



# Master's degree thesis

**LOG953 Sustainable Energy Logistics**

**Knowledge and capabilities of incumbent Norwegian oil and gas companies contributing to gaining competitive advantage through sustainable business model innovation: a single case study of Odfjell Technology**

Bye, Kristine Haram

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Molde, 22.05.23



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## **Preface and Acknowledgements**

This thesis marks the end of a two-year-long journey in the Master of Science in Sustainable Energy Logistics degree program at Molde University College. The knowledge acquired during these years has helped me grow remarkably academically.

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*A friend of mine once told me that writing a master's thesis to running a marathon, except I would like to consider my method of work more comparable to a sprint.*

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## **Abstract**

As the global energy environment undergoes a profound transformation towards sustainability, incumbent Norwegian oil and gas companies face the challenge of adapting their business models to remain competitive. Utilizing data from Odfjell Technology as a case company, this master's thesis explores the knowledge and capacities of such companies in helping to acquire a competitive advantage through sustainable business model innovation.

This study applies a qualitative research methodology and a single case study design to examine the context of Odfjell Technology and their efforts to innovate a sustainable business model. Direct observations, document analysis, and interviews are the data collection techniques, and thematic analysis is employed to identify significant patterns and trends from the gathered data. Concepts from absorptive capacity, knowledge transfer, sustainable business model innovation, and the triple bottom line (TBL) approach are all incorporated into the research's theoretical framework. This study adds to the body of knowledge on sustainable business model innovation by analyzing the knowledge and capabilities of Odfjell Technology with insights into how knowledge transfer can help geothermal energy implementation, overcome barriers, and create a competitive advantage in the renewable energy market.

The findings of this study shed light on the significance of knowledge transfer in shaping the competitive advantage of incumbent Norwegian oil and gas companies through sustainable business model innovation. Companies can navigate the energy transition by leveraging existing knowledge, collaborating with niche businesses, and improving absorptive capacity. Climate change urgency, cost savings, and corporate image enhancement drive Odfjell Technology's pursuit of sustainable business model innovation through geothermal energy. Overcoming barriers like upfront investment, technical feasibility, and regulations is essential. Strategic planning, stakeholder collaboration, and a long-term perspective are necessary. Knowledge transfer helps Odfjell Technology to overcome these barriers, leverage the drivers, and provide the opportunity to become an industry front-runner. Companies can learn from their case study to align with sustainability, optimize techniques, and contribute to a greener future. The findings of this thesis reveal managerial implications and suggestions for further research regarding the topic.

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# 1.0 Introduction

## 1.1 Introduction to The Thesis

The need to lessen dependency on fossil fuels, increase energy security, and mitigate climate change is a pressing issue that the modern world must address. Climate change has intensified due to greenhouse gas emissions from burning fossil fuels; therefore, efforts are being made worldwide to find alternative energy sources. Reducing pollution nowadays appears challenging with the population multiplying and rising consumption levels (Panchal, Singh, and Diwan 2021). In response, renewable energy options have shown promise to fulfill sustainability goals and satisfy society's rising energy needs (United Nations n.d.; IEA 2022). We can lessen the effects of climate change, decrease our reliance on finite fossil fuel supplies, and promote a sustainable future by switching to renewable energy sources. Compared to conventional fossil fuels, renewable energy has been shown to provide several benefits, including decreased greenhouse gas emissions, increased energy security through diversification, and the opportunity for localized energy generation. This shift offers an opportunity to mitigate climate change, improve energy security, and create a sustainable future (Dyatlov et al. 2020; Ahmad and Zhang 2020; Dong, Dong, and Jiang 2020; International Energy Agency (IEA) 2021).

By diversifying the energy mix and decreasing reliance on limited fossil fuel stocks, which are vulnerable to geopolitical and market uncertainties, renewable energy solutions also contribute to increased energy security. Furthermore, localized energy production is made possible by the decentralized character of many renewable energy sources, which helps communities and areas become more independent and resilient in the face of potential interruptions. Attention has been drawn to the detrimental effects of non-renewable energy and technical advancements on sustainability. However, there are financial constraints on a complete switch to renewable energy and a need for innovative studies into renewable energy sources, such as geothermal and biomass energy, which can increase dependability and resilience (Lombardi et al. 2020; Dyatlov et al. 2020; Usman and Radulescu 2022).

As the traditional energy sector undergoes profound disruption, these companies encounter challenges and opportunities to adapt to evolving market dynamics and engage with the renewable energy domain (Zhong and Bazilian 2018; Heiskanen et al. 2018; Fashina et al.

2019; Firdaus and Mori 2023). Thus the expectation of a fall in demand and investment in the oil and gas industry as renewable energy sources gradually will replace fossil fuels as a result of the worldwide targets for decreasing GHG emissions tied to the Paris Agreement (United Nations 2015; IEA 2018; 2022), the transition to renewable energy presents incumbent Norwegian oil and gas companies with opportunities due to their extensive expertise, experience, and institutional knowledge. They have various technical and operational knowledge that can be used to accelerate the energy transition toward renewable energy sources. The insightful technological expertise built up in the sector, like exploration, production, and distribution, can be used to improve the effectiveness, dependability, and affordability of renewable energy solutions. By strategically embracing renewable energy, these companies can diversify their portfolios, leverage existing capabilities, access established market networks, enhance their reputation, and manage long-term risks (Zhong and Bazilian 2018; IEA 2018; 2020).

Geothermal energy stands out among the many renewable options as a particularly appealing choice. Geothermal energy enables power production and offers heating and cooling capabilities by utilizing the Earth's natural heat. It is an ongoing, dependable, and low-carbon energy option that could considerably aid in shifting to a sustainable future. Inherent benefits of geothermal energy include its constant supply, low operating emissions, and comparatively modest environmental impact compared to other energy sources. As a result, it has attracted considerable interest and funding as a viable alternative to fossil fuels, encouraging excitement about its potential to alter the world's energy environment fundamentally (Barbier 2002; Haslinger et al. 2022; Islam et al. 2022; Ioannou et al. 2023).

This thesis explores the knowledge and capabilities of incumbent Norwegian oil and gas companies, specifically focusing on their potential to transition to a sustainable business model to gain a competitive advantage. The focus will be on how such companies can leverage their existing knowledge, resources, and competitive strengths to foster sustainable innovation and effectively navigate the energy transition, specifically geothermal energy.

## 1.2 Research Objective – and Questions

### 1.2.1 Research Objective

In the current global picture regarding the environment, the goal of reducing carbon emissions is quite essential. There is a need for change in oil and gas companies to stay competitive due to the rising demand for sustainable energy (Chaiyapa, Esteban, and Kameyama 2018; IEA 2018; Bach 2019). Incumbent oil and gas businesses can use sustainable business model innovation as a tool to tackle these issues and seek new opportunities in growing markets of renewable energy. Several studies on sustainable business model innovation and knowledge transfer related to gaining a competitive advantage have been conducted. However, there is little information about how oil and gas companies can utilize their incumbent knowledge to gain this competitive advantage through a sustainable business model innovation. Therefore, this thesis aims to add to the body of knowledge by examining the skills and expertise incumbent Norwegian oil and gas corporations need to satisfactorily implement business model innovation, and the following research objective was chosen:

*Knowledge and capabilities of incumbent Norwegian oil and gas companies contributing to gaining competitive advantage through sustainable business model innovation – a single case study of Odfjell Technology*

This thesis aims to examine how incumbent Norwegian oil and gas companies can utilize their knowledge and capabilities to gain a competitive advantage through sustainable business model innovation, particularly outside their core business operations, by performing a single case study of Odfjell Technology. By adopting a single case study methodology, this study aims to enhance the understanding of these incumbents' prospects for gaining a competitive advantage through sustainable business model innovation. Additionally, it seeks to contribute knowledge on the role of knowledge transfer, within a company, in facilitating the attainment of a competitive advantage. Through this study, valuable insights will be gained, benefiting academic research and oil and gas companies.

