviewee 10, 2021). These processes are usually ad hoc driven and they are initiated when companies realize that their processes must change; it is not based on systematics (Interviewee, 6, 2021).

According to interviewee 1 (2021), the process of evaluating and changing the business model is a challenge that many companies struggle with. The interviewee states that the process is increasingly influenced by a sharing culture where interactions between different supplier actors are more emphasized, rather than solving the companies problems alone (Interviewee 1, 2021). There are several tools available to handle the process of changing the business model,

however, it must be initiated with recognizing the need for change. Companies must then thoroughly evaluate their current situation before starting the process. This applies both internally in different departments, but equally important in the value chain on the supplier and customer side, "…since there is an incredible number of companies who do not know their customers and do not dare to ask questions since they are afraid of the answer" (Interviewee 3, 2021).

Several of our interviewees argue that companies' routines on evaluating and improving the business model vary and that these routines may lack depending on different factors. Some companies are proactive by actively taking a clear position in transition into renewable energy, and willing to seize the first new market opportunities within the energy transformation. These companies have a clear conviction that they need to change direction, and they are finding out how they can utilize their expertise in the new industries (Interviewee 3, 2021). Other companies continue within oil and gas production while 'sitting on the fence' waiting to evaluate the expenses and risks on the green transition. Furthermore, we found that companies' routines on changing the business model may depend on the size of the company. Generally, there is not a clear focus on the business model as companies tend to do what they always have done instead of finding new ways to improve. This applies especially in small and medium-sized companies, while larger companies seemingly have more routines for evaluating and improving their business model (Interviewee 5, 2021).

According to our interviewees, there are several challenges for oil and gas companies when entering renewable industries. First, oil and gas companies must realize the need for change to keep up with the market needs. If companies fail to realize this need, they will eventually disappear from the market (Interviewee 1, 2021). By entering a new industry, they will not be familiar with the new market or its customers, which may result in several challenges. For example, there may be new customers with different framework conditions and demands. Furthermore, we found that most of our interviewed sample mentioned uncertainty, new competence, cost, risk, and the requirement of great investments as some of the main challenges with changing industrial trajectories. A lot of existing expertise may be used in new industries, but oil and gas companies must still acquire new industrial expertise and knowledge which can be challenging. However, interviewee 9 (2021) argues that oil and gas competence is not relevant for renewable energies such as offshore wind since it is a maritime industry. A solution can be to make the two industrial trajectories coexist by companies remaining as significant oil and gas producers, while also establishing new business models to transition into new industries

(Interviewee 2, 2021). Several companies do this by creating dedicated departments or subsidiaries with a primary focus on the new markets

Our interviewed sample argues that another main challenge will be to facilitate initiatives that make it financially possible to enter new industries as companies are dependent on earnings and a stable bottom line. Today it is expected that companies account for 50 percent of the financing themselves and receives 50 percent support from the public sector; it is not certain that companies have the opportunity to initiate new projects as there are not good enough incentives to run sufficient preliminary projects (Interviewee 3, 2021). Furthermore, it is argued that keeping a high CO_2 tax is important for the restructuring process so that those who produce CO_2 are punished, and those who transition into renewables receive benefits. Accordingly, we found that the risk level of the business model is very unclear when entering a new industry. Therefore, oil and gas companies must find investors who are willing to accept the risk and expenses (Interviewee 10, 2021).

According to our interviewees, another main challenge for oil and gas suppliers is that they must succeed in industrializing in a completely different environment than today. The geology where renewable energy is developed is often different, so it must be tailored in another way. Additionally, we found that the cost level may be a challenge for oil and gas companies since they must adapt to another market with lower margins than what they are currently used to. For instance, offshore wind and hydrogen production are four times more expensive than other electricity, which entails a much higher cost (Interviewee 7, 2021). Moreover, Norwegian companies are quite late in entering several markets which can be another challenge. The consequence is that some of those markets are dominated by large foreign suppliers who have a competitive position that is difficult to break through, precisely because there are benefits such as economies of scale associated (Interviewee 6, 2021). It is vital to work with the company's sustainability strategy to deal with these challenges as companies must improve these key areas to appear sustainable (Interviewee 1, 2021).

Lastly, the majority of our interviewed sample claim that competitors are not important when considering changing their business model. They argue that they would rather be the first movers in the race of developing new industries despite the uncertainty; "…the more people involved, the better, but we are not dependent on them…" (Interviewee 10, 2021). Interviewee 10 (2021) also states that there are no benefits in being late in the transition. When initiating the transition, the company can involve large actors and authorities from the beginning, and setting the direction for the industry restructuring; then the company receives a positive

environmental profile that many appreciate. On the other side, interviewee 9 (2021) argues that the transition is much easier when the competitors already have made the changes. Since all industries tend to move in crowds the snowball effect occurs; then the changes become the direction to go and the market follows. In such situations, companies are helpless without competitors (Interviewee 9, 2021). Accordingly, several new entrants in the market know much more about wind power – these are getting ahead of the game. Catching up with these competitors is argued to be another challenge for oil and gas companies (Interviewee 2, 2021).

Summary

Our findings indicate that there are several challenges oil and gas companies face in the process of changing industrial trajectories. We found that challenges within the following elements are most prominent when changing industrial trajectories: uncertainty, new competence, cost, risk, new environment, and the requirement of great investments. Furthermore, we found that changing the business model is usually ad hoc driven and not based on systematics. Larger companies usually have more routines for assessing and changing their business model compared to small and medium-sized companies. Accordingly, some companies have taken a clear position in renewable industries, while other companies continue within oil and gas production while waiting to evaluate the expenses and risks on the green transition. Furthermore, a lot of existing expertise can be used in new industries, but oil and gas companies must still acquire new industrial expertise and knowledge. Another main challenge will be to facilitate initiatives that make it financially possible to enter new industries as companies are dependent on earnings and a stable bottom line.

6. Discussion

The following chapter discusses our empirical findings in the context of the theoretical framework to create a foundation for reaching our research objective. Based on the discussion we aim to find **how business model innovation can contribute to a restructuring of the Norwegian oil and gas industry and comply with Norway's climate ambitions for 2030 and 2050** by discussing the four presented sub-questions. The first discussion part is based on theories of defining innovation and findings disclosed in section 5.1 Industry Status and relates to sub-question 1: *How does the need for change differ from the willingness to change within the industry?* The second discussion part is based on theories of business model innovation and findings presented in section 5.2 Busines Models and relates to sub-question 2: *Which parts of the business model should be emphasized the most in the restructuring?* The third discussion part is based on theories of environmental factors influencing business model innovation and findings disclosed in section 5.3 The Oil and Gas Industry Landscape and relates to sub-question 3: *What are external challenges oil and gas companies face that may influence business model innovation?* Lastly, the fourth discussion part is based on theories of the process of business model innovation, barriers in committing to business model innovation, and findings presented in section 5.4 Changing Industrial Trajectories and relates to sub-question 4: *What are the internal barriers oil and gas companies face in the process of change?*

6.1 The need for change vs. the willingness to change

There is a significant need for the Norwegian oil and gas industry to change to reach the country's climate ambitions for 2030 and 2050 as described in section 1.1 Motivation. Even though the process is already ongoing, our findings indicate that there is a variation between the oil and gas companies' need for change and their real willingness to change. We argue that identifying how, why, and where this variation occurs is an important part of acknowledging how business model innovation can contribute to the industrial restructuring of the Norwegian oil and gas industry. The following discussion is based on the theoretical framework elaborated in section 3.1 Defining Innovation. Furthermore, we have attained qualitative data through the first part of our interviews (Appendix 4), and our main findings are presented in section 5.1 Industry Status. Hence, this discussion is based on the theoretical framework, collected data, and presented findings, and the main subject for the discussion is sub-question 1: *How does the need for change differs from the willingness to change in the industry?*

Innovation Strategy and Innovative Organizations

Our findings indicate that there is a significant difference between oil and gas producers- and suppliers' need and commitment to change industrial trajectories. Currently, there are 1100 oil and gas supplier companies, while there are only 37 exploration and production companies on the Norwegian continental shelf (Norsk Petroleum, 2020c). The market for oil and gas production is today highly active and profitable, and our findings imply that the production companies will continue to extract oil until the business is no longer profitable. On this basis, the willingness to scale down production, change industrial trajectories, and enter renewable energies is currently low. We argue that there is a difference between the need for change and the actual willingness to change, as the oil and gas production is still very profitable making it attractive to continue the value creation.

On the other side, the supplier industry notices the reduction in oil and gas production, and unless the industry is growing on the production side, it is not profitable for the suppliers to expand. The supplier industry has decreased in terms of turnover, value creation, and employment due to the strong effects of lower oil and gas prices (Menon Economics, 2020). Moreover, Norwegian oil and gas producing companies will likely not invest in new expensive equipment until their current equipment has expired, and at this point, the development within renewable industries may make the continuance of oil and gas production less attractive. As there are currently few expansions in Norwegian oil and gas production, the supplier industry experiences a decrease in turnover. Hence, the suppliers are currently trying to restructure and adjust their offerings to serve other industries. Several supplier companies have succeeded in achieving new customer segments outside the oil and gas industry, and we argue that this part of the industry currently has a larger need and willingness to change. However, while there are significant plans to restructure the activities to new industries, the current status of the restructuring in the oil and gas industry as a whole, has not come far.

Based on our findings, oil and gas companies are aware of the need to change their operations to contribute to sustainable development and comply with the climate targets. However, the awareness of how to change differs within the industry. We argue that oil and gas producers can be described as **reactive type B** companies (Tidd & Bessant, 2009), as most understand the need to change but are hesitant to the process. Most are choosing to continue their oil and gas exploration and production activities and change their current operations to comply with the new regulations. Moreover, many oil and gas producing companies still have extraction and production contracts that secure them revenue from oil and gas activity for several years to

come which makes the industry still profitable to operate in. Changing industrial trajectories will require more substantial changes for the production companies compared to the suppliers which influence their willingness to change. While most oil and gas companies are classified as **reactive**, a few oil and gas producing companies can be classified as **strategic type C** as they know they need to change and have some ability to generate and absorb technology. They are currently transforming and entering new industries as first movers like Equinor. However, when considering the oil and gas production side of the industry as a whole, we classify them as **reactive type B** organizations as illustrated in figure 16 below. On the other hand, we describe most oil and gas suppliers as **strategic type C** organizations (Tidd & Bessant, 2009) as they have a proactive approach to exploiting existing technologies while exploring new opportunities within renewable energy industries and particularly maritime industries. Finding the proper balance between exploiting current resources with exploring new opportunities is a key factor for survival (March 1991, p. 71). Hence, oil and gas companies should aim to balance exploring new business models within renewable energy while exploiting current business models within the oil and gas industry and find how to transition the company successfully between these domains.

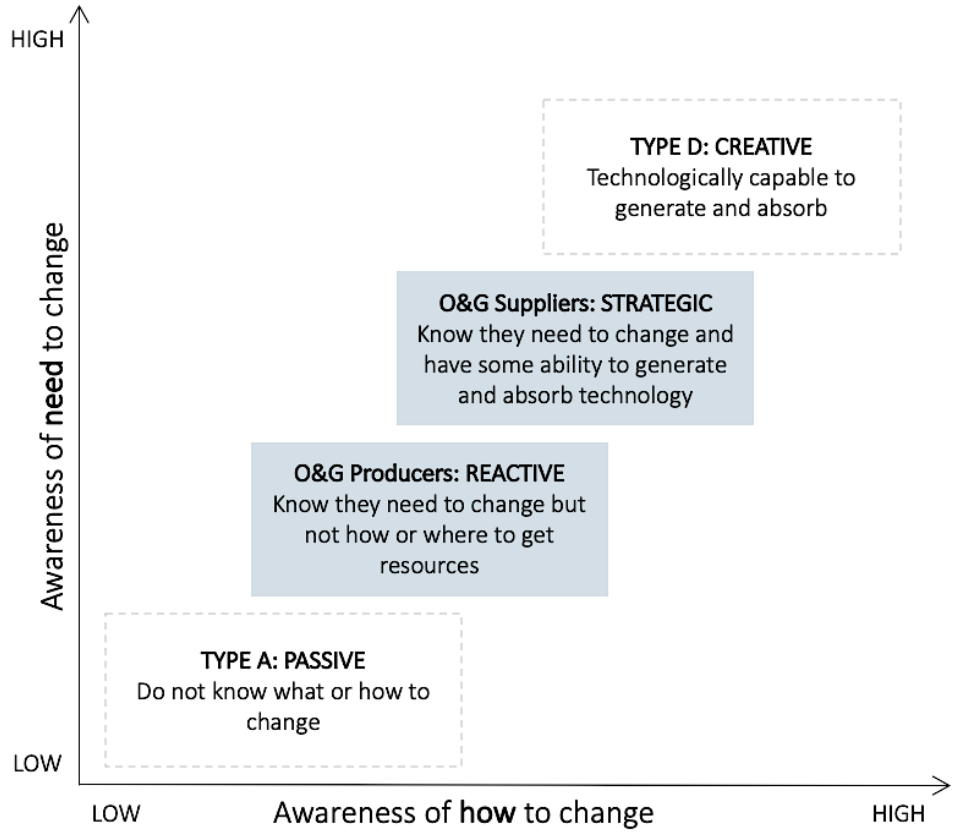

Figure 16. Developing innovation management capability in the oil and gas industry.

To summarize, we argue that the willingness to change differs within the industry between the oil and gas producing and supplying companies; the production companies' willingness is currently low as oil and gas production is still profitable, while the supplier companies' willingness is high since they have no other options as it is not profitable to operate in an industry that is decreasing in market potential. However, to reach Norway's climate ambitions for 2030 and 2050, it is crucial that the oil and gas production companies contribute to the restructuring process. The production companies' primary customer segments are not increasing in size and their equipment will someday expire; hence, production will stop. However, the production will continue as long as there are considerable investments in the oil and gas industry. For example, there are still significant investments in oil and gas, and therefore suppliers gain more from the construction of an oil and gas installation than in the construction of a traditional offshore wind farm. Based on our findings, we argue that while the willingness to change is larger amongst the supplier companies, the need for change in a climate ambition aspect is larger on the production side. The process of industrial restructuring is more prevalent on the supply side of the industry. However, we can likely expect an increase in the focus on the production side as first moving companies like Equinor transition and successfully position themselves in other industries.

Levels of innovation

Our findings indicate that oil and gas companies must change several elements of their business model to succeed in transitioning to renewable industries, which is further discussed in section 6.2 Business Model Innovation. The more the new industrial trajectory differs from current activities and operations, the more substantial the business model innovation should be. Hence, the need for different levels of business model innovation: incremental, sustaining, radical, or disruptive; may differ between companies within the oil and gas industry. Moreover, it can be argued that different industries have different priorities and characteristics where some may be scale-intensive while others are science-intensive. This can also apply to different companies within the same industry like for instance the oil and gas industry. Research and development are crucial elements of the restructuring process in the industry. However, to succeed within the offshore wind industry high volumes are required (scale-intensity) for a company to be profitable.

Our findings show that oil and gas companies usually make small improvements to their business models and that these changes are often ad-hoc driven. The companies might be too risk-averse, as they tend to hold on to their competence for too long and faile to seize new opportunities. Hence, we argue that oil and gas companies currently work with incremental innovation including small changes that involve low levels of risk. However, the oil and gas producers' process of changing industrial trajectories requires **radical business model innovation** as we found that several areas of their business model must change to succeed in other industries. Accordingly, radical business model innovation is required as it is necessary to transform the oil and gas industry by providing new solutions to the energy demand. The process requires both exploitation of resources and exploration of new opportunities.

On the other hand, oil and gas supplier companies can utilize some of their existing technologies and raw materials in other comparable industries. They may need to reduce the focus on oil and gas specific expertise as this may be irrelevant for other industries, and nurture the necessary competence for the new industries (Interviewee 9, 2021). We argue that **sustaining business model innovation** is required at the supplier side, as several supplier companies currently operate in multiple other industries where they can utilize their current competencies and resources. The supplier companies will likely aim to impact the renewable energy industries while keeping the risk levels low. Sustaining business model innovation requires exploitation and exploration while focusing on the existing offerings. However, the supplier companies will aim to make a shift towards increasing profits in renewable energy industries. Some of the innovations may begin as disruptive and transform into sustaining when the supplier companies have acquired a strong position in the renewable energy markets. In any case, the expertise from the oil and gas industry will be important in the restructuring within the supplier industry. Additionally, companies may deploy 'dual structures' or even split or spin-off to exploit opportunities. For example, Aker moved their value creation from solely oil and gas supply/production to entering the renewable industry including offshore wind and carbon handling.

Furthermore, it can be argued that the restructuring in Norway will have an insignificant impact on the global climate goals. Norway will not be able to compete with the Middle East and the OPEC countries that largely control the market price dynamics, have a major impact on supply and demand, and that can produce oil at a fraction of the price (Interviewee 3 & 4, 2021). Also, it is a bit of a paradox that as this energy shift continues, there are countries in the world that are planning new coal-fired power plants that do not contribute to the global solution

(Interviewee 4, 2021). Accordingly, it is "Business as usual" in Houston where they focus on expansion plans in oil and gas, regardless of the sustainability aspect (Interviewee 9, 2021). However, building a significant domestic market through support schemes and regulations within renewable energies will probably mean that the restructuring we have seen in the oil and gas industry will accelerate in the years to come, which will contribute to reaching Norway's climate goals. Several operators are leading the way through significant investments in new solutions for clean energy. Moreover, according to Menon Economics (2020), large parts of the supplier industry will probably evolve from being specialized in oil and gas to having a broader specialization in offshore energy production.

Summary

The purpose of recognizing how the need for change differs from the willingness to change within the industry is important to identify how the willingness to change impacts business model innovation. We argue that the willingness to change differs within the industry between the production and supplier companies; the production companies' willingness is currently low as oil and gas production is still highly profitable, while the supplier companies' willingness is high since they have no other options as it is not profitable to expand when the industry is not growing. Moreover, oil and gas exploration and production will continue as long as there are significant investments in the industry. We argue that the process of changing industrial trajectories for oil and gas production companies requires radical business model innovation as several elements must be changed. Furthermore, the industrial restructuring will likely require sustaining business model innovation on the supplier side as several companies already have entered other industries and can utilize more of their existing resources. Lastly, we discuss that the Norwegian energy restructuring will have a minor impact globally. However, we predict that the restructuring in Norway will accelerate in the years to come.

6.2 Business Model Innovation in the Industrial Restructuring

Business model innovation can help companies strengthen their competitive position through reevaluating who their target customer is, what they should offer to their customers, how they will create their value proposition, and how they can make money from it (Foss & Saebi, 2015; Keeley et al., 2013; Osterwalder & Pigneur, 2010; Tidd & Bessant, 2014). We argue that identifying which parts of the business model should be emphasized the most is an important part of recognizing how business model innovation can contribute to the restructuring of the Norwegian oil and gas industry. The following discussion is based on the theoretical framework elaborated in section 3.2 Business Model Innovation. Furthermore, we have attained qualitative data through the second part of our interviews (Appendix 4), and our main findings are presented in section 5.2 Business Models. This discussion is, therefore, based on our theoretical framework, collected data, and presented findings, and the main subject for the discussion is sub-question 2: *Which parts of the business model should be emphasized the most?*

An organization's customers, offerings, infrastructure, and financial aspects will most likely change over time, especially in dynamic markets like the oil and gas industry. All elements in a business model are subject to innovation, and innovating the organization's business model is key to create long-term, sustainable, competitive advantages and provide a high return on invested capital (Boer & During, 2001; Keeley et al., 2013). As many of the oil and gas companies will remain in the oil and gas industry while they also transition into renewable energy industries, we argue that innovating their current business model to align these two sides of the business is vital if they are not generating a new business model for the new market. The key takeaways from the nine elements in the business model that are to be further discussed are presented in figure 17 below. Moreover, we particularly emphasize the importance of innovating **customer segments**, **value propositions**, **key resources**, **key partners**, and **cost structure**, covering each of the four main areas of a business.

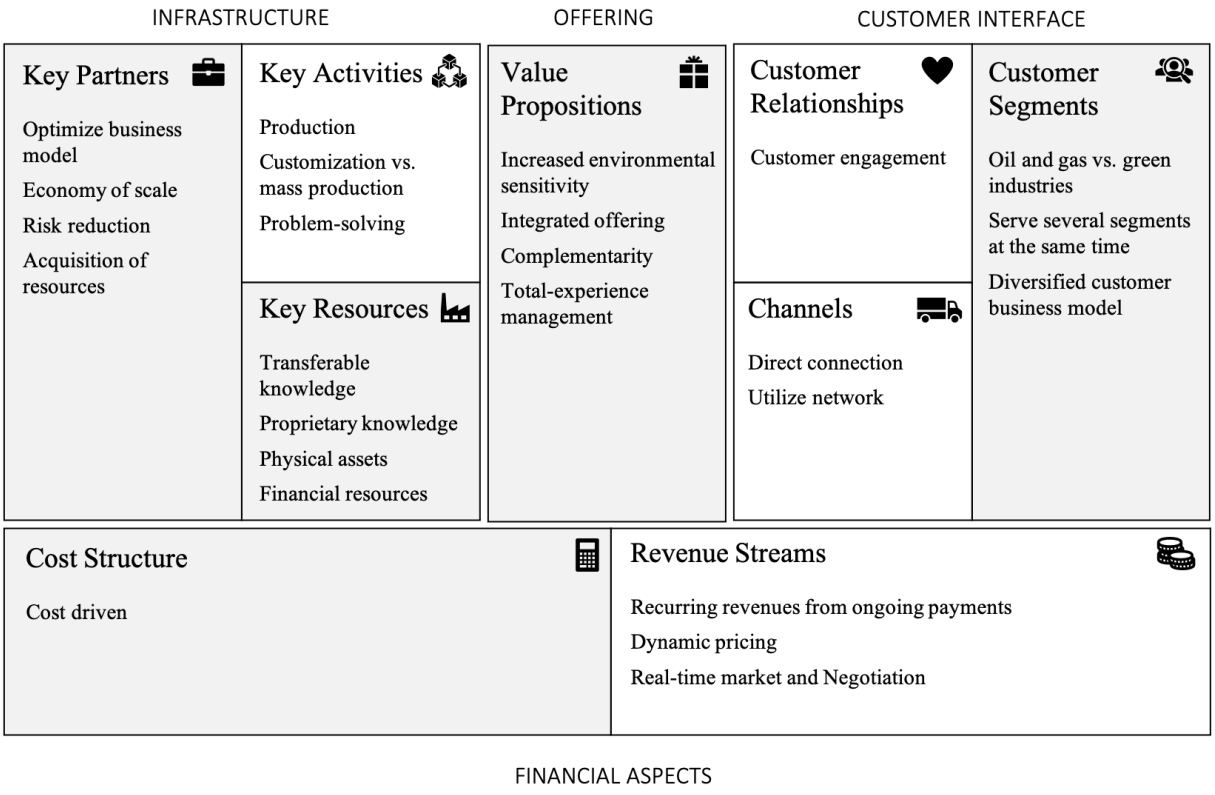

Figure 17. Business Model Canvas for oil and gas companies transitioning to renewable energy industries.

Customer Segments

Customer segments are one of the most essential elements in business models. Accordingly, one of the initial elements in the business model that need to be changed in the restructuring is the companies' customer segments. Our findings suggest that many oil and gas companies, especially suppliers, have already found new customer segments due to the decrease in size of the traditional oil and gas customers. It is argued that they will continue to maintain their position in the oil and gas industry, while at the same time grow in renewable energy industries. However, our findings imply that Norway is quite late in entering a number of these markets which can be challenging for Norwegian oil and gas companies that want to transition. In some of the markets like offshore wind, CCS, and hydrogen, the market is already dominated by large foreign suppliers who already have a competitive position that is difficult to penetrate due to the economies of scale associated (Interviewee 6, 2021). Thus, we argue that oil and gas companies will most likely serve several different customer segments, in the oil and gas industry and renewable energy industries, at the same time in this transition.

Companies will need to define their customer segments by identifying whom they are creating value for and who their most important customers are. Different customer segments have different needs and oil and gas companies will experience substantial differences between the oil and gas customers and customer segments in renewable energies. It is argued that customers in renewable energies take on new roles where the end customer may own the plant that produces the new energy (Interviewee 7, 2021). We argue that this necessitates a diversified customer business model as the customer segments have very different needs and challenges where segments in the oil and gas industry are more or less unrelated to those in renewable energies.

Value Propositions

Due to the sustainability aspect of the industrial restructuring where the aim is to reduce climate emissions, companies now have to create offerings that comply with the climate ambitions which increases the environmental sensitivity of their offerings (Keeley et al., 2013, p.164). They are now trying to solve other types of problems than before, necessitating new value propositions. While our findings imply that it is hard for oil and gas producers to change their offering due to the nature of oil and gas and their delivery and supply agreements, we argue that new industries provide new opportunities. Furthermore, our findings indicate that there is a greater focus on software- and service-based solutions within the oil and gas supply industry. We argue that this trend might be equally important when looking at offshore wind, CCS, and hydrogen industries.

Combining equipment and physical machines with an offering that also includes service, updates, and maintenance can increase the value created. Integrated offerings where companies combine otherwise separate components that complement each other into a complete experience may, therefore, be an important part of the industrial restructuring. Furthermore, we argue that companies can strengthen their value proposition, and thus also their competitive position by offering total experience management. This entails providing an attentive, holistic, management of their consumer's experience across the offering's lifecycle (Keeley et al., 2013, p.166). As the industries of offshore wind, CCS, and hydrogen already have some incumbent companies with strong market positions, this can be a way for oil and gas companies to enter the market. Moreover, entering renewable energy industries may require rebranding like Equinor did when they transitioned from the oil and gas company Statoil to becoming the

energy company Equinor. We argue that rebranding can be an important part of aligning the company's new set of values and offerings and can help oil and gas companies enter renewable energies as they through rebranding can reduce their associations with the negative impacts of the oil and gas industry.