## 1.2.2 Research Questions

Based on the objective of the thesis, the three following research questions (RQs) were formulated. These questions would guide the thesis to collect the information that is required to understand the impact of knowledge and capabilities on the competitive advantage of an incumbent Norwegian oil and gas company through sustainable business model innovation. Specifically, it investigates the drivers and barriers that the case company faces when implementing geothermal energy as part of their sustainable business model innovation. The research further explores how knowledge transfer can assist the company in overcoming these barriers, utilizing the drivers effectively, and ultimately gaining a competitive advantage through sustainable business model innovation. By addressing these RQs, the thesis aims to provide valuable insights into the role of knowledge and capabilities of incumbent Norwegian oil and gas companies in shaping the competitive landscape and facilitating the transition towards sustainable energy practices within the oil and gas industry.

RQ1 has a broader scope compared to RQ2 and RQ3 by exploring the concept of knowledge transfer and how it influences competitive advantage within the oil and gas industry. On the other hand, RQ2 and RQ3 are specific to the case company, Odfjell Technology, and investigate the company's specific drivers, barriers, and capabilities to utilize these, making the results more tailored to the company's context. By including both general and specific RQs, the thesis can provide a comprehensive analysis of knowledge transfer's broader implications in the industry while also examining the specific case of the company and their pursuit of sustainable business model innovation through geothermal energy implementation. This approach allows for a balanced exploration of theoretical concepts and practical insights specific to the case company.

### **RQ1: How can knowledge transfer impact the competitive advantage of an incumbent Norwegian oil and gas company through sustainable business model innovation?**

This RQ explores the impact of knowledge transfer on the competitive advantage of an incumbent Norwegian oil and gas company through sustainable business model innovation. It aims to understand how knowledge transfer can influence the ability of a company to adapt and innovate, particularly in response to sustainability challenges. By examining this relationship, the study contributes to understanding how knowledge flows within an

organization can drive sustainable business model innovation and enhance competitive advantage.

**RQ2: What drivers and barriers does Odfjell Technology face through sustainable business model innovation by implementing geothermal energy?**

This RQ focuses on the specific context of Odfjell Technology and investigates the drivers and barriers influencing the company as it adopts geothermal energy as a sustainable business model. By examining these drivers and barriers encountered in this transition, the study aims to provide valuable insights into the challenges and opportunities faced when integrating geothermal energy into their operations. The research contributes to the understanding of implementing sustainable business models centered around geothermal energy within the context of Odfjell Technology.

**RQ3: How can knowledge transfer help the company overcome the barriers, utilize the drivers to implement geothermal energy, and gain a competitive advantage?**

This RQ also focuses on the specific context of Odfjell Technology. It investigates the potential role of knowledge transfer in assisting the company in overcoming barriers, harnessing drivers for implementing geothermal energy and attaining a competitive advantage through sustainable business model innovation. By examining the specific circumstances of the company, the study aims to identify and analyze strategies and mechanisms of knowledge transfer that can effectively address obstacles, leverage favorable factors, and drive the successful integration of geothermal energy, ultimately leading to the development of sustainable business practices and enhanced competitiveness for the company.

### **1.3 Structure of The Thesis**

This master thesis is divided into seven main chapters. The background of the thesis, the research objective, and the RQs are introduced in Chapter 1. The literature review is presented in Chapter 2, and the case description is presented in Chapter 3. The research methodology is described in Chapter 4. The findings from the interviews, observations, and document analysis are presented in Chapter 5, along with the discussion of the findings in Chapter 6. The conclusion and suggestions for further research are presented in Chapter 7.

## 2.0 Literature Review

### 2.1 Background

This section addresses the theoretical background of the thesis. The following subsections shed light on the role of incumbency and incumbent knowledge in the changing energy landscape, focusing on the energy transition in the oil and gas industry and drivers and barriers for geothermal energy.

#### 2.1.1 Incumbency

Incumbents have been proven to have a competitive advantage in the context of technological innovation and patents (Rothaermel 2001). It has been demonstrated in numerous studies that incumbents oppose change for a variety of reasons, including organizational inertia, a lack of incentives, and regulatory difficulties, which can be seen as barriers (van Mossel, van Rijnsoever, and Hekkert 2018; Heiskanen et al. 2018; Biglaiser, Calvano, and Crémer 2019; Turnheim and Sovacool 2020; Metzler and Muntermann 2020; Curran 2020). Despite these challenges, existing players in the energy industry have a big part to play in the shift to sustainable business models, as incumbency can aid in the transition to a more sustainable energy system by giving access to cash, already-existing infrastructure, research and development, political influence, and client trust. These tools may accelerate the implementation of green energy technologies and aid in the shift to a more sustainable energy system. (Rothaermel 2001; Steen and Weaver 2017; Chaiyapa, Esteban, and Kameyama 2018; Di Lorenzo and van de Vrande 2019; Turnheim and Geels 2019; Firdaus and Mori 2023). Some researchers' contributions to the definition of incumbency are shown in Table 1.

Table 1 - Different definitions of incumbency from the literature

| Author                                       | Definition  |
|--|---|
| <b>Metzler and Muntermann (2020)</b>         | <i>"firms that (1) are positioned in a traditional industry, (2) were established before the digital revolution, and (3) whose business models were not originally based on the use of digital technologies."</i> |
| <b>Biglaiser, Calvano, and Crémer (2019)</b> | <i>"firms already installed which generate higher profits than entrants even if the latter offer identical or even better terms (in terms of price and quality) to consumers."</i>                                |
| <b>Heiskanen et al. (2018)</b>               | <i>"firms that control most of the fixed capital, including infrastructures like distribution grids, and the existing customer base."</i>   |



Based on the definitions by Metzler and Muntermann (2020); Biglaiser, Calvano, and Crémer (2019); and Heiskanen et al. (2018), this thesis defines incumbency as “*The beneficial position held by established businesses in the traditional industry, who have the abilities, resources, and expertise necessary for gaining a competitive advantage over new entrants.*” to understand further discussions better.

### **2.1.2 The Role of Incumbent Knowledge in Industries**

The barriers incumbents experience while introducing sustainable technology are highlighted by van Mossel, van Rijnsoever, and Hekkert (2018). They also emphasize the need for a flexible organizational structure that encourages experimentation and learning. They contend that removing barriers and encouraging the implementation of sustainable innovations depend on cooperation with stakeholders, such as clients, suppliers, and regulators. Furthermore, it can be argued that developing sustainable business models can assist incumbents in overcoming the barriers associated with transitioning from hydrocarbons to renewable energy sources (van Mossel, van Rijnsoever, and Hekkert 2018).

Similarly, Heiskanen et al. (2018) investigate what motivates companies to switch from fossil fuels to renewable energy sources. They highlight essential factors such as laws and regulations, market dynamics, and technological innovations. The study focuses on bricolage and strategic action as the two main corporate tactics used throughout energy transitions. Taking strategic action entails looking for new business opportunities and financial sources, such as investments in developing and storing renewable energy. Bricolage, on the other hand, focuses on little adjustments to improve energy efficiency and maximize the usage of fossil fuels. According to the study, companies prioritizing satisfying consumer needs and providing various goods and services are more likely to take strategic action, giving them a competitive advantage in creating long-term, sustainable business models (Heiskanen et al. 2018).

Nevertheless, the results emphasize that businesses should prioritize innovation and adjust to new technological developments and market trends. This information can help stakeholders and decision-makers prepare for and respond to the opportunities and difficulties presented by energy transitions. Exploring the potential and difficulties of

implementing sustainable business models in the geothermal energy sector will require more research (van Mossel, van Rijnsoever, and Hekkert 2018; Heiskanen et al. 2018).