Channels

This leads us to how the companies will be reaching and communicating with their customer segments to deliver their value proposition (Keeley et al., 2013, p.52; Osterwalder & Pigneur, 2010, p.26). Channel innovations have been argued to be particularly sensitive to the industry context in which they are applied (Keeley et al., 2013, p.53). This is an element in the business model that was not emphasized as important by our interviewed sample. However, we argue that it is increasingly important to consider this aspect when entering a new industry as it can be crucial in bringing the value proposition to the market. The need and demand for sustainable solutions are currently larger than the supply, and oil and gas companies transitioning into renewable energy industries will likely have a direct connection with their customers. Moreover, we argue that oil and gas companies are in a great position to utilize their network and partnerships as they have corporate customers and not private consumers.

Customer Relationships

Lastly, the final element in the customer aspect of the business model is how companies establish and nurture their customer relationships (Osterwalder & Pigneur, 2010, p.28). Our findings indicate that transitioning from the oil and gas industry to renewable energy industries, such as offshore wind, entails new customers and suppliers. It is argued that such a transition enforces involvement from their customers where their expertise is utilized early in the process (Interviewee 10, 2021). Our findings imply that this differs from the traditional oil and gas industry, resulting in new customer relationships. As industrial restructuring requires the acquisition of new knowledge and experience from those markets one wants to enter, we argue that fostering compelling interactions through customer engagement can be vital. Moreover, new markets have different needs, necessitating interaction between the oil and gas company and their customer to develop profitable customers and obtaining a competitive advantage.

Revenue Streams

This leads us to the financial viability aspect of the business, more specifically how revenue streams occur from value propositions being successfully offered to the customers. Revenue streams are closely connected to what value each customer segment is willing to pay for and how each of the revenue streams contributes to the business' overall incomes (Osterwalder & Pigneur, 2010, p.30). To adapt to the changing market conditions when transitioning into renewable energy industries, we argue that the companies will likely need to adjust their profit model. Our findings indicate that revenue streams have already changed dramatically in the oil and gas industry, which will most likely influence the profit models of the new industries they enter. Previously their revenue streams came from the sale of steel products and typically large drilling packages while there is now a larger amount of revenues from services like upgrades, maintenance, spare parts et cetera. While the new markets including offshore wind, CCS, and hydrogen will need the production of physical equipment they will also depend on good service providers especially due to their location on the Norwegian continental shelf. Thus, we argue that this provides new opportunities where the companies can obtain recurring revenues from ongoing payments to provide post-purchase customer support to their value proposition. Moreover, their pricing mechanism will likely be dynamic and based on market conditions like supply and demand, as well as negotiation between two or more parts.

Key Resources

For companies to be able to offer and deliver the previously described elements they require some key resources and assets. Our findings suggest that there is a lot of available transferable knowledge from the oil and gas industry which is important in new industries. The oil and gas companies have played a central role in the transformation in the maritime industry as they have a lot of technical and business expertise that provides a good foundation for investing in renewables (Interviewee 1, 2021). Moreover, they have a lot of experience in running large projects which can be valuable in the event of major investments in renewable energy industries (Interviewee 5, 2021). New markets and industries will also necessitate the acquisition of new industry-specific skills and competencies. Furthermore, we argue that intellectual resources may also be of great importance as many companies focus on the development of new technologies and solutions resulting in propriety knowledge requiring patents and copyrights.

Additionally, oil and gas companies transitioning to renewable energy industries will likely rely heavily on physical resources which are often capital intensive. There are large costs associated with testing technology on a full scale, and the possibility of a return on environmental technology projects is associated with risk. Our findings imply that it is crucial for the companies that they can profit from transitioning to new renewable industries, if not – they will not change. One of the main challenges is, thus, to facilitate initiatives that make it financially possible to enter new industries as companies are dependent on earning and a stable bottom line. To ensure sustainable growth and innovation, the public sector shares the risk associated with the development, construction, and testing of environmental technology (Innovasjon Norge, 2020). It has been argued that the policy instruments have already stimulated industrial restructuring as many companies have used them to innovate parts of their business model (Interviewee 6, 2021). Thus, we argue that the oil and gas companies' new business models may require additional financial resources and/or financial guarantees to be viable.

Key Activities

Organizations have to perform several key activities to offer and deliver their value propositions, solve problems and collaborate with their partners and networks (Osterwalder & Pigneur, 2010, p.36). While this element of the business model was not emphasized by our interviewed sample, we still have some thoughts on important aspects that should be considered. As previously mentioned, our findings indicate that one of the main challenges for the companies is to be able to succeed in industrializing in a completely different way than today. Oil and gas companies entering the offshore wind industry must shift from customizing for each specific oil field to providing large deliveries of duplicated wind turbines. Additionally, when a component does not work in the oil and gas industry, it stops an entire oil field and leads to very large losses, while if a component breaks in a wind turbine solely the individual wind turbine stops for a short period (Interviewee 5, 2021). Moreover, the geology where renewable energy is developed is often different compared to oil and gas plants, requiring new solutions and constant problem-solving. Therefore, we argue that oil and gas companies' processes and key activities must transform to succeed, and production activity will likely dominate the business model of the manufacturing companies.

Key Partnerships

Lastly, the final element in the infrastructure perspective of the business model is how the company connects with its network of suppliers and partners to create value. For oil and gas companies to be able to enter renewable energy industries, our findings imply that they will have to form alliances and partnerships with companies with complementary skills and competencies. This can be companies within the industry they are currently operating in, but it can also be across industries including companies with a position in the industry they want to enter. This way, the oil and gas companies can optimize their business model, obtain economy of scale, reduce risk, and acquire valuable resources. How the companies are motivated to create partnerships will vary, however, we argue that reducing the risk associated with entering an unfamiliar market and acquiring valuable resources may be particularly important. Moreover, there will be more players involved in the value chain of renewable energies compared to the oil and gas industry (Interviewee 1, 2021). This allows for more input in decisions that make it possible to customize their offering to the needs of their customers. Furthermore, due to the shift from only providing products to also including services, we argue that there will be an increased demand for partners with competence related to software developments and a decreased demand for traditional suppliers and factories. Some oil and gas companies are part of constellations that have worked together for a long time and that have changed and adapted in the same manner (Interviewee 5, 2021). While there may be benefits of continuing the cooperation into new markets, we argue that they should also widen their horizon and explore new opportunities with new partners.

Cost Structure

Finally, the business model elements result in the company's cost structure which includes all costs incurred in operating a business. Business model cost structures are to a large extent cost-driven or value-driven (Osterwalder & Pigneur, 2010, p.40). By transitioning from oil and gas to renewable energy industries our findings indicate that the companies must adapt their cost level to a market that is lower than what they are used to from the oil and gas industry. While there already is pressure to drive costs down in the oil and gas industry to remain competitive regardless of the oil price, their cost focus must change to succeed in the new industries. We argue that this likely will entail a cost-driven business model where the focus is to minimize costs wherever possible. Moreover, it will likely also include some value-driven aspects with a particular focus on value creation. As illustrated previously with the different consequences if

a component stops working in the oil and gas industry compared to offshore wind, our findings suggest that oil and gas companies have different measures of what is considered critical and not. They will only cut costs where they can tolerate fault in situations (Interviewee 5, 2021) and such situations may differ widely between industries. Furthermore, offshore wind and hydrogen are argued to be four times more expensive than other energy sources, which entails a much higher cost (Interviewee 7, 2021). This requires serial production and succeeding with robotization and digitalization of production processes to ensure a viable cost level. The ideal profit model will vary widely by context and industries and must be aligned with the organization's strategy and innovation intent. Thus, we argue that innovating the profit model through the cost structure may be key for oil and gas companies as new entrants to attain market shares in industries like offshore wind, CCS, and hydrogen.

Summary

The purpose of business model innovation is to identify rooms for improvements and find new ways of delivering and capturing value. While there are several similarities between the oil and gas industry and the renewable energy industries, it is important to recognize that new problems and challenges necessitate business model innovation for companies to stay competitive. There is no perfect business model that can be duplicated from one company to another as they have different strengths and weaknesses, and because each business model is aligned with the individual company's strategy. However, we have identified some key elements that will need to be innovated for the majority of oil and gas companies to succeed in the industrial restructuring. This includes particularly their customer segments, value propositions, key resources, key partners, and cost structure. In other words, elements covering each of the four main areas of a business: 1) customers, 2) offering, 3) infrastructure, and 4) finance.

6.3 Environmental Factors Influencing Business Model Innovation

Business model innovation can also help oil and gas companies adapt to external factors like market forces, industry forces, key trends, and macroeconomic forces that, to various degrees, influence the environment in which they operate in. Identifying some of the main external factors influencing the oil and gas industry landscape is, thus, an important part of recognizing how business model innovation can contribute to the restructuring of the Norwegian oil and gas

industry. The following discussion is based on the theoretical framework elaborated in section 3.3 Environmental factors influencing business model innovation. Furthermore, we have attained qualitative data through the third and fifth part of our interviews (Appendix 4) and utilized some of the quantitative data presented in Menon Economics' (2020) report, and our main findings have been presented in section 5.3 The Oil and Gas Industry Landscape. Hence, this discussion is based on our theoretical framework, collected data, and presented findings, and the main subject for the discussion is sub-question 3: *What are external challenges oil and gas companies face that may influence business model innovation?*

While the different segments and companies in the oil and gas industry will be influenced by external factors differently, we argue that the following elements will necessitate changes in the business models for most companies to stay competitive. As illustrated in figure 18 below, we have developed a figure of the Norwegian oil and gas industry landscape to illustrate our most prominent findings. The key takeaways from the 18 factors in the business model environment will be further discussed. While all four main areas of their business model environment are found to have a significant impact on the oil and gas industry, we argue that market forces and key trends are particularly important.

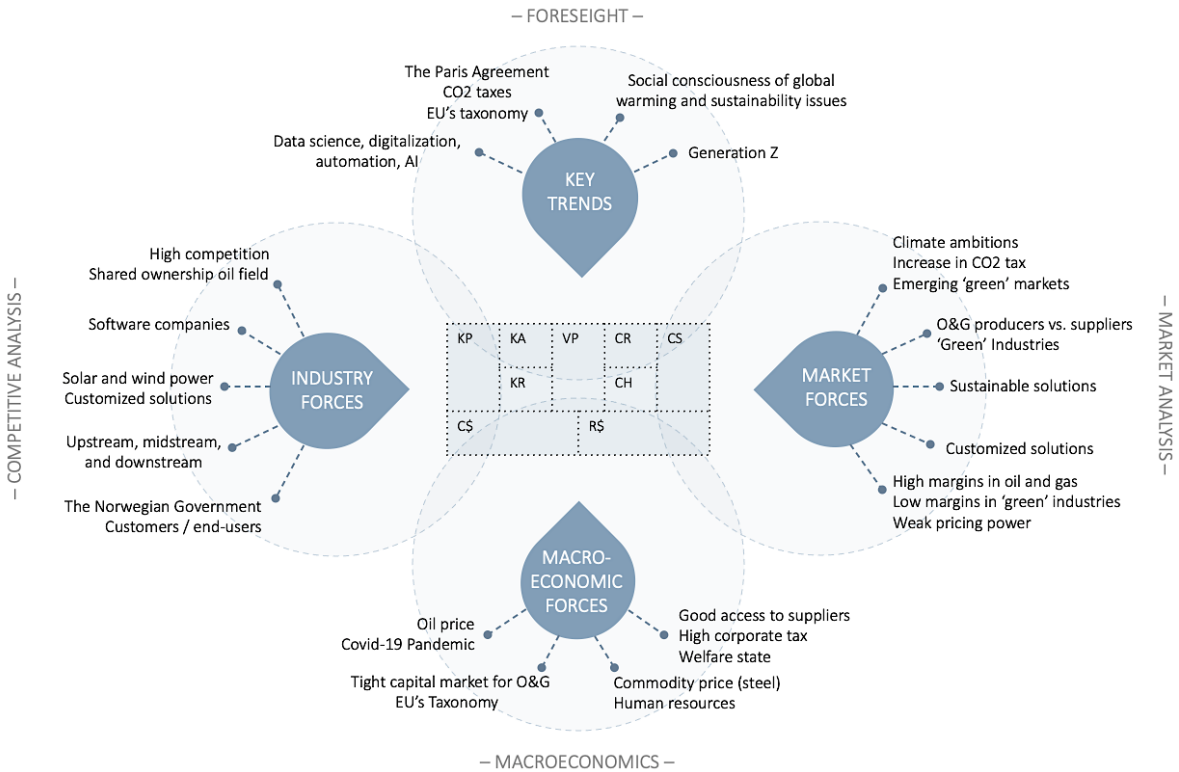

Figure 18. The oil and gas industry landscape.

Market Forces

Market issues concern key factors that affect the customer landscape and transform the market (Osterwalder & Pigneur, 2010, p.202). Our findings imply that the most prominent issue is the different sustainability goals and climate ambitions. There has been an increase in the CO_2 tax, making the production of oil and gas more expensive for Norwegian companies and, hence, influencing their profitability. Our findings suggest that the need for sustainable change creates a shift in the oil and gas industry between the companies that change and become more sustainable, either by making their production less environmentally damaging or by transitioning to new industries, and the companies that do not. There is an increase in demand for sustainable solutions with emphasis shifting from only offering physical equipment to an increased focus on software- and service-based solutions. Emerging markets within renewable energy industries are also becoming more important, influencing the attractiveness of the Norwegian oil and gas industry.