According to Giustiziero, Kaul, and Wu (2019), incumbent industry knowledge is crucial for innovation but can lead to a barrier of reliance on standard approaches. Di Lorenzo and van de Vrande (2019) propose that corporate venture capital (CVC) investments provide access to external knowledge and technology to overcome this barrier. Utilizing external information helps incumbents encourage innovation, seize new opportunities, and remain competitive. However, Giustiziero, Kaul, and Wu (2019) emphasize the importance of leveraging current industry knowledge in knowledge transfer for the transition to sustainable business models by incorporating new technologies, strategies, and tools (Giustiziero, Kaul, and Wu 2019; Di Lorenzo and van de Vrande 2019).

In the transition to sustainable business models, a study by Banzholer, Berger-de León, and Patel (2019) argue that incumbents have a competitive advantage due to their financial stability, existing customer base, well-known brands, and internal expertise (Banzholer, Berger-de León, and Patel 2019). However, this transformation presents barriers found by Turnheim and Geels (2019) that call for strategic judgment and adaptability because businesses must be open to unpredictability and ready to adjust their strategic course. Incumbents can guide search paths, use resources, and support historical activities to carve out a strategic niche and impact the transition (Turnheim and Geels 2019). Incumbents can use their current expertise, resources, and political influence by concentrating on specific technologies and solutions that support their objectives. Additionally, they might give funding and resources to assist initiatives that validate new infrastructure and dispel stakeholder reluctance (Turnheim and Geels 2019). In contrast, according to a later study by the same researchers, it is necessary to take a diversified approach that takes into account the incumbents' views and biases in order to overcome resistance from those who support present methods, which entails addressing obstacles to adopting sustainable business models by working cooperatively and reflectively (Turnheim and Sovacool 2020).

Energy incumbency is vital to the global energy transition, although they frequently resist transitioning to a low-carbon economy (Curran 2020). To effectively navigate the energy transition, however, several variables must be considered, including the state of the market, available funding, and prevailing legislative frameworks (Firdaus and Mori 2023).

Understanding the drivers of this transformation is crucial, according to Firdaus and Moiri (2023); nevertheless, the institutional, political, and financial barriers, such as legislative measures, a lack of financial incentives, or insufficient support for renewable energy technology, faced by incumbents in implementing sustainable business strategies (Curran, 2020). A more seamless transition can be achieved by removing barriers like governmental regulations, financial incentives, and restricted support for renewable energy (Curran, 2020). To overcome these barriers and aid in transitioning to a sustainable energy system, policymakers can create comprehensive plans (Curran, 2020; Firdaus and Moiri, 2023).

### **2.1.3 The Changing Energy Picture**

#### ***Climate Change***

Due to the severe threat posed by climate change, the United Nations (UN) is working to reduce emissions, support renewable energy sources, and improve energy efficiency. In order to reduce global emissions, a low-carbon economy and a vital energy industry (United Nations n.d.). The International Energy Agency (IEA) stresses the need for structural adjustments to reduce greenhouse gas emissions over the long run because of the need to reevaluate energy production and consumption considering climate change. As organizations transition to sustainable business models, switching to renewable energy is essential (IEA 2020).

The energy sector's incumbents are essential players in the fight against climate change (Steen and Weaver 2017; Heiskanen et al. 2018; Curran 2020). They must invest in renewable energy and energy storage technologies, boost energy efficiency, work with other stakeholders, and research new sustainable energy solutions to transition to a low-carbon economy and meet the UN's sustainability goals. The industry may lower greenhouse gas emissions and lessen climate change's effects by prioritizing these initiatives (IEA 2018).

Figure 1 demonstrates how increasing demand for energy and CO<sub>2</sub> emissions will be caused by expanding industry, transportation, and urbanization, making it challenging to combat climate change. This emphasizes the requirement for sustainable rules and better energy sources. The prediction can be used by decision-makers, energy experts, and the public to comprehend future trends and take appropriate action. However, the problem for established

energy businesses is balancing declining CO2 emissions with rising energy consumption. These companies must navigate the energy industry's future and support climate change initiatives (IEA 2018). Jiang, Fan, and Klemeš (2021) argue that a coordinated and comprehensive energy policy and strategy is necessary to solve the issues posed by Figure 1's forecast of the world's energy demand and CO2 emissions. Funding for dependable energy systems, improved efficiency, and alternative sources should be prioritized in this strategy.

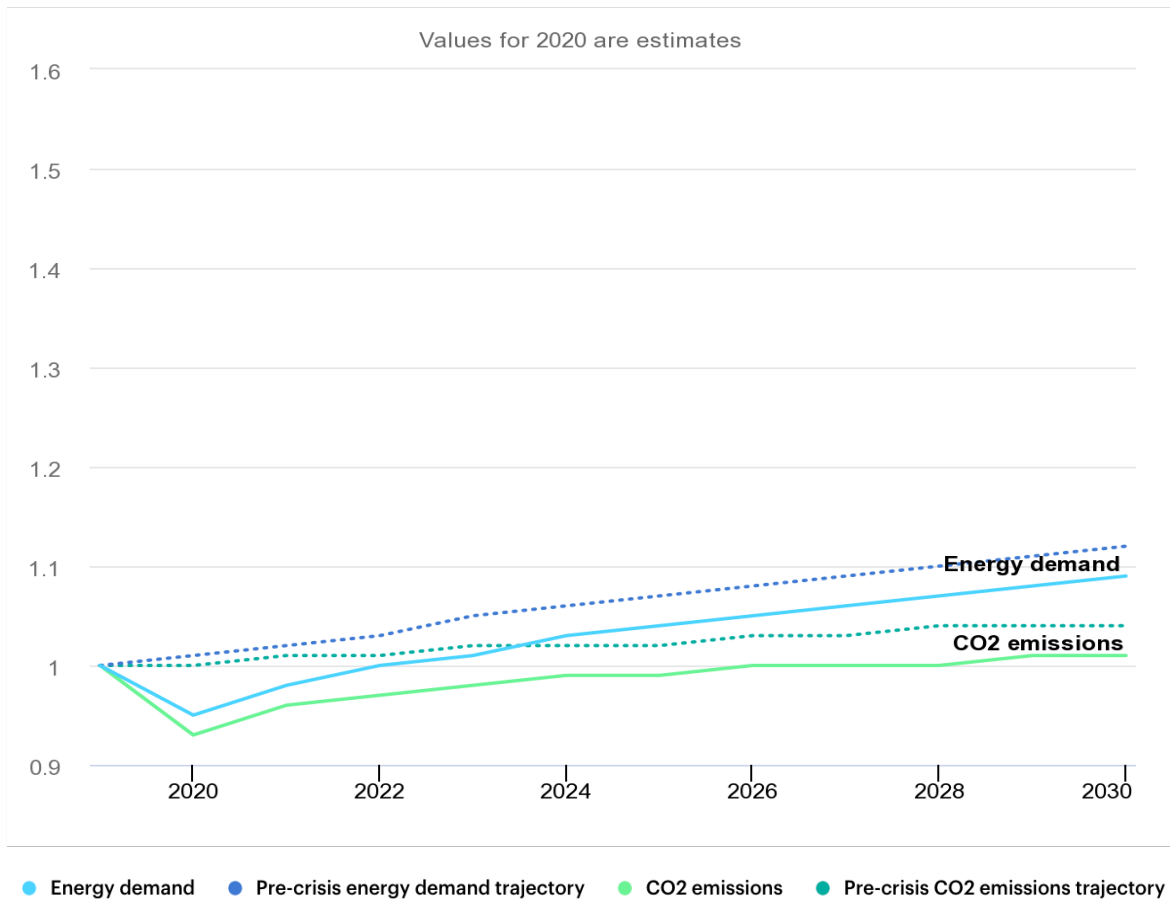


Figure 1 - Global energy demand and CO2 emissions trends in the Stated Policies Scenario, 2019-2030 (IEA 2020, 163).

Energy companies should prioritize adopting low-carbon technologies, including energy storage, renewable energy, carbon capture and storage, and energy efficiency to reduce CO2 emissions. By investing in these technologies, they may meet energy needs while lowering their carbon footprint. They can also work with legislators to advance advantageous legislation and rules, such as carbon pricing and other CO2 emission-reduction plans. For these companies, it is still challenging to balance lowering emissions and offering reasonably priced energy to fulfill the growing demand (IEA 2018; Jiang, Fan, and Klemeš 2021).

### ***Energy Demand in Northern Countries***

The case study by Fischer, Elfgren, and Toffolo (2020) in Sweden offers a workable strategy to lower CO<sub>2</sub> emissions and peak electricity imports without materially raising total costs. The northern regions of Finland, Norway, and Sweden present several challenges to municipal energy systems, including a cold environment, big companies, and a high need for electric heating, which results in peak electricity demand. A key tactic for lowering CO<sub>2</sub> emissions while attaining objectives for economic growth, energy self-sufficiency, and affordability is investing in renewable electricity generation and enhancing energy efficiency. Fischer, Elfgren, and Toffolo's (2020) research can be connected to the significance of sustainable business model innovation in the energy sector to obtain a competitive advantage while supporting global sustainability efforts (Fischer, Elfgren, and Toffolo 2020).

### ***Investments in Renewable Energy***

Due to the volatility of the energy market, renewable energy is essential for energy security, economic development, improving public health, and preventing climate change (IEA 2022). However, a study by Fabrizio (2012) emphasizes that considerations for investing in renewable technology include stakeholder preferences, costs, the availability of electricity, and laws. To guarantee client affordability, consideration of marginal market costs is necessary (Fabrizio 2012). The study by Firdaus and Mori (2023) argues that the transition to renewable sources has picked up steam to prevent unprofitable fossil fuel infrastructure. Existing energy companies must choose between risking stranded assets and investing in fossil fuels (Firdaus and Mori 2023). Considering this, established oil and gas businesses must evaluate their skills and knowledge to create innovative business models that will give them a competitive advantage (Fabrizio 2012; Firdaus and Mori 2023).

The study by Firdaus and Mori (2023) emphasizes the significance of comprehending the switch to renewable sources and its effects on investments in infrastructure utilizing fossil fuels. A thorough awareness of the industry's complexity and the organization's internal strengths and weaknesses is therefore required when evaluating the knowledge and capabilities of an established oil and gas company to obtain a competitive advantage through sustainable business model innovation (Firdaus and Mori 2023).

### ***Geothermal Energy as A Renewable Alternative***

According to Kalair et al. (2021), researchers are looking at renewable energy sources as fossil fuels deplete and energy demand rises. Each country must establish its energy transition strategy due to the available resources. The 20–25% renewable energy percentage is expected to rise to 100% by 2050. Although geothermal energy is a renewable alternative that is not widely used, it has significant advantages over traditional sources. Geothermal energy is produced by the Earth's chemical makeup and molecular processes and is thought to be more dependable and sustainable than fossil fuels (Kalair et al. 2021). According to Islam et al. (2022), geothermal energy has the potential to be a dependable and sustainable source that can aid in lowering greenhouse gas emissions. They argue that additional studies and favorable policies are required to help geothermal energy fully meet the world's energy needs while preventing climate change (Islam et al. 2022).

Geothermal energy adoption, however, confronts several difficulties. According to Farzanehkhameh et al. (2020), the high installation costs of geothermal heat exchangers (GHE) are the main barrier to the widespread use of geothermal heat pump (GHP) systems. The GHE must be optimized for cost reduction. The government's energy subsidies will decrease, and the payback period will be short, claims economic research (Farzanehkhameh et al. 2020). Additionally, Ioannou et al. (2023) discovered that geothermal projects face several difficulties due to a lack of social acceptance. A decision tree was used by Ioannou et al. (2023) to assist geothermal energy investors in overcoming these challenges. They concluded that the stage of the project life cycle influences investment risk, social engagement tactics, and funding mechanisms. Given the opposition to geothermal projects in society, engagement strategies must be developed (Ioannou et al. 2023).

Despite these obstacles, incumbent oil and gas companies want to acquire a competitive advantage by utilizing their expertise and resources in the renewable energy sector. These businesses can explore creative business models that can help them tap into the possibilities of this promising energy source by remaining educated about the most recent advancements and research in geothermal energy. By doing so, they can lessen greenhouse gas emissions and the effects of climate change in addition to helping to meet the world's energy needs (Farzanehkhameh et al. 2020; Kalair et al. 2021; Islam et al. 2022; Ioannou et al. 2023).

### **2.1.4 Energy Transition in The Oil & Gas Industry**

The term "energy transition" describes the global transition from environmentally damaging fossil fuels to renewable energy sources like solar, wind, hydropower, and geothermal energy. Concerns about climate change, air pollution, ecosystem destruction, and the availability and affordability of renewable sources are driving this revolution. The successful implementation of sustainability transitions requires more than just technology breakthroughs; it also requires changes in social, institutional, and cultural practices (Markard, Raven, and Truffer 2012). With its resources and abilities, the oil and gas industry can change the conventional energy sector (IEA 2018; United Nations 2017). Future changes to the global energy system will be strongly influenced by how the oil and gas industry responds to efforts to reduce climate change and transition to sustainability (Morgunova and Shaton 2022).

In response to external influences, including the economy, government, and society, Wan Ahmad et al. (2016) determined that the oil and gas industry needs to integrate sustainability into its business models, driven by external influences such as the economy, government, and society (Wan Ahmad et al. 2016). However, despite modest investments in renewable energy and emission reductions, the industry's reaction to energy transition is still insufficient, needing increased governmental monitoring and public pressure (Bach 2017). Later research by Bach (2019) states that the transition to a low-carbon economy must be accelerated. While progress has been achieved, more work is still required to ensure sustainability (Bach 2019). Supporting this, the researchers Chaiyapa, Esteban, and Kameyama (2018) examined the factors that led Thailand's oil and gas corporations to invest in renewable energy. There were three primary drivers: economic, environmental, and social, which included business possibilities, decreasing reliance on fossil fuels, lowering climate change, strengthening corporate social responsibility, meeting stakeholder expectations, and promoting community well-being. Corporations prioritized economic and environmental issues more than social incentives. However, actively promoting the social benefits of renewable energy investments could build confidence and trust with stakeholders and possibly benefit the competitive advantage (Chaiyapa, Esteban, and Kameyama 2018).

## ***The Norwegian Oil & Gas Industry***

Norway's economy has significantly benefited from its abundant natural resources, which include salmon, hydropower, oil, and gas (Confederation of Norwegian Enterprise (NHO) n.d.). However, environmental issues have been exacerbated by the usage of fossil fuels and a linear economic paradigm (Okafor et al. 2021). Despite this, the Norwegian government hopes to reduce carbon emissions by at least 50% by 2030 and intends to continue producing oil and gas as a substitute for coal until renewable energy sources are economically viable (Lund 2021). The opportunity for oil and gas businesses to capitalize on their comparative advantages in the developing energy economy by applying their understanding of oil and gas production to the renewable energy industry is highlighted by Zhong and Bazilian (2018). However, according to Steen and Weaver's (2017) study on diversification strategies in Norway's energy sector, while entering complementary industries can be advantageous for established businesses, doing so may also cause them to lose their expertise and specialization, which may make it more difficult for them to compete and adapt to market changes. According to the study, such diversification may also impact how new companies are formed, and industries are organized, resulting in barriers to entry for new businesses and industry consolidation (Steen and Weaver 2017).

### **2.1.5 Drivers and Barriers for Geothermal Energy**

Although there are few studies on the subject, some publications highlight how vital alternative energy sources are for improving energy security and cutting emissions. According to Fashina et al. (2019), geothermal energy is recognized as a great alternative that can help achieve these goals. Geothermal energy is viable and sustainable, making it a potential alternative for businesses transitioning from traditional to sustainable business models. Notably, recent research by Madurai Elavarasan et al. (2020) gives a SWOT analysis of geothermal energy, highlighting its advantages and limitations as a source of alternative energy. The drivers to geothermal energy are significant for businesses looking to transition to a sustainable business model. It is a desirable option due to its high dependability, cheap operating costs, and low carbon emissions (Madurai Elavarasan et al. 2020). Geothermal energy also offers prospects for power production, heating and cooling services, and baseload power supply reliability. These qualities support established businesses' objectives to switch from reliance on conventional fossil fuels to more sustainable energy sources.