Market segments concern the main parts of an industry and there are several ways of defining the market segments in the oil and gas industry. One can for instance segment the market in terms of upstream, midstream, and downstream parts of the industry. Menon Economics differed between six segments: operators, drilling and well, maritime business, platforms and onshore facilities, subsea production plants, and support functions, while we have differentiated between oil and gas producers and oil and gas suppliers. In our interviewed sample it was argued that there has always been strong global competition and overcapacity in the oil and gas supplier industry which has resulted in high pressure on the supply side. In Norway, there are currently 37 oil and gas producing companies while the supply side of the industry constitutes over 1100 companies. As illustrated previously in figure 13, oil and gas companies expect their revenue to increase in several renewable energy industries towards 2023. Thus, their business will be influenced by market segments from both the oil and gas industry and other industries including offshore wind, CCS, and hydrogen.

Needs and demands outline market needs and ought to analyze how well they are served (Osterwalder & Pigneur, 2010, p.202). While some argue that there have been large fluctuations on the demand side of oil and gas, making the markets less attractive, others emphasize that there is still great demand and that it reduces companies' desire and motivation to enter new, less profitable, industries. Nonetheless, the demand for sustainable solutions to reduce climate change is increasing and influencing all industries, especially the oil and gas industry. Our findings suggest that development in market needs where customers now have different

requirements than before is, thus, one of the biggest drivers for change. While the attractiveness of the oil and gas market can be debated, new technology has emerged, and oil and gas companies have started to move into renewable energies due to the increase in the demand for more sustainable industries.

Switching costs describe the impacts related to customers switching business to competitors (Osterwalder & Pigneur, 2010, p.202). As the size of the supplier side is substantially bigger than the producer side of the oil and gas industry, it will be easier for the production companies to switch their supplier due to the large competition in this part of the industry. Our findings imply that oil and gas companies use a lot of resources to compete for contracts where many companies base their operations on these contracts and operate under set conditions over a certain amount of time. As all oil and gas platforms are different and require to a large extent customized equipment, the companies will benefit from having suppliers that already know the platform and the challenges to be solved. Hence, it may be hard for customers to find and purchase similar offers which increase the switching costs.

Revenue attractiveness comprises elements related to the market and the company's pricing power (Osterwalder & Pigneur, 2010, p.202). Our findings indicate that there are currently higher margins in the oil and gas industry compared to offshore wind, CCS, and hydrogen, which highly influence the companies' willingness to transition. Oil and gas producers' offering to the market is oil and gas, a commodity. The raw material is a natural resource that can be further utilized as inputs in the production of other goods. While Norwegian oil and gas producers have little influence over the oil and gas price, the price level has been relatively high, making the industry prosperous. The supplier side of the industry is to a larger extent dependent on identifying what value their customers are willing to pay for, where the largest margins can be achieved, and if their customers can easily find and purchase similar products and services at a lower price. Thus, our findings suggest that revenue attractiveness is more important for the supplier side of the oil and gas industry as the producers have little to no pricing power.

Industry Forces

Competitors are incumbent companies with strengths that allow them to take a competitive position in the market (Osterwalder & Pigneur, 2010, p.204). The Norwegian oil and gas industry has an oligopolistic market structure with a few companies dominating the market through large market shares. Our findings indicate that oil and gas companies are highly influenced by their competitors as they have different price aspects and offerings. The dominant players will differ between the producer and the supply side of the oil and gas industry as they have different offerings to the industry and target different customer segments. Furthermore, the focus on sustainable development is resulting in the oil and gas industry decreasing in volume and, thus, increasing the competition. Moreover, oil fields on the Norwegian continental shelf are often owned by several competing players together. This entails that oil and gas companies are also affected by how they coexist with their competitors.

New entrants are insurgent companies that enter the industry with a different business model, aiming to attain market shares and position themselves (Osterwalder & Pigneur, 2010, p.204). Our findings suggest that new actors have a positive impact on the oil and gas companies as they can create new business opportunities. As there has been a shift from a product focus to a software and service focus new types of businesses are investing in the industry, increasing the number of entrants. While there have not been many new traditional oil and gas players in the industry, there are now other types of businesses that are taking an interest in the industry. New players bring new technology, methods, and ways of delivering value in a new and more efficient way. They challenge the traditional mindset in the oil and gas industry and contribute to sustainable development through renewable thinking. Several of the companies already operate in multiple industries and markets at the same time. The Norwegian industry landscape makes this possible through collaborations and development across industries and sectors through cluster networks and different partnerships.

Substitute products and services involve other value propositions that can challenge and replace an offering (Osterwalder & Pigneur, 2010, p.204). The alternatives to oil and gas energy can be nuclear power, solar power, ethanol, and wind power. Thus, our findings imply that some products can serve as substitutes for oil and gas producing companies. However, these sources of energy are much more expensive to produce, making them less attractive to invest in. Offshore wind power is one of the main areas that oil and gas companies consider transitioning to, but they are still hesitant due to the low margins that can be achieved. For oil and gas suppliers there are many substituting products and services which results in large

competition between the companies. Their customers often rely on customized products and processes which creates big competition between companies that can offer similar solutions to the problem at hand.

Suppliers and other value chain actors concern key value chain incumbents in the market as well as new emerging players (Osterwalder & Pigneur, 2010, p.204). The oil and gas value chain represents the sequence of activities from the supply source to trading mechanisms. Our findings suggest that the supply chains in the oil and gas industry are much more competitive today as they can deliver offerings more cost-effectively than before. Furthermore, based on our findings, we argue that oil and gas companies are highly dependent on other players, and changing their business model, especially their value propositions, will affect their entire value chain. The use of new technology can mean that the company needs a different type of supplier than before, requiring changes to be made in their business model. Furthermore, suppliers and other value chain actors are argued to be especially important in renewable energy industries as there are more players involved in the value chain compared to the oil and gas industry. While suppliers can utilize their knowledge and expertise from the oil and gas market and contribute to the development of renewable energy industries, many companies will also need to acquire new industrial-specific knowledge and competencies. Thus, our findings indicate that the industrial restructuring will change the need for different types of suppliers and other value chain actors.

Stakeholders are the actors that influence the oil and gas companies and their business models (Osterwalder & Pigneur, 2010, p.204). The most obvious stakeholders for oil and gas companies are likely their owners and investors. Furthermore, we argue that the government is to a large extent a stakeholder in the Norwegian oil and gas industry and that they will likely have a critical role in the development of renewable energies. Our findings indicate that customers are considered an important influence as oil and gas companies try to adapt to changes in customer's demands. Customers are also argued to be important because they can reduce the margins of oil and gas companies' offerings as there is rarely a fixed price but usually negotiation between the actors. Competitors may also serve as stakeholders, particularly for oil and gas producing companies, due to Norwegian oil fields often being owned by several competing players together.

Key Trends

Technology trends are technological developments that can threaten the company's business model or enable them to improve and evolve (Osterwalder & Pigneur, 2010, p.206). Our findings imply that the traditional oil and gas companies are highly affected by the increasing focus on sustainable technologies to reduce climate change. This involves technologies including data science, software solutions, digitalization, automation, robotization, and artificial intelligence and is particularly associated with energy efficiency and electrification of oil and gas installations. Thus, technology trends are increasingly adapted to sustainable projects. New technologies bring new opportunities through new products and processes. Furthermore, new industries can emerge where oil and gas companies can utilize the technology and expertise the industry possesses today to transition into other related industries.

Regulatory trends involve laws and regulations that influence business models, and the way companies operate (Osterwalder & Pigneur, 2010, p.206). Our findings show that regulations have, and will continue to, influence the Norwegian oil and gas industry substantially. Particularly the Paris Agreement is argued to be governing for how oil and gas companies operate as it requires companies to reduce their environmental footprint. Furthermore, our findings suggest that the EU's taxonomy likely will affect access to finance and the development of sustainable industries. The taxonomy ensures that certain criteria are met for activities to be considered sustainable or green and will highly influence investors. On the other hand, our findings indicate that the EU's taxonomy will likely not affect the daily oil and gas operations as today's framework makes it impossible for oil and gas related activities to be considered anything but brown. This creates challenges in the sustainable development aspect as oil and gas companies likely will continue their value creation as they are judged by the taxonomy either way.

Social and cultural trends comprise shifts in social and cultural values that may influence buying behavior and the need for business model innovation (Osterwalder & Pigneur, 2010, p.206). Our findings suggest that social and cultural trends can strongly influence oil and gas companies' reputations. There is a growing social consciousness amongst customers where they are increasingly conscious of global warming, sustainability issues, and prefer green offerings. There is generally an unfavorable image of the oil and gas industry where the market is considered to be in decline. We found that social and cultural trends influence access to expertise and competencies through the acquisition of new labor. Acquiring competence is

affected by whether the market one operates in corresponds with markets in which new employees want to work.

Socioeconomic trends involve changes in demographic factors, wealth distribution in the market, and spending patterns (Osterwalder & Pigneur, 2010, p.206). While the theoretical framework focus on private consumers and their buying behavior, the oil and gas industry has corporate customers. Our findings, thus, focus on socioeconomic trends in terms of demographic factors that influence oil and gas companies' access to new employees. It is argued that oil and gas companies must take a stand concerning sustainable development to be an attractive employer for the younger generations, especially generation Z. The new generations are more aware of global warming and climate change and, thus, more aware of what type of company they want to work in. We argue that the new workforce over time will influence the strategies and visions of their companies and, thus, highly affect the development of the traditional oil and gas industry and new sustainable industries.

Macroeconomic Forces

Global market conditions outline external factors that influence the oil and gas industry from a macroeconomic perspective (Osterwalder & Pigneur, 2010, p.208). Many oil and gas companies are to a large extent export-oriented, and our findings indicate that the industry is highly influenced by global market conditions. Traditionally, the oil and gas industry has always explored other industries when the oil and gas market is struggling. We are now experiencing a global pandemic and a low oil price which highly challenge the traditional oil and gas industry. Our findings imply that the industry, especially the suppliers, is sensitive to changes in the oil price and that the fluctuation in the oil price impacts their focus on innovation and sustainable development. We found that the restructuring of the oil and gas industry and the development of sustainable industries require high and consistent oil price to keep pace. Furthermore, our findings suggest that the Covid-19 pandemic impacts the industry differently compared to other crises as it affects both the supply and demand side of oil and gas at the same time as the price of oil and gas has fallen markedly. Our findings imply that these global market conditions will have an influence on oil and gas companies' turnover in the upcoming years, and will likely increase the speed of the industrial restructuring of the oil and gas industry and the development of renewable energy industries.

Capital markets describe current capital market conditions and comprise how they influence companies' ability to ensure access to finance (Osterwalder & Pigneur, 2010, p.208). Our findings suggest that there are no prominent challenges with the international capital market but the possibilities of ensuring access to finance will highly depend on whether the companies' activities are considered sustainable or not. Investors want to be more involved in projects that can be classified as sustainable, resulting in more favorable financing for companies with a green profile. Thus, it will become increasingly difficult to get finances to develop offerings in the oil and gas market resulting in a shortage of capital for those companies that refuse to change in a sustainable manner. It will be easier to ensure access to finance for projects within offshore wind, CCS, and hydrogen, which will likely impact companies' willingness to transition to these industries. Moreover, our findings imply that the EU's taxonomy will likely play a central role in this as it provides investors information about the companies' sustainability profile.

Commodities and other resources highlight current trends that influence companies' ability to acquire the resources required for the company's business model (Osterwalder & Pigneur, 2010, p.208). Our findings suggest that access to raw materials and other resources influences the oil and gas industry to some degree. The price of steel fluctuates and is currently high, affecting some of the oil and gas companies that supply physical equipment et cetera. We also argue that oil and gas companies transitioning to other markets like offshore wind, CCS, and hydrogen are influenced by the competition between companies to attract prime talents with the desired industry-specific knowledge and experience.

Economic infrastructure concerns the economic infrastructure of the markets in which the companies operate (Osterwalder & Pigneur, 2010, p.208). We argue that oil and gas companies have great access to suppliers and customers, however, the corporate taxes and labor costs in Norway are quite high. While our findings suggest that the economic infrastructure does not have an impact on the oil and gas industry or the development of more sustainable industries because of the economic infrastructure of Norway being well-developed, we dispute this claim for the very same reasons. For instance, the Covid-19 pandemic freed up an enormous amount of funds from the public sector and initiated many new sustainable projects that have accelerated the development. Moreover, Menon Economics (2020) found that the so-called "oil package" contributed to increasing the activity level compared to what it would have been without it. Norway as a welfare state provides great opportunities and is invested in contributing to sustainable development.