However, several barriers exist to overcome when implementing a geothermal energy-focused sustainable business strategy. Since geothermal techniques need specific geological conditions, their widespread adoption may be constrained (Madurai Elavarasan et al., 2020). The significant upfront expenses of drilling and exploration may also hamper the feasibility of geothermal projects. Geothermal energy production may also be hampered by legislative and policy barriers, such as permitting requirements and land-use limitations (Madurai Elavarasan et al. 2020).

## **2.2 Theoretical Foundation**

This section addresses the theoretical foundation of the thesis. The following subsections focus on the idea of change, the entrepreneurial mindset, the absorptive capacity and knowledge transfer, the Natural-Resource-Based view of The Firm, and sustainable business models. The final part of this section combines these toward competitive advantage.

### **2.2.1 The Idea of Change**

This thesis is significantly based on the idea of change and transitions. The causes of change can be internal or external and can impact people, organizations, and society. Changes in technology and the environment are typical examples of change. For progress, overcoming obstacles, and situational adaptation, it is crucial to comprehend the idea of change. Researchers have characterized change itself in a variety of ways. Van de Ven and Poole (1995, 512) define it as “*the empirical study of the difference in the structure, quality or status of an organizational entity over time*” (Özcan Buckley 2020, 153). However, more recent research by Wang et al. (2020) states that “*Change refers to change that is evident whereas transformation refers to change that is gradual.*” (Wang et al. 2020).

The idea of change concerning the energy transition to more sustainable energy systems is examined by Child and Breyer (2017). They argue that transformation, as opposed to transition, necessitates a fundamental restructuring of the energy system and outlines the four main dimensions of change in sustainable energy systems as being technological, economic, social, and political (Child and Breyer 2017).

## **2.2.2 Entrepreneurial Mindset**

Organizations must become more entrepreneurial as environments grow more dynamic and competitive. Mcgrath and MacMillan (2000), referred to in Kouakou et al. (2019), defined the entrepreneurial mindset based on three characteristics: the capacity for perception, the capacity for quick action, and the capacity for resource mobilization, even under uncertain circumstances.

Phipps and Prieto (2012) find empirical data in their study that there is a beneficial association between knowledge management and individual creativity. The study's conclusions are consistent with earlier studies demonstrating how knowledge management techniques, such as knowledge sharing and transfer, can enhance individual creativity (Nonaka and Takeuchi 1996; Alavi and Leidner 2001). According to earlier research that has emphasized the significance of having an entrepreneurial mindset in fostering creativity and innovation (Shalley, Zhou, and Oldham 2004), an entrepreneurial mindset can enhance the beneficial effects of knowledge management on an individual's creativity (Phipps and Prieto 2012).

The research provided by Kouakou et al. (2019) argues that successful entrepreneurs can be distinguished from those who fail by having a mindset of entrepreneurship. As the social and economic circumstances changed throughout time, it also changed, and it consists of several entrepreneurial mindset components. The four main categories stated by the research are opportunity recognition, creativity and invention, risk-taking, and resilience (Kouakou et al. 2019).

More recent research by Lynch and Corbett (2023) provided an understanding of how managers can change their perspective to become more resilient in the face of difficulties and setbacks. They briefly introduce their framework, the "entrepreneurial mindset cycle," which can be used to study case studies of successful entrepreneurs. The entrepreneurial mindset might then be regarded as one that oscillates between implementation orientation and elaboration orientation, leading to learning cycles rather than as one single concept, as shown in Figure 2.

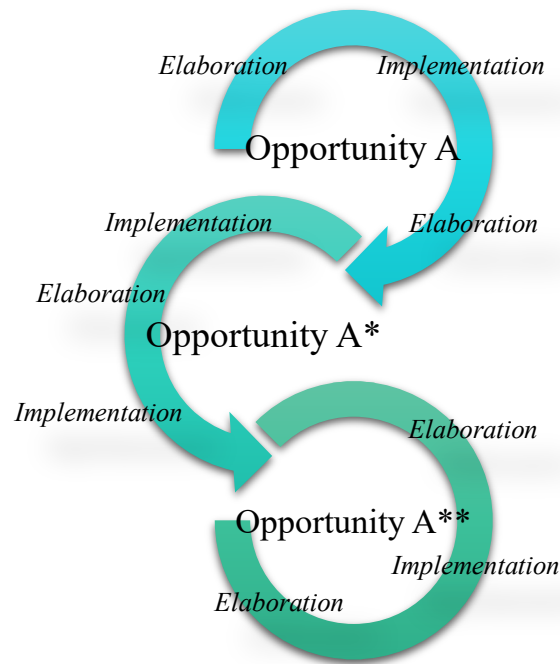


Figure 2 - Cycles of learning within the entrepreneurial mindset. Adapted from Lynch and Corbett (2023).

Entrepreneurs learn by repeatedly switching between elaborative and implementation orientations to determine the right market fit. Entrepreneurs gain new knowledge and integrate it into their consciousness when they switch between these two orientations, enabling them to choose implementation path(s) forward with superior judgment. Better judgment results from learning during these cycles between the orientations. Entrepreneurs must be experiential learners who modify their business notions by acting under uncertainty and making commission errors when starting a new company. As can be observed, entrepreneurs go through constant cycles of learning in which mistakes of commission and minor failures aid in the idea’s revision in response to input from the market (Lynch and Corbett 2023).

### 2.2.3 Absorptive Capacity and Knowledge Transfer

Absorptive capacity has drawn much attention in the organizational learning and innovation literature. It describes an organization’s capacity to acquire, absorb, and apply new skills and information to enhance performance. Any firm that wants to be competitive and adjust to shifting market conditions must invest in developing its absorptive capacity. Increased innovation, a competitive advantage, more outstanding performance, and better risk management are all benefits of absorptive ability. A business can get a competitive

advantage by incorporating and using new information and technology. It can also outperform its competitors by being on the cutting edge of implementing new technologies.

Additionally, absorptive capacity enables a company to boost performance by incorporating new skills and information into its operations. Furthermore, it can handle risk better and minimize losses with a solid absorptive ability (Lim and Falk 2016). Although absorptive capacity provides many benefits, there may be drawbacks and difficulties. For some businesses, the high expenses of creating and maintaining absorptive capacity might be a problem. Implementing new technologies and processes can be challenging due to employee and stakeholder resistance to change. Finally, a business may find it challenging to efficiently filter and prioritize which innovations to employ due to the amount of new knowledge and technologies available (Lim and Falk 2016).

Effective knowledge transfer is closely related to absorptive capacity, and an organization needs to absorb and utilize new information to transfer knowledge successfully. An organization can successfully transfer knowledge among its people and with outside partners by establishing absorptive capacity, which encourages creativity and boosts productivity. Knowledge transfer is transferring knowledge, information, and skill inside an organization from one individual or group to another. Information, skills, and experience are transferred from one person or team to another to improve organizational performance, efficiency, and effectiveness. Knowledge transfer can be particularly crucial for a company going through a transformation, such as a merger or acquisition, a restructuring, or a change in corporate strategy. Employees may need to pick up new abilities during the change to adopt new procedures and systems or adjust to new roles and responsibilities (Lim and Falk 2016).

A study by Liao et al. (2017) investigates the connections between organizational learning, knowledge transfer, absorptive capacity, and sustained competitive advantage. The study's conclusions emphasize the significance of absorptive capacity in creating a long-lasting competitive advantage. They discovered that absorptive capacity favors sustained competitive advantage, showing that businesses that can absorb, assimilate, and utilize outside knowledge are more likely to keep a competitive advantage. The study also found that information transfer significantly mediated the link between absorptive capacity and long-term competitive advantage. Companies can increase their ability to absorb by forming partnerships with outside parties. These connections can make it easier for people to share

knowledge and skills, which helps businesses develop new skills and capabilities that they can utilize to stand out from the competition and add value for their consumers. The study emphasizes the significance of knowledge transfer in maximizing absorptive capacity's advantages. This may help businesses successfully implement the knowledge they have learned through absorptive capacity, resulting in a long-lasting competitive advantage (Liao et al. 2017).

Figure 3 provides a visual representation of the framework composed by Liao et al. (2017). The absorptive capacity is emphasized in this concept as a key mechanism for acquiring and integrating knowledge, and knowledge acquisition practices and prior knowledge impact absorption capacity. The figure highlights knowledge transfer as a process by highlighting several ways to transform existing knowledge into knowledge for a new business area. The model also emphasizes the value of organizational learning, which is the buildup of knowledge within the company. Establishing a sustained competitive advantage is proven to result from information transfer and absorptive ability, which results in organizational learning. The relationships between absorptive capacity, information transfer, organizational learning, and how it can lead to competitive advantage are illustrated (Liao et al. 2017).

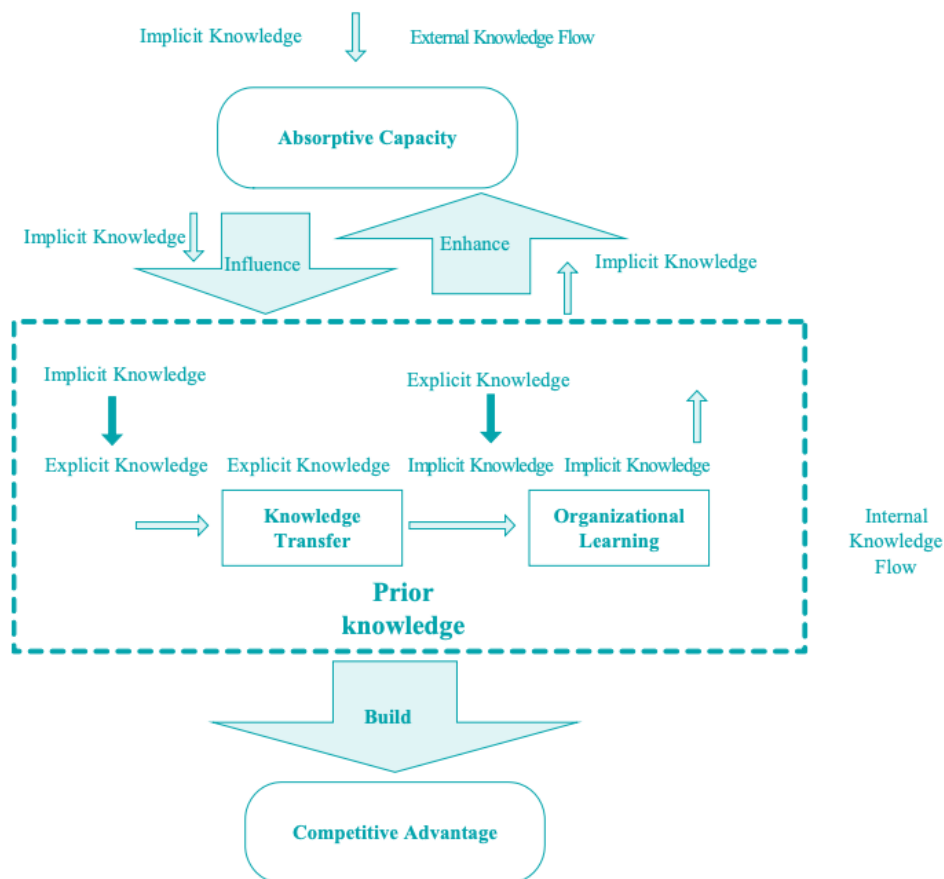


Figure 3 - Conceptual framework from Liao et al. (2017, 1433) on absorptive capacity and knowledge transfer

The idea is supported by Liu, Dutta, and Park (2021) in their research paper on the value of organizations acquiring external knowledge to sustain a competitive advantage in today's fast-paced business climate. They argue that companies with greater absorptive capacity are better equipped to gather, absorb, and apply outside knowledge, which boosts their competitiveness. According to their research, the relationship between absorptive capacity and business performance and competitive advantage is significantly enhanced by absorptive capacity. In particular, companies with more substantial absorptive capacity can better transform external knowledge into higher levels of labor productivity, consequently improving company performance and creating a long-lasting competitive advantage (Liu, Dutta, and Park 2021).

#### **2.2.4 Natural-Resource-based View of The Firm**

The Natural-Resource-Based View of the Firm (NRBV) is a theoretical framework that holds that a firm's sustained competitive advantage is generated from unique and valuable resources and capabilities anchored in its natural resource context. The NRBV stresses the external environment and the role of natural resources as a significant source of a business's value creation, in contrast to other firm perspectives emphasizing internal variables like organizational structure or technical innovation. Scholars in various disciplines, including corporate social responsibility, environmental economics, and strategic management, have since improved and built on Hart's (1995) original position. The NRBV offers a practical framework for examining how businesses can generate value while addressing urgent environmental and social issues (Hart 1995).

The significance of comprehending the dynamic interaction between businesses and the settings in which they operate was underlined in Hart's (1995) article. To produce value for stakeholders other than shareholders, the essay suggested that businesses should establish strategies that balance economic performance and environmental sustainability. By evaluating the NRBV's development in the 15 years that followed Hart's (1995) article, Hart and Dowell's (2010) article expands on this basis. They broaden the scope of the NRBV to account for ecosystem services and draw attention to the theory's shortcomings in solving more significant societal issues. The expansion of the NRBV to include ecosystem services proposed by Hart and Dowell (2010), illustrated in Table 2, is consistent with Hart's (1995)

emphasis on environmental sustainability, indicating that Hart’s approach is still relevant today (Hart and Dowell 2010).

Table 2 - Adapted from the table “NRBV: fifteen years later” of Hart and Dowell (2010).

| Strategic Capability | Societal Driving Force                   | Key Resource            | Competitive Advantage  | State of Research Development   |
|----------------------|--|-------------------------|------------------------|---|
| Pollution prevention | Minimize emissions, effluents, and waste | Continuous improvement  | Lower costs            | Strong empirical evidence in favor of NRVB                                    |
| Product stewardship  | Lower product life cycle cost            | Stakeholder integration | Reputation/ legitimacy | Growing area of research but much to be accomplished                          |
| Clean technology     | Make quantum-leap improvement            | Disruptive change       | Future position        | Little research to date   |
| Base of the pyramid  | Meet unmet needs of the poor             | Embedded innovation     | Long-term growth       | Growing body of practitioner-oriented research, but academic attention needed |

### 2.2.5 Sustainable Business Models

A sustainable business model is a structure that enables an organization to run its operations in a way that is long-term commercially, socially, and environmentally viable. Such a model balances the requirements of all stakeholders, including shareholders, employees, consumers, suppliers, and the larger community. Sustainable business models are deployed for several beneficial reasons, such as risk mitigation, improved efficiency, innovation, attraction and retention of customers and employees, and positive environmental and societal impact. Implementing a sustainable business model can lead to improved financial performance, enhanced brand reputation, increased customer loyalty, attraction and retention of employees, and reduced risk (Geissdoerfer, Vladimirova, and Evans 2018; Khan, Ahmad, and Majava 2021). On the other hand, there are disadvantages connected to such business models as it demands change. The disadvantages connected to sustainable business models, as for any significant changes, are often higher costs, resistance to change, limited availability of sustainable inputs, complexity, and lack of standards and regulations.