Summary

The purpose of mapping the oil and gas industry landscape is to identify environmental factors that can affect oil and gas companies' need and willingness to initiate business model innovation. As discussed, business model innovation can help oil and gas companies adapt to external factors which we argue is important in the restructuring of the Norwegian oil and gas industry. The oil and gas industry landscape are highly affected by market forces including climate ambitions, emerging green markets, the need for sustainable solutions, and high margins. Moreover, industry forces are also discussed to impact their operations through high competition, shared ownership of oil fields, substitute products like solar and wind power, and stakeholders including the Norwegian Government, investors, and customers. Furthermore, key trends like digitalization, automation, increase in CO_2 taxes, social consciousness of global warming, and sustainability issues are argued to have an effect and increase the need for business model innovation. Lastly, we argue that macroeconomic forces including the oil price, Covid-19 pandemic, tight capital markets, commodity prices, access to human resources, and high corporate tax affect the Norwegian oil and gas industry.

6.4 The Process of Changing Industrial Trajectories

Identifying barriers to achieve business model innovation is increasingly important as research shows that most companies are not able to initiate nor achieve the process due to several challenges and barriers (Björkdahl & Holmén, 2013; Chesbrough, 2010; Foss & Saebi, 2016). We argue that identifying the different barriers and challenges oil and gas companies face in the process of changing industrial trajectories is an important part of recognizing how business model innovation can contribute to the restructuring of the Norwegian oil and gas industry. The following discussion is based on the theoretical framework elaborated in sections 3.4 The Process of Business Model Innovation and 3.5 Barriers in Committing to Business Model Innovation. Furthermore, we have attained qualitative data through the fourth part of our interviews (Appendix 4), and our main findings are presented in section 5.4 Changing Industrial Trajectories. Thus, this discussion is based on our theoretical framework, collected data, and presented findings, and the main subject for the discussion is sub-question 4: *What are the internal barriers oil and gas companies face in the process of change?*

Based on our findings, we argue that the different barriers can occur at various phases of the process of business model innovation, however, some barriers are more likely to happen at

specific stages. Furthermore, we suggest that the barriers the Norwegian oil and gas companies encounter can be prevented and that the challenges can be solved by incorporating a proper structure for the process of changing the business model. Osterwalder & Pigneur's (2010) model on the process of business model innovation is an intuitive model that is easy to apply, which can be utilized to guide oil and gas companies' process when entering new industries, including mapping their main activities and potential barriers/challenges. This section is structured by the process of business model innovation, where we have identified when the different barriers are likely to occur in the process of changing the business model, as illustrated in figure 19 below.

Mobilize	Understand	Design	Implement	Manage
Prepare for a successful business model design project	Research and analyze elements needed for the business model design effort	Generate and test viable business model options, and select the best	Implement the business model prototype in the field	Adapt and modify the business model in response to market reaction

Setting the stage	Immersion	Inquiry	Execution	Evolution
Organizational resistance	The dominant logic	Uncertainty and complexity	Deficient managerial knowledge	No BMI routines or processes
	Market dependency	Conflict with disruptive innovation		

Figure 19. Barriers in the process of business model innovation. The barriers are color-coded: dark blue = organizational barriers, light blue = cognitive barriers, grey = additional barriers.

Mobilize

First, we suggest that **organizational resistance** is probable to occur at the "Mobilize" phase where organizations are at the beginning of the process by assembling suitable teams. One of the challenges of this phase is the motivation levels of managers and employees (Osterwalder & Pigneur, 2010, p. 250), hence, it is crucial to identify and prevent organizational resistance. Organizational resistance describes counteract from the corporate culture when changing the business model and intimidating established positions, processes, privileges et cetera (Foss & Saebi, 2016). Our interviewed sample did not mention any of these internal barriers when asked about possible challenges when changing industrial trajectories. While our findings indicate that companies emphasize external factors, we argue that internal barriers including organizational resistance are still important but not acknowledged. For example, the oil and gas

industry is highly profitable compared to the renewable industries, which can lead to strong organizational resistance when entering these industries. We also found that there is currently a big gap between the older generation that highly values the oil and gas industry as it has provided Norway with prosperity, and the younger generation that focuses more on sustainability. Hence, we argue that these two generations collaborating to enter renewable industries are probable to create organizational resistance within the organization. Saebi (2016) suggests that organizational resistance can be prevented by designing organizational cultures that support innovation. Lastly, we suggest that organizations can prevent these challenges by running a communication campaign announcing the new business model, which can help face organizational resistance or lack of motivation.

Understand

Second, we argue that **the dominant logic** may be prominent in the "Understand" phase of changing the business model. This phase involves developing a total understanding of the context in which the business model will progress, including analysis of potential customer segments and sketching out competitor's business models (Osterwalder & Pigneur, 2010, p.252). One of the key challenges in this phase is to question the current business model as it often has provided long-term success. This relates to the dominant logic in the Norwegian oil and gas industry where organizations keep their competence for too long and may fail to exploit new opportunities. The dominant logic or "bias of the current business model" refers to prevailing knowledge within the firm. This issue can be perceived as something positive since it reduces costs of handling new information and makes the firm predictable for its stakeholders. However, it also leads new information to be rejected as it does not comply with the dominant logic (Foss & Saebi, 2016). Companies require both single- and double-loop learning, and repetitive issues faced daily can easily be solved by single-loop learning. However, double-loop learning challenges the dominant logic of a company and is required for handling complex challenges (Argyris et al., 1978) such as changing the business model.

This cognitive barrier relates to our qualitative findings, as we found that one of oil and gas companies' challenges is that they may hold on to their competence from oil and gas for too long. Accordingly, we found that oil and gas competence is not as relevant for new industries such as offshore wind. The barrier is problematic as oil and gas companies cannot bring this specific knowledge into new industries (Interviewee 10, 2021). Hence, our findings indicate

that the dominant logic is present in the Norwegian oil and gas industry, as the companies can hold on to competence for too long and may fail to exploit new opportunities. Saebi (2016) suggests that these challenges could be managed by ensuring balance in how to best utilize existing business models and at the same time open up for new and improved business models. To some extent, these challenges can be handled by investing more in research and development to create offerings that are adapted to the new markets. It can also be important to enter new alliances and partnerships to share the cost and risk of these developments (Interviewee, 6, 2021).

Additionally, when evaluating the competitor's business model in this phase, it is vital to prevent the barrier of depending on the competitor's developments. **Market dependency** describes companies that do not change their business model since they are dependent on these changes being implemented by competitors in the industry first. Our findings indicate that market dependency is not significant in the oil and gas industry when considering entering renewable industries. Most of our interviewed sample argue that they would rather be first movers despite the uncertainty of new industries. Accordingly, they argue that what their competitors do is not important when considering changing their business model. However, interviewee 9 (2021) stated that it is easier to transition into renewable energies when the competitors have already implemented the changes, due to the snowball effect where the changes become the market direction. These results should be taken into account when considering Björkdahl & Holmén's (2013, p. 221) study presented in the theoretical framework, which suggests that managers tend to favor changes they see implemented by other actors in the same industry. Thus, we argue that oil and gas companies that aim to be first movers will not depend on their competitors when changing their business model but likely keep an eye on their competitors' developments to ensure competitive advantage. While the industry as a whole will likely wait for a snowball effect, some companies will have to take the lead for the restructuring of the industry to be successful.

Design

In the "Design" phase of the process, organizations aim to find the most appropriate business model by generating and testing several options. Accordingly, brainstorming, testing, prototyping, and selecting are key activities to proceed. However, critical challenges involve generating new models and succeeding in maintaining them, suppressing bold ideas, or falling

in love with ideas too quickly (Osterwalder & Pigneur, 2010, p.254). We argue that the barrier of **complexity and uncertainty of the business innovation model process** is likely to happen at this phase, describing the uncertain and risky process of changing the business model, as it is challenging to predict the outcomes (Foss & Saebi, 2016). We found that uncertainty is one of the main challenges when oil and gas companies enter renewable energies, as the companies must work with completely new circumstances including new customer segments, framework conditions, and demands (Interviewee 4, 2021). Subsequently, we found that the new business models bring high levels of risk and finding investors willing to accept the risk and expenses is challenging for oil and gas companies. Changing industrial trajectories brings significant levels of uncertainty since most of the renewable industries are currently in the start-up phase and it is difficult to predict the outcomes. Thus, we argue that the cognitive barrier of complexity and uncertainty is strongly present in Norwegian oil and gas companies entering renewable industries. Lastly, Saebi (2016) suggests that the barrier of complexity and uncertainty can be handled by giving managers the expertise to become experts on business model innovation.

Additionally, we suggest that the barrier **conflict with disruptive innovation** is probable to occur at the design phase, where companies do not initiate business model innovation since the new business model conflicts with the traditional configurations of the organization's assets. Organizations find it challenging to handle the conflict between the new business model which is required to exploit new disruptive technology, and the current business model suited for the existing technology (Chesbrough, 2010, p.358). Our findings show that oil and gas companies must gain new competence and utilize new technologies when entering renewable energies and that this will affect the entire value chain (Interviewee 8, 2021). We found that oil and gas companies can finance the development of new technologies by using the revenues they are currently generating and move forward in renewable energy industries. On the other side, the oil and gas industry does not possess all competence and technology required to profit and succeed in other industries. Consequently, we argue that there is a conflict between the disruptive innovation required for entering new industries and the traditional configurations of the companies' assets including their current value creation within oil and gas production and supply.

Implement

Deficient managerial knowledge can significantly hinder the process as key activities in the "Implement" phase involve communication and execution by defining milestones and related projects, organize legal structures, and prepare a specific budget and project roadmap; which requires managerial knowledge. Aligning the old and new business model, quickly adapting the business model, and best practice project management is crucial to succeeding in this process (Osterwalder & Pigneur, 2010, p.256). Deficient managerial knowledge or "lack of managerial know-how" refers to the lack of understanding the organization's business model, and thus, new business model ideas cannot be assessed or implemented (Foss & Saebi, 2016). Our findings indicate that competence is crucial in the process of changing industrial trajectories. Additionally, realizing the need for change is vital to secure competitive advantage (Interviewee 1, 2021). However, we found that the process of evaluating and changing the business model is an issue that several companies find challenging. Saebi (2016) suggests that these challenges can be managed by developing tools that make it possible to analyze the competitor's business models. Moreover, we emphasize the importance of developing capabilities of assessing the company's own business model and creating systems and procedures that will help to implement changes. Furthermore, attaining new competence is mentioned as one of the main challenges in entering renewable industries. Our findings imply that the oil and gas industry can experience the cognitive barrier of deficient managerial knowledge where they might lack competence in understanding and evaluating their current business model, and therefore, avoid initiating the process of innovation.

Manage

Although the new business model has been implemented at this stage, the process of business model innovation is often repetitive, leading the activities to further continue. Key activities in the "Manage" phase are continuous evaluation, managing synergies or conflicts between models, aligning the business model throughout the organization, and scanning the environment to find how the business model can be influenced over the long term (Osterwalder & Pigneur, 2010, p. 258). We claim that this process can be hindered if the organization has **no business model innovation routines or processes**. Accordingly, having adequate routines and competence in how to organize the process of changing the business model is crucial to succeed (Björkdahl & Holmén, 2013, p. 221). Some companies aim to be the first movers in the

transition to renewable energy by taking a clear position and seizing new opportunities, while other companies wait to evaluate the risks and costs.

Our findings show that companies' routines for assessing and changing the business model vary greatly and that these routines may be lacking for various reasons. Saebi (2016) suggests that these challenges can be handled by ensuring dedicated teams and individuals in the organization responsible for working with business model innovation. We found that changing the business model is usually ad hoc driven, and not based on structured routines, which apply particularly in small and medium-sized companies. Furthermore, we found that larger companies tend to have greater routines for changing their business model such as yearly strategy reorganizations and business model assessments. Our results indicate that larger oil and gas companies will be at the forefront of the industrial restructuring as they are more likely to utilize structured routines for evaluating and changing their business model. Moreover, this relates well to the current status of the transition to renewable energy, where Equinor is currently at the forefront (Menon Economics, 2020, p.15).

Summary

The purpose of identifying the internal barriers oil and gas companies face in the process of changing industrial trajectories is crucial to recognize how business model innovation can contribute to the transition. Our findings imply that external factors influencing the oil and gas industry receive greater attention than internal barriers occurring within the companies. The dominant logic, deficient managerial knowledge, uncertainty and complexity, and no routines are the barriers we evaluate as most prominent in the industry. Organizational resistance is most likely to occur at the "Mobilize" phase of the process. Further, we evaluate that organizations may face the barriers of the dominant logic and market dependency in the "Understand" phase. In the "Design" phase, organizations are likely to meet barriers including uncertainty, complexity, and conflicts with disruptive innovation. Next, the "Implement" phase may be hindered if organizations have deficient managerial knowledge on the business model innovation process. Lastly, we evaluate that having no business model innovation routines or processes can disrupt the last "Manage" phase of the process. By assessing figure 19, oil and gas companies can recognize when the different barriers are probable to appear in the different phases of transitioning to a new industrial trajectory and take measures to handle the challenges.

7. Conclusion

The restructuring of the Norwegian oil and gas industry has received considerable attention due to the need for sustainable change to reach the climate ambitions in the Paris Agreement of 2015. Meanwhile, most companies focus on developing new technologies and making processes less environmentally damaging, whereas business model innovation receives little consideration. Business model innovation can contribute to the restructuring by helping companies adapt to changing market conditions and gaining competitive advantages. Hence, the **research objective** of this master's thesis is to find *how business model innovation contributes to a restructuring of the Norwegian oil and gas industry to comply with Norway's climate ambitions for 2030 and 2050*.

The theoretical framework has created a foundation for exploring our research objective through introducing concepts of business model innovation, environmental factors influencing change, the process of change, and barriers in committing to business model innovation. As there have currently not been conducted similar studies except Menon Economics' study in 2020 on the status of the restructuring, we are covering a research gap in this field of innovation. We have applied an exploratory research strategy and a mixed-method design utilizing both quantitative and qualitative data. The research design allowed us to achieve complementarity in which findings were elaborated, confirmed, and enhanced in our analysis. Moreover, this contributed to establishing generalizability, a greater diversity as we got information from several sources, and a simultaneous focus on both micro and macro aspects.

To reach our research objective we developed four supplementary questions that cover different aspects of the restructuring and more specifically how business model innovation is part of the solution. First, **sub-question 1** concerns how the need for change differs from the willingness to change in the industry. Our findings imply that the need for change differ from the willingness to change within the industry where the supplier part of the industry has a higher willingness to change than the producing side. Moreover, we argue that the production of oil and gas will continue as long as there are significant investments, and the industry is considered profitable. Due to the industry status, oil and gas producers transitioning into other markets will necessitate radical innovation of their business model while oil and gas suppliers will likely focus on sustaining business model innovation. Second, **sub-question 2** comprise which parts of the business model should be emphasized the most in the restructuring. Our findings suggest that particularly companies' customer segments, value propositions, key resources, key

partners, and cost structure must be changed to succeed in the industrial restructuring. These elements cover all main areas of a business: 1) customers, 2) offering, 3) infrastructure, and 4) finance.

Third, **sub-question 3** covers the external challenges that oil and gas companies face that may influence business model innovation. By initiating business model innovation oil and gas companies can adapt to changes in their market, the industry in which they operate, key trends, and macroeconomic conditions. Our findings indicate that the focus on sustainable change influence all parts of the oil and gas industry landscape and is found to be particularly important in creating a need for change and, thus, initiating business model innovation. Lastly, **sub-question 4** involves the internal barriers that oil and gas companies face in the process of change. While our findings imply that oil and gas companies will face several internal barriers that may hinder the process of change, we evaluate the most prominent barriers to be the dominant logic, deficient managerial knowledge, uncertainty and complexity, and no business model innovation routines or processes.

We conclude that business model innovation can be a decisive contribution to the restructuring of the Norwegian oil and gas industry to comply with Norway's climate targets for 2030 and 2050. Industrial restructuring requires companies to make several changes to different elements of their business simultaneously to position themselves in a new market or industry, necessitating business model innovation. While oil and gas companies may have sufficient competence and experience in developing new technologies, the process of innovating several aspects of their business at the same time is unfamiliar to most but crucial to success. Thus, business model innovation can provide the companies with a comprehensive framework to structure the process of change which will contribute to a successful restructuring of the oil and gas industry and to comply with the country's climate ambitions.

7.1 Limitations

The initial plan was to conduct 12 interviews in total by utilizing a purposive sampling technique. However, there were 2 organizations we did not manage to get in contact with despite several attempts to approach the particular company and cluster network. As we had specific reasons for selecting our sample, we were not able to replace the specific company and cluster network with other potential participants. Hence, our interview sample was reduced with two participants which can be considered as a limitation of the study as these participants were relevant for our research objective and could contribute to new findings. Furthermore, due to the lack of previous research on our topic, we had limited opportunities to compare our results to existing research which can be considered a limitation in our study. Lastly, we initially collected and analyzed quantitative data retrieved from Innovation Norway that we believed to strengthen our qualitative analysis. However, we found this data to exceed our research objective as it concerned innovation systems and initiatives, requiring another type of theoretical framework and data collection. Hence, we consider the limited access to quantitative data as a possible limitation to our study.

7.2 Suggestions for Future Research

As previously discussed, companies experience high levels of risk and uncertainty when entering new markets like offshore wind, hydrogen, and CCS. The data from Innovation Norway on the environmental technology scheme, presented in Appendix 5, can indicate that policy initiatives can influence investments in different industries. While the transformation of the Norwegian oil and gas industry will require large financial investments, we argue that knowledge and expertise in the field of changing industrial trajectories are just as important. Thus, a suggestion for future research is to investigate the role of different innovation systems[3] and initiatives. Innovation Norway, the Research Council of Norway, Enova, and SkatteFUNN provide several programs and initiatives primarily aimed at the development of new technologies to ensure innovation and sustainable growth. Hence, we argue that public policy instruments and initiatives allocated to increase the knowledge of business model innovation are decisive to succeed in the restructuring.

[3] The four main innovation system approaches in current research include National Innovation Systems (NIS), Regional Innovation Systems (RIS), Sectoral Innovation Systems (SIS), and Technological Innovation Systems (TIS) (Klein & Sauer, 2016).

7.3 Managerial Implications

Most companies primarily focus on what to offer a market through different products and services, and how their value propositions can be improved. We argue that it is becoming increasingly important to also recognize the importance of the elements surrounding the company's value proposition to stay competitive. Transitioning from one industrial trajectory to another will necessitate simultaneously changing several parts of a company's business model to adapt to new market conditions. Innovating the business model can help oil and gas companies adapt to the need for sustainable change and position themselves in a different market. For oil and gas companies, this will likely involve new customers, differentiated value propositions, new activities and partners, and a different profit model to succeed. While companies may have sufficient competence and experience in developing new technologies, the process of business model innovation is unfamiliar to most. Thus, we argue that it is crucial for managers in oil and gas companies to gain knowledge in how to change their business model and how to initiate the appropriate measures to succeed in the industrial restructuring.

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Appendices

Appendix 1. Structure of the Thesis

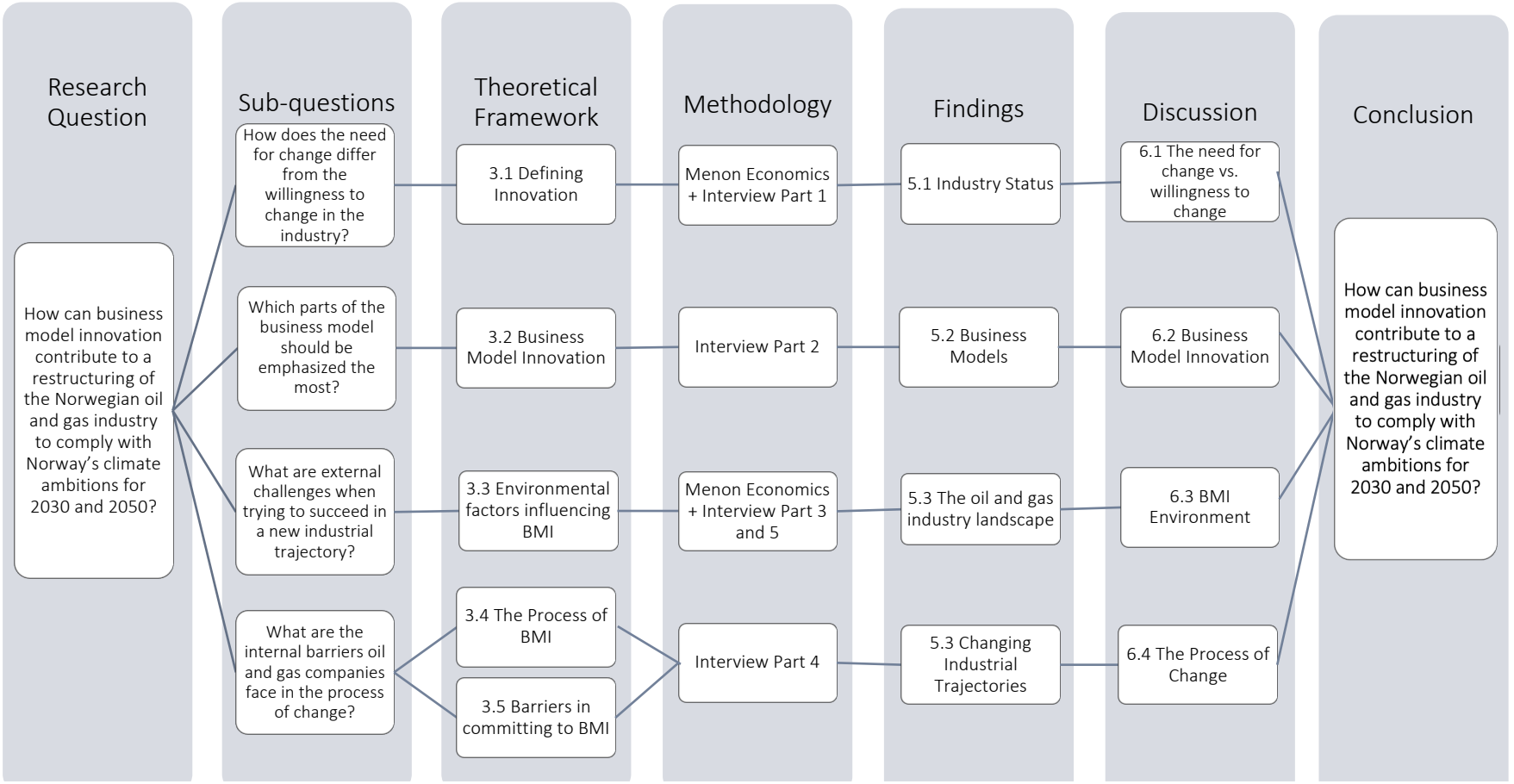

Figure 20. Structure of the master's thesis.

Appendix 2. Interview Sample

Aker Solutions

Aker Solutions is an international supplier company that provides engineering services, fabrication, technology products, maintenance, specialist services, and total solutions to the oil and gas industry. The company was established in 2004 as Aker Kværner, and following several subsequent reorganizations, Aker ASA became the company's main shareholder. The key part of the business includes deliveries to oil, gas, and petrochemical plants. As a supplier, the company's ambition is to help accelerate the transition to more sustainable energy production. Aker Solutions aims to grow within renewable industrial areas and low-carbon solutions (Aker ASA, 2021).

Please visit Aker Solutions' webpage for more information: https://www.akersolutions.com/

Equinor

The Norwegian state oil company Statoil was established in 1972. The company changed its name to Equinor in 2018 to reflect its new climate focus and ambitions for the future. Equinor is an energy company that develops and produces oil, gas, wind, and solar energy worldwide. The company is the world's largest operator in deep water and has a leading position on the Norwegian shelf where it accounts for about 80 percent of the extracted oil. Equinor's future ambitions is to reach net-zero emissions by 2050 to commit to the Paris Agreement. Moreover, the company aims to be the leader in the energy transition by growing in renewable energy industries (Equinor, 2021).

Please visit Equinor's webpage for more information: https://www.equinor.com/

Total

Total E&P Norway is a subsidiary of the Total Group and was established in 1965. The company's value creation originates from the exploration and production of oil and gas on the Norwegian continental shelf. Total aims to continue being a substantial player in the oil and gas industry, and they currently have a long-term perspective on their production activities in Norway. Moreover, the Total Group is one of the world's leading oil and gas companies, holding interests in 66 production licenses (Total, 2021).

Please visit Total's webpage for more information: https://www.total.no/

Vår Energi

Vår Energi was established in 2018 as a result of the merger between Eni Norge AS and Point Resources AS. The company operates oil and gas production throughout the continental shelf with fields in the Barents Sea, the Norwegian Sea, and the North Sea. In collaboration with the company's shareholders, they plan to further develop and expand more fields on the Norwegian shelf over the next four years and continue to identify new growth opportunities. Moreover, Vår Energi aims to be an industry leader when it comes to reducing carbon emissions on the Norwegian shelf through low-carbon technology (Vår Energi, 2021). The global energy company Eni and the Norwegian private equity investor HitecVision established the joint venture company Vårgrønn, intending to help Vår Energi reduce its greenhouse gas emissions through electrification of oil and gas fields in the North Sea (Vårgrønn, 2021).

Please visit Vår Energi's webpage for more information: https://varenergi.no/no/

Innovation Norway

Innovation Norway is a public, semi-state special law company which through consultation, financing, competence, and networks, aims to contribute to developing profitable business development in Norway. They can trace their history back to the District Development Fund (DU) which was established in 1961. After some reorganizations, Innovation Norway was established in 2004. One of their main objectives are to help entrepreneurs, companies in growth, and business environments to succeed with future-oriented business activities. Currently, Innovation Norway and national authorities specifically highlight opportunities in the marine and maritime industries, as well as climate-related industries within renewable energy as they see clear international growth potential in these industries. Another important focus area is to stimulate foreign companies to invest in Norwegian industries (Garvik, 2020).

Please visit Innovation Norway's webpage for more information:

https://www.innovasjonnorge.no/no/

Arena Ocean Hyway Cluster

Arena Ocean Hyway Cluster was established in 2019 and is a national cluster network for maritime hydrogen. The network collaborates closely with the industry to exploit commercial opportunities of new hydrogen technology. They aim to make Norway a leading player globally

within maritime hydrogen. Their main focus is "networking, project activity, influence policy and regulations, increase knowledge about hydrogen, and promote their cluster members" (Arena Ocean Hyway Cluster, n.d.). Moreover, they aim to reduce barriers and stimulate innovation by sharing knowledge and gain insight into new markets, actors, and technology (Innovasjon Norge, n.d.).