Sustainable business models can, according to Geissdoerfer, Vladimirova, and Evans (2018), be defined as “*business models that incorporate pro-active multi-stakeholder management, the creation of monetary and non-monetary value for a broad range of stakeholders, and hold a long-term perspective.*” (Geissdoerfer, Vladimirova, and Evans 2018, 404). The original idea was to use businesses to support the shift to a more sustainable economic system, give organizations leverage for integrating sustainability considerations,

and support businesses in achieving their sustainability goals. Sustainable business models are now more frequently considered a source of competitive advantage (Geissdoerfer, Vladimirova, and Evans 2018). Figure 4 illustrates the factors and changes that must be made when moving from a traditional business model toward a sustainable one.

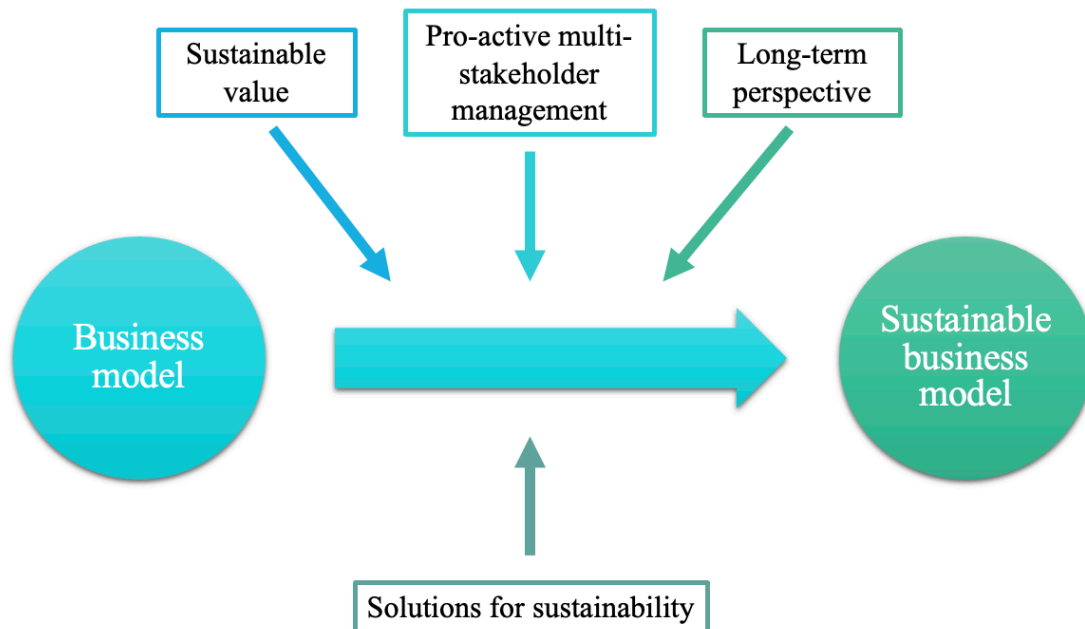


Figure 4 - Changes in the business model to become sustainable. Adapted from Geissdoerfer, Vladimirova, and Evans (2018).

A thorough analysis of the literature on sustainable development is provided by Khan et al. (2021), focusing on the triple bottom line and sustainable business model viewpoints. The triple bottom line and sustainable business models were two significant themes that the authors discovered after conducting a methodical mapping analysis to assess the literature on sustainable development (Khan, Ahmad, and Majava 2021). Business models that consider the economy, society, and environment are considered sustainable. The authors classified many sustainable business models, such as closed-loop, regenerative, and product-service systems. These models strongly emphasize eliminating waste, conserving resources, and generating value for all parties involved. To support sustainable development, the study emphasizes the significance of sustainable business models. According to the authors, businesses embracing sustainable business models are more likely to be resilient since they are better prepared to deal with climate change, resource depletion, and social and economic inequality (Khan, Ahmad, and Majava 2021).



Additionally, companies prioritizing sustainability are more likely to draw in and keep clients, staff members, and investors who share their principles. To support sustainable development, the study emphasizes the significance of sustainable business models. According to the study, businesses embracing sustainable business models are more likely to be resilient since they are better prepared to deal with climate change, resource depletion, and social and economic inequality. Furthermore, companies prioritizing sustainability are more likely to draw in and keep clients, staff members, and investors who share their principles (Khan, Ahmad, and Majava 2021).

### ***Sustainable business model innovation***

Formulating an enhanced approach towards attaining financial gains while concurrently upholding the well-being of individuals and the environment is called sustainable business model innovation. Achieving enduring outcomes by simultaneously generating profits and meeting client expectations necessitates the endeavor of reevaluating and enhancing the company's offerings of goods or services, as well as its collaborations, operational procedures, and resource allocation, encompassing energy, raw materials, and supply chain configuration. To meet the augmented expectations for ethical and sustainable practices from investors and consumers alike, enterprises should actively adopt pioneering sustainable business models (Geissdoerfer, Savaget, and Evans 2017).

A review by Geissdoerfer, Vladimirova, and Evans (2018) defines sustainable business model innovation as *“the conceptualization and implementation of sustainable business models. This can comprise the development of entirely new business models, the diversification into additional business models, the acquisition of new business models, or the transformation from one business model to another.”* (Geissdoerfer, Vladimirova, and Evans 2018, 407). The paper covers the opportunities and difficulties of developing sustainable company models, and it discovers several difficulties, including resource shortages, regulatory restrictions, and reluctance to adapt. They also review the advantages of sustainable business model innovation, like heightened competition, more extraordinary brand reputation, and higher stakeholder engagement (Geissdoerfer, Vladimirova, and Evans 2018).

Geissdoerfer, Savaget, and Evans (2017) emphasize the significance of sustainable business model innovation for businesses to acquire a competitive advantage in today's highly competitive business environment, which is supported by researchers Bocken and Geradts (2020). A thorough awareness of the industry environment, client demands, and technical improvements are necessary for successful business model innovation. Incumbent companies in the oil and gas sector have tremendous information and skills that may be used to promote the development of innovative sustainable business models. The research also emphasizes the value of partnerships and collaboration in fostering the development of new business models. Companies can co-create sustainable business models that exploit new trends, technology, and regulatory frameworks by exploiting their current knowledge and capabilities and fusing them with outside expertise. The paper outlines a systematic approach for navigating the challenges of sustainable business model innovation offered by the Cambridge Business Model Innovation Process framework, illustrated in Figure 5. By employing this procedure, businesses can successfully identify, assess, and adopt sustainable business models which support environmental sustainability goals while gaining a competitive advantage. Additionally, the framework highlights the significance of continual learning and adaptation, arguing that businesses must regularly upgrade their skills and knowledge to stay ahead in changing markets (Geissdoerfer, Savaget, and Evans 2017; Bocken and Geradts 2020).