Please visit Arena Ocean Hyway Cluster's webpage for more information: https://www.oceanhywaycluster.no/

GCE NODE

Global Center of Expertise (GCE) NODE is a national cluster network that supplies technology, products, and services to the global energy and maritime industries. The cluster was established in 2006 and have today several major members that supply to the energy and maritime markets. Through the cluster network, they aim to build expertise and R&D collaboration with national and international actors. GCE NODE's main objective is to ensure industry competitiveness, improve the development of new products and services, as well as sustainably transfer knowledge and technology to new markets (GCE NODE, n.d.).

Please visit GCE NODE's webpage for more information: https://gcenode.no/

NCE iKuben

NCE iKuben was established in 2011 and is a national competence center for innovation and restructuring with a specific focus on digitalization, sustainability, and business models. The cluster is cross-industrial with participating companies from production, technology, academia, R&D, and the public sector. In this network, several of Norway's most competitive and innovative companies meet to share competence and experiences. The cluster targets to find how they can utilize digital technology in ways that create additional value, how sustainability can contribute to increased value, and how to develop sustainable business models (NCE iKuben, n.d.).

Please visit NCE iKuben's webpage for more information: https://ikuben.no/

Norwegian Energy Solutions

Norwegian Energy Solutions was established in the years between 2015-2017 and are an energy cluster network with a specific target to lead the transition to low emission energy solutions. The cluster contributes to assisting companies in the transition to succeed in new value chains. Collaboration between industry actors, different segments, and the member companies creates an environment for technologial development and innovation. The cluster has a wide range of members including operators, suppliers, start-ups, academia, investors, and authorities, and covers the entire value chain for the oil and gas industry. Some of their main focus areas are to generate a zero-emission value chain, promote local innovation, place Norway on the map for the development of renewable energy, et cetera (Norwegian Energy Solutions, 2019).

Please visit Norwegian Energy Solutions' webpage for more information:
https://www.norwegianenergysolutions.no/about

Norwegian Offshore Wind Cluster

Norwegian Offshore Wind Cluster was established in 2016 and currently targets to be the most significant worldwide supply chain for floating offshore wind farms. Based on having Norway's only test center for full-scale floating wind turbines, the cluster focus on increased knowledge and more innovation to increase competitiveness in the international market. The cluster is closely following the development of offshore wind in the global, European, and national markets. Their main goal is to create profits by cooperating on innovation and market opportunities in offshore wind (Norwegian Offshore Wind Cluster, n.d.).

Please visit Norwegian Offshore Wind Cluster's webpage for more information:
https://offshore-wind.no/

Appendix 3. Request for Participation in Research Project

All participants received the following information as a request for participation.

Background and purpose of the research project:

The purpose of this research project is to identify how business model innovation can contribute to the restructuring of the Norwegian oil and gas industry. The study is part of a master's thesis in cooperation with Innovation Norway and is carried out by two students at the Business School at the University of Stavanger.

Participating in this research project entails:

We would like to conduct a semi-structured interview with you in the upcoming weeks of February 2021. The interview will have an estimated duration of 60 minutes, and you can choose if you want the interview to be conducted in English or Norwegian. You will be asked to answer questions regarding innovation and challenges as a representative for the company you work for. We will not ask you to reveal any trade secrets.

Process of collection and storage of information:

The data will be collected through personal notes during the interview, and we will not be using any type of recording device. We will not publish any personal information of our participants, and all data collected is strictly business oriented. The project is scheduled to be completed and submitted within 15.06.2021. All data collected will be deleted when censorship has been finalized on the thesis.

Voluntary participation:

It is voluntary to participate in our study and you can withdraw your consent at any time without providing a reason for this. If you withdraw, all data collected from you will be removed from our study.

Contact information:

Researcher: Katrine Wangen Jonasmo, 991 54 339, katrinewangen@live.no
Researcher: Silje Sletten, 476 57 075, siljesletten1@gmail.com
Project supervisor: Marte Cecilie Wilhelmsen Solheim, marte.solheim@uis.no

The participant agrees on the terms explained above by participating in the interview.

Appendix 4. Interview Guide

The interview guide with an overview of the different topics covered in the semi-structured interviews with the five businesses and the five cluster networks. The wording of the questions will differ slightly depending on whether the interviewee represents a business or the organizations within a cluster network.

Part 1. Background Information on the Company / Cluster	
Q1.	What industries are you currently operating in or trying to enter, and why?
Q2.	Does the company actively work with innovation and sustainable development? If yes, in what ways?
Q3.	What type of innovation do you emphasize the most, and why?
Part 2. Business Model Innovation	
Q4.	In which situations do you make substantial changes to your customer segments, distribution channels, and customer relationships, and why?
Q5.	Do you make changes to what you offer the market (products/services)? If yes, when and how?
Q6.	In which situations would you consider making changes regarding your key partners, key activities, and key resources?
Q7.	When do you make changes influencing your cost structure and revenue streams?
Part 3. Business Model Environment	
Q8.	How is the organization influenced by market forces (market segments, needs and demands, market issues, switching costs, and revenue attractiveness)
Q9.	How is the organization influenced by industry forces (suppliers, stakeholders, competitors, new entrants, and substitutes)?
Q10.	How is the organization influenced by key trends (technology, regulations, social and cultural trends, and socioeconomic trends)
Q11.	How is the organization influenced by macroeconomic forces (global market conditions, capital markets, commodities, and other resources, and economic infrastructure)
Part 4. The Process of Change	
Q12.	What routines do your organization currently have for evaluating and improving your business model?
Q13.	What are the main drivers/opportunities for changing your business model?
Q14.	What are the main challenges for oil and gas companies when entering a new industry like offshore wind, hydrogen, or carbon capture and storage, and how can these be handled?
Q15.	If you consider changing your business model – How important is it that competitors in the same industry have already implemented the same changes?
Part 5. EU's Taxonomy, Oil Price, and Covid-19	
Q16.	How does the EU's Taxonomy influence the oil and gas industry and the development of sustainable industries including offshore wind, hydrogen, and carbon capture and storage?
Q17.	How do the fluctuations in the oil price influence your focus on sustainable development?
Q18.	How has Covid-19 affected your organization in terms of your focus on innovation and sustainable development?

Appendix 5. The Environmental Technology Scheme

We had to redefine our scope before proceeding with the main analysis as we found the data from Innovation Norway to exceed our research objective. This resulted in the quantitative data on their environmental technology scheme being removed from our study. However, we suggest that this data could be subject to future research as elaborated in section 7.2 Suggestions for future research. Hence, we include parts of the work that was conducted with this data prior to it being removed from the main study.

Innovation Norway

There are large costs associated with testing technology on a full scale, and the possibility of a return on environmental technology projects is associated with risk. To ensure sustainable growth and innovation, the public sector shares the risk associated with the development, construction, and testing of environmental technology (Innovasjon Norge, 2020). Part of this work is an environmental technology scheme where Innovation Norway offers funding for projects that provide a basis for green value creation in Norway. Environmental technology includes technologies, processes, solutions, and services that directly or indirectly have a positive environmental effect (Innovasjon Norge, 2020). The environmental technology scheme provides finances like grants or loans for the development, pilot, and demonstration of new environmental technology. All Norwegian companies that develop technology that protect and improve the environment can apply for grants from Innovation Norway. However, the environmental technology scheme is particularly aimed at large projects and large companies. The project must provide lasting value creation in Norway in the form of new jobs, strengthened competence, and increased competitiveness (Innovasjon Norge, 2020).

Sample

During the last decade, from 2010 to 2020, a total of 1431 projects have received grants from the environmental technology scheme in Norway. The internal validity of the sample is high as it includes the total amount of grants issued through the environmental technology scheme and, hence, gives an accurate measurement of the total amount of green investments from this public subsidy scheme. As illustrated in figure 21 below, this subsidy scheme covers a range of different industries including biotechnology, marine, maritime, oil and gas, and renewable

energy. However, the following analysis will be limited to solely include oil and gas, and renewable energy projects due to the delimitation of the thesis. This constitutes a sample size of in total 252 projects; 65 projects within oil and gas, to a total subsidy amount of NOK 153 million; and 187 projects within renewable energy, to a total subsidy amount of NOK 590,3 million. The projects that have received grants from the environmental technology scheme are considered green projects. This means that the data will only include green investments and, hence, only provide a picture of this type and not the total amount of investments in the industry. The total growth and development of the different industries may, therefore, look different than illustrated in figure 21.

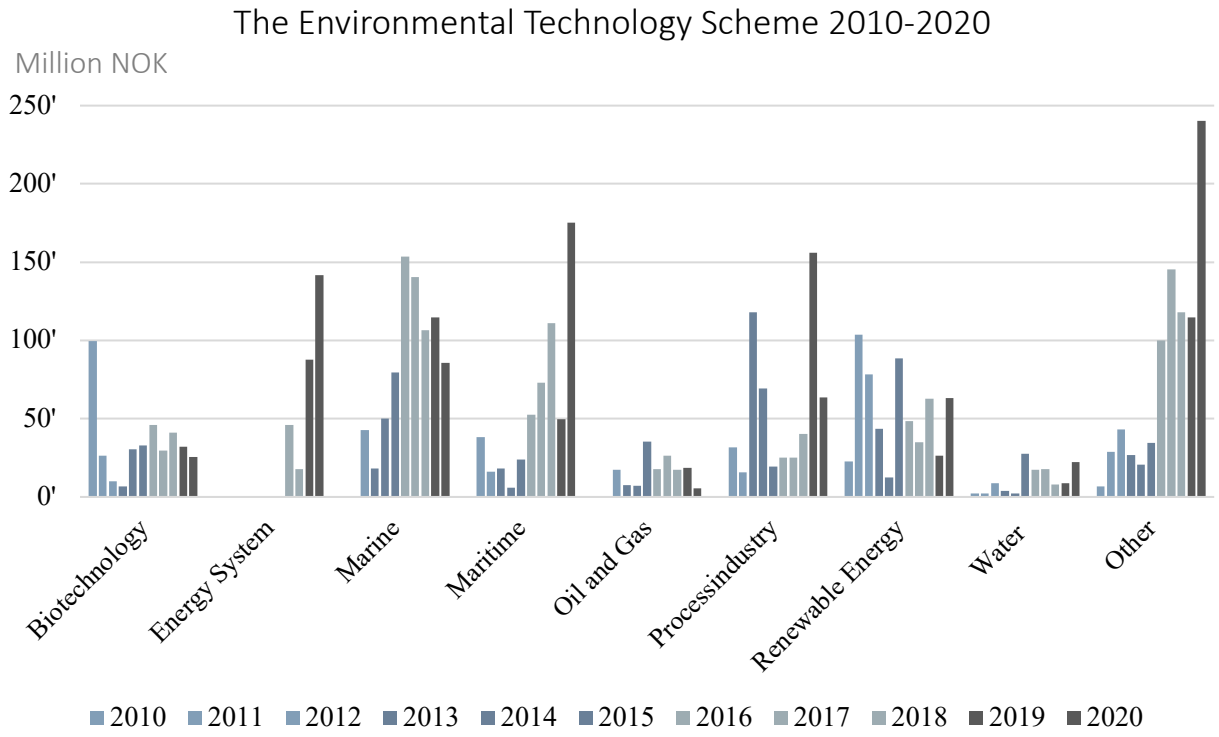

Figure 21. The Environmental Technology Scheme from 2010 to 2020.

Data Collection

Due to our collaboration with Innovation Norway for this master's thesis we got access to the raw data from all projects that have received subsidies from the environmental technology scheme in Norway in the last decade. The project data from the subsidy scheme has been collected by Innovation Norway over a period of 11 years, from 2010 to 2020. The data was collected through Innovation Norway's internal systems used when companies apply for subsidies or loans. All applications require information regarding company name, municipality,

theme of project, year, subsidy amount, total project cost, and project description, which amounts to the database. We were provided access to compiled data that had received some form of selection and summarizing (Saunders et al., 2019, p.341) by a business analyst from Innovation Norway. Furthermore, the data was structured in a spreadsheet where it was organized into a format that was easy to process and analyze. Due to the size and extent of the data, it would be very difficult for us to collect the same data ourselves if we were not to have this collaboration. The collected data is considered reliable as it includes all projects that have received grants from this subsidy scheme in the last 11 years. The measurements are stable and give consistent results if the data collection and the same measurement were to be repeated.

Ethical Considerations

Innovation Norway is clearly acknowledged to be the source for this secondary data, fulfilling expectations regarding the responsibility concerning the analysis of data and reporting of findings (Saunders et al., 2019, p.258). Due to the discretion of the data collected, we had to sign non-disclosure agreements with Innovation Norway before we got access to the data. This non-disclosure agreement entails that we have a duty of confidentiality regarding what we in connection to this project get to know about business and personal matters. This entails that we are obliged to process all information in a reassuring and inaccessible manner and in accordance with Innovation Norway's current guidelines. The duty of confidentiality also applies after we have completed the project. As a result of this, we have treated the data as a collective database as opposed to analyzing single projects. We analyzed the data based on theme, year, subsidy amount, and total project costs. Thus, no sensitive information has been processed. This entails that the data published cannot be traced back to any particular company or project, ensuring the confidentiality of data and anonymity of those taking part. Moreover, this contributes to strengthening the reliability of the data as confidentiality and anonymity are secured (Saunders et al., 2019, p.258).

Analysis Part 1. Oil and gas

The environmental technology scheme, from Innovation Norway, has helped finance 64 different projects within the petroleum industry from 2012 to 2020, as illustrated in figure 22 below. The projects are considered to directly or indirectly have a positive environmental effect (Innovasjon Norge, 2020) and are, therefore, considered green in this aspect. The largest amount of subsidies through this scheme were given in 2015 where a total of 14 projects received subsidies were the total amounted to over 35 million NOK. The years 2016 and 2017 were also quite prosperous, while 2012-2014 and 2018-2020 have received relatively low amounts of subsidies.

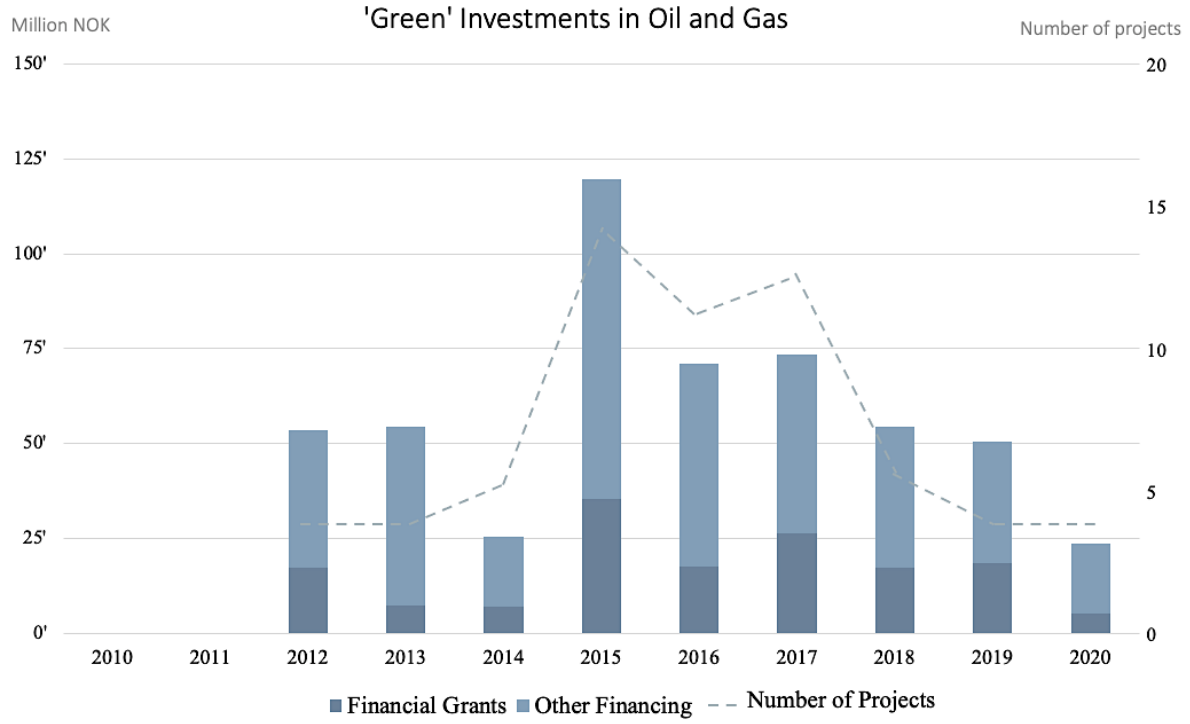

Figure 22. Subsidies to oil and gas projects from the environmental technology scheme.

Analysis Part 2. Renewable Energies

The environmental technology scheme has also provided financial grants to 185 different renewable energy projects from 2010 to 2020 as illustrated in figure 23 below. This indicates the current status in the renewable energy industry in terms of projects with granted subsidies from the national innovation scheme. However, it will not provide a full picture of the total investments in the industry as it only includes a fraction of the projects. The largest financial grants through this scheme were given in 2011 where 17 projects received subsidies that amounted to over 100 million NOK. The financial grants given were almost as high in 2012 and 2015, while the least provided subsidies were in 2014. There were considerable variations in the subsidies in the period between 2015-2020 where the most provided financial grants were in 2015, while the least provided financial grants were in 2019.

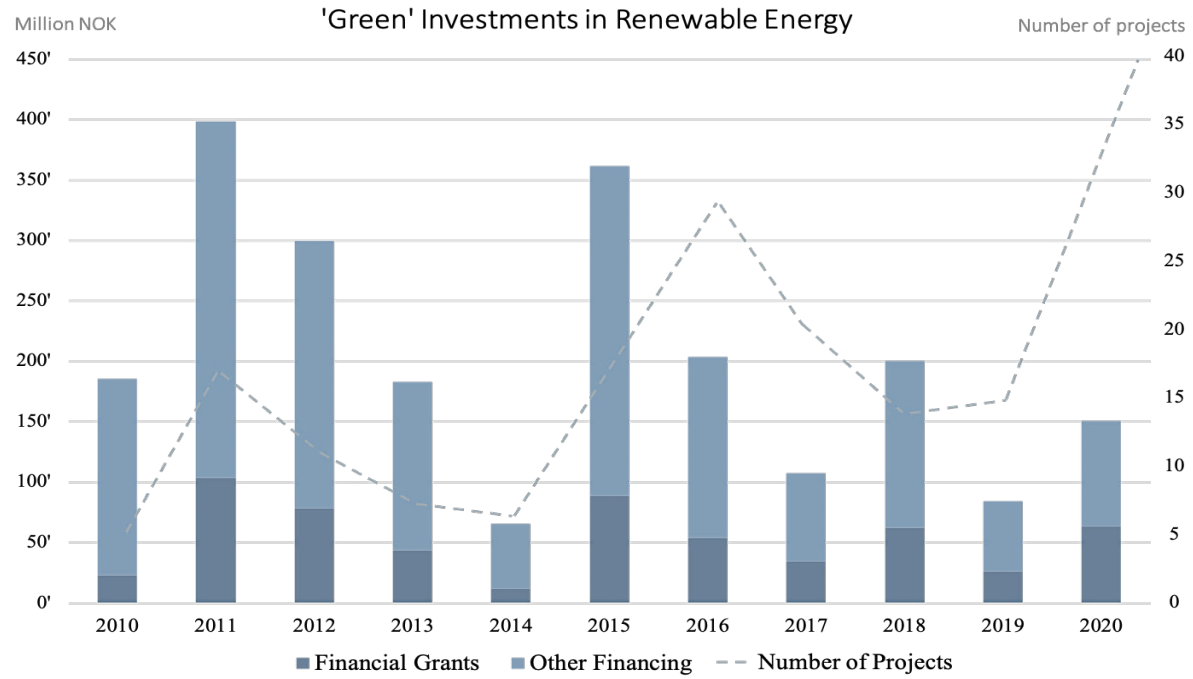

Figure 23. Subsidies to renewable energy projects from the environmental technology scheme.

Figure 24 illustrates a distribution of renewable energy projects that have received subsidies from the environmental technology scheme from 2010 to 2020. However, projects within hydropower and solar energy will not be further analyzed or discussed due to the industry delimitation disclosed in section 1.2. The most significant financial grants in wind power amounted to over 200 million NOK and were provided in 2011, followed by 180 million NOK in 2013. There were also given relatively high subsidies in 2015 and 2016, amounting to approximately 120 million NOK. While there was a low level of subsidies distributed in 2019, there has been a small increase in 2020.

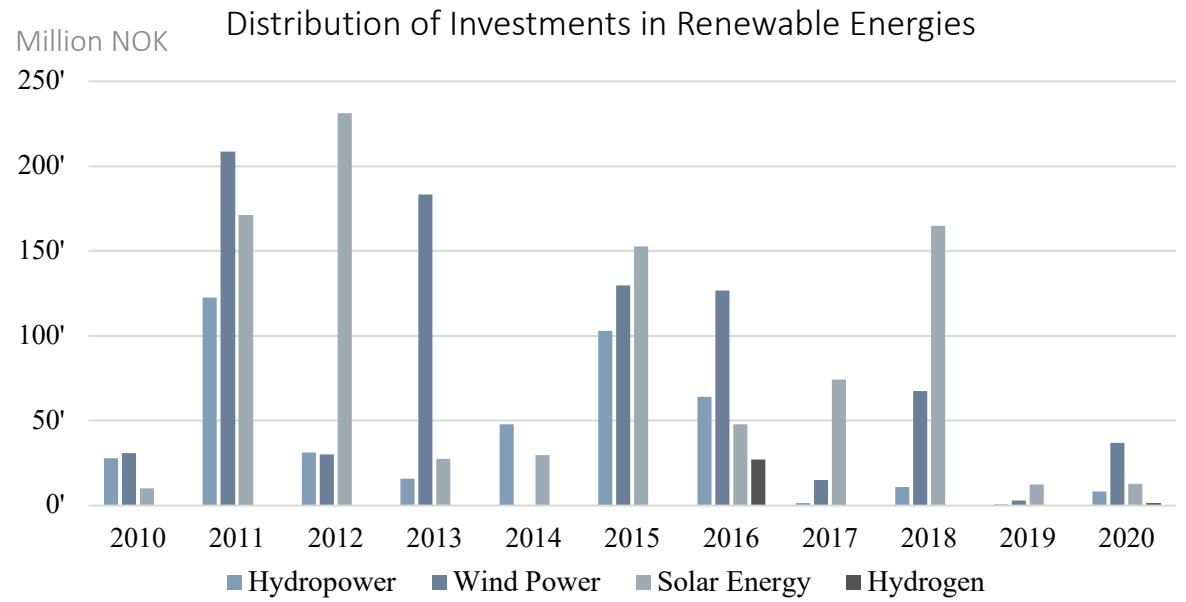

Figure 24. Types of renewable energy projects that received subsidies from the subsidy scheme.

Analysis Part 3. Size of investments in comparison to the oil price

We combined the data from investments in oil and gas with those of renewable energy and visualized these in combination with the fluctuations in the oil price as illustrated in figure 25. The purpose was to identify if there was any pattern between the size of investments and the oil price. However, there has not been reached any conclusion on this matter, but it is suggested for future research.

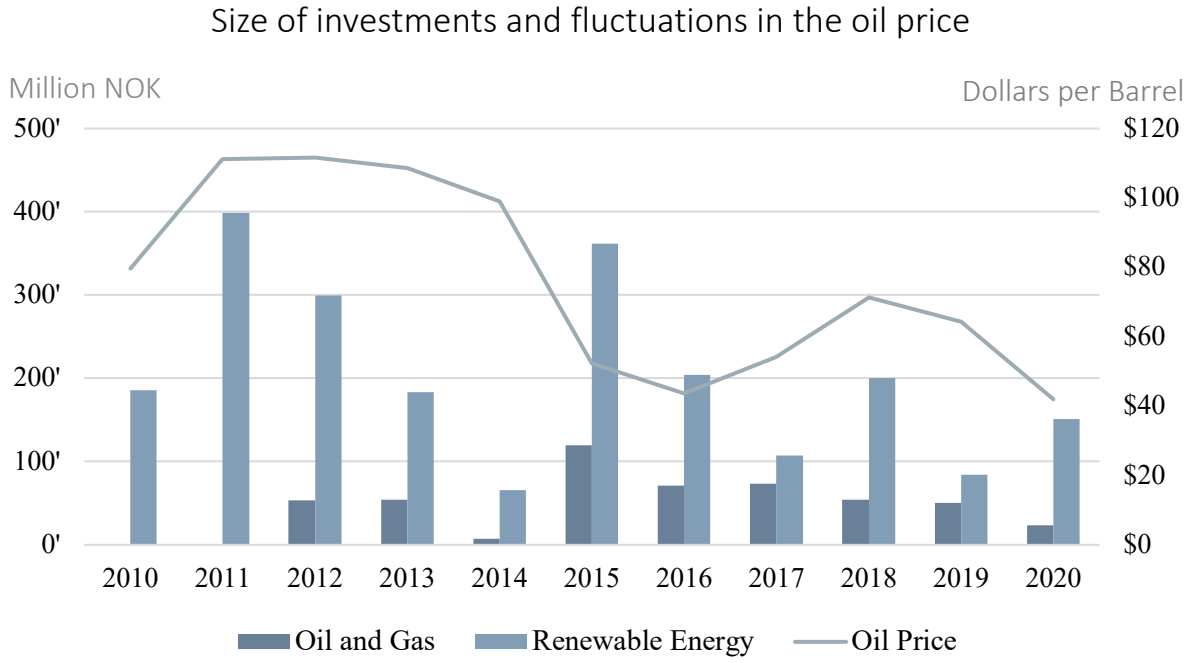

Figure 25. The relationship between investments and fluctuations in the oil price.