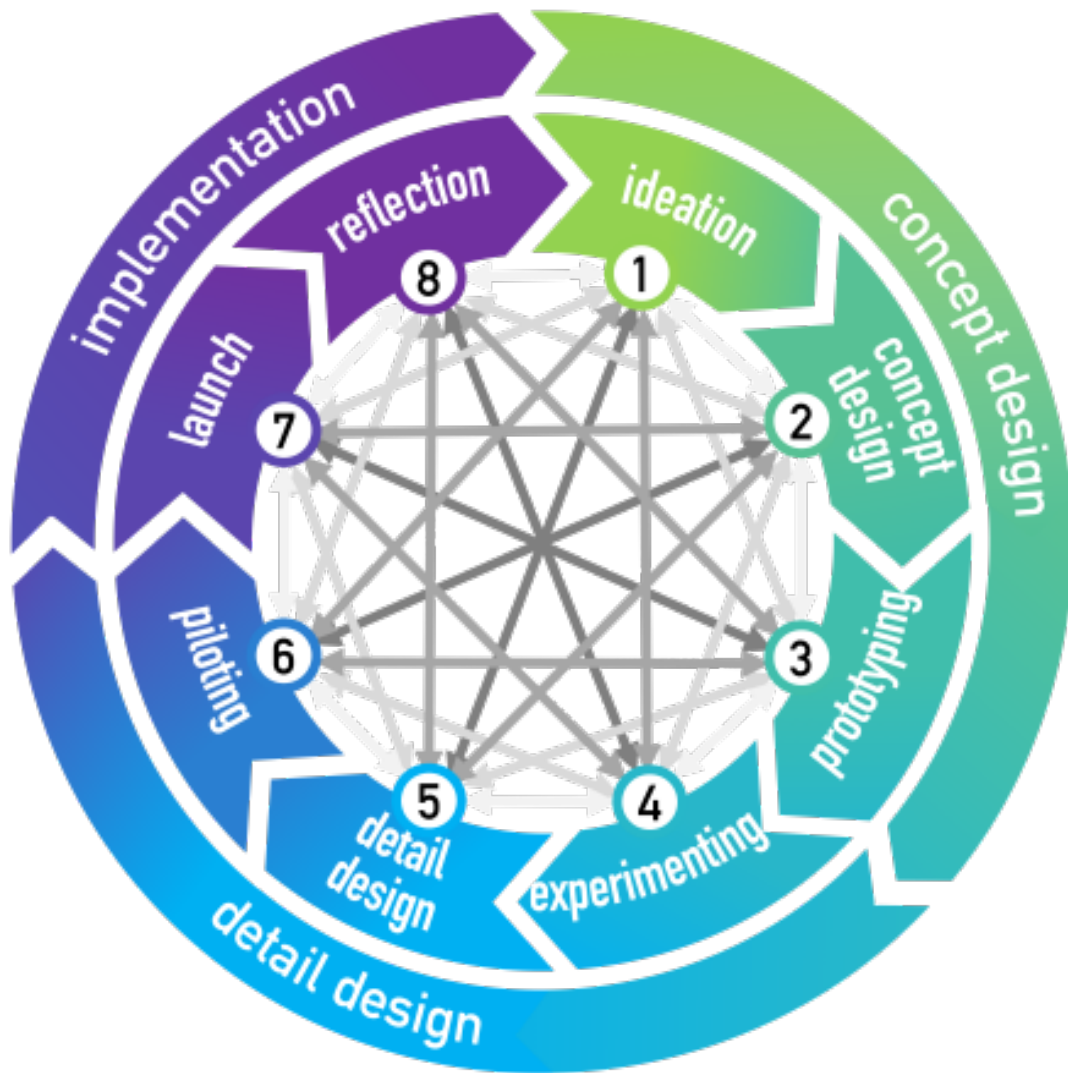


Figure 5 - Sustainable business model innovation and associated activities (Geissdoerfer, Savaget, and Evans 2017, 268).

### ***Triple Bottom Line***

Usually, a sustainable business model considers the Triple Bottom Line (TBL) approach. The TBL approach is a theoretical framework for sustainable business practices considering the economic, social, and environmental bottom lines. To increase value for every stakeholder, including the environment, employees, customers, suppliers, and communities, as well as to create value for shareholders, it was first introduced in the late 1990s. It aims to move beyond the typical emphasis on financial performance and incorporate environmental and social concerns into business decision-making (Elkington 1998; Khan, Ahmad, and Majava 2021).



*Figure 6 - The Triple Bottom Line perspective. Adopted from Miller (2020).*

The TBL approach can be connected to the energy transition by considering the three facets of sustainability during the decision-making process, as illustrated in Figure 6. The economic component of investing in renewable energy sources can be considered by evaluating the project's long-term financial sustainability. The social aspect can be considered by including local people in the decision-making process and ensuring that the project offers employment possibilities and other social advantages. The environmental component can be considered by assessing the project's effect on the ecosystem and taking action to mitigate any unfavorable effects. Using the TBL strategy, businesses can prioritize sustainable business practices that contribute value to society and the environment and produce profits by taking a comprehensive view of how the energy transition will affect diverse stakeholders. This could contribute to developing a more resilient and sustainable energy system that can fulfill the needs of both the present and the future (Khan, Ahmad, and Majava 2021).

Researchers Hourneaux, Gabriel, and Gallardo-Vázquez (2018) investigated whether industrial organizations should use the TBL technique to assess their sustainability performance. According to the study, industrial enterprises most frequently utilize the economical category of the TBL approach, which focuses on financial performance, to

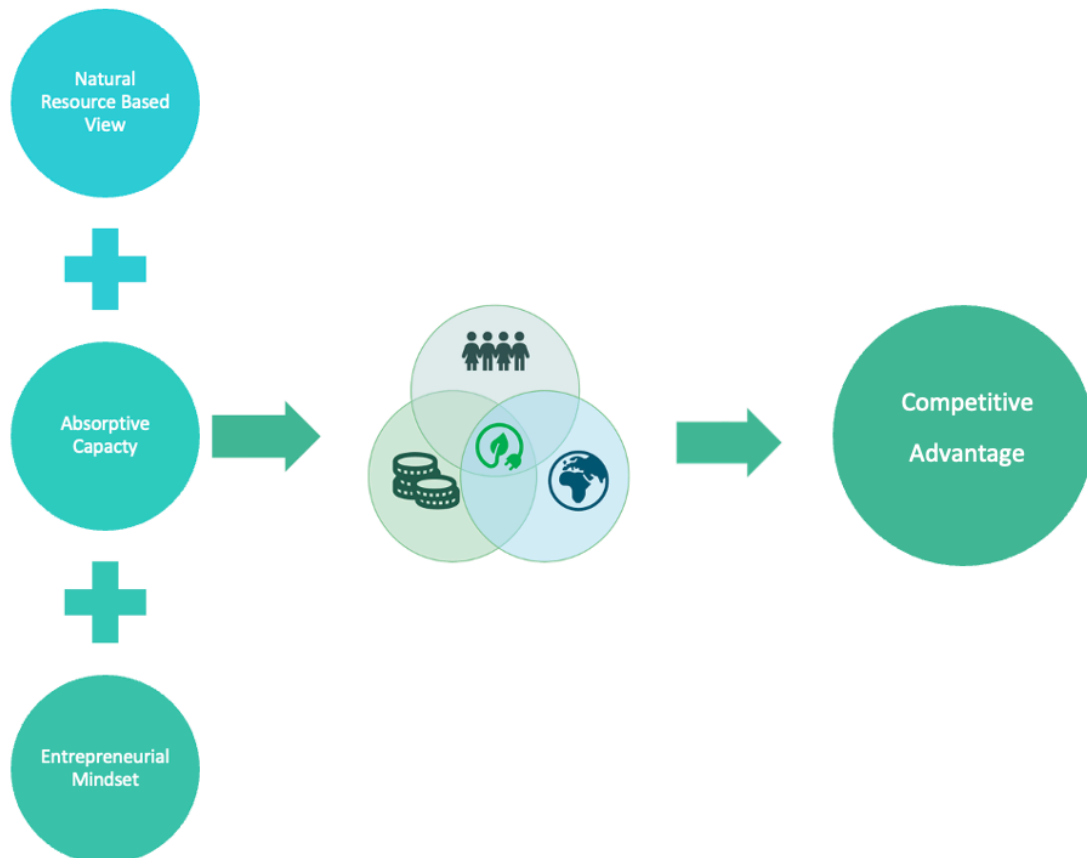
gauge their sustainability performance. The authors discovered that determining the economic viability of industrial enterprises frequently uses financial performance metrics, including return on investment, net present value, and economic value added. To measure sustainability performance in industrial organizations, the authors also discovered that the environmental and social categories of the TBL approach, which concentrate on environmental and social performance, are becoming more significant.

However, the study discovered that the environmental and social categories of the TBL approach, which concentrate on environmental and social performance, are becoming more significant in gauging sustainability performance in industrial organizations. The authors identified relevant practices of the TBL approach in measuring sustainability performance in industrial companies, including environmental performance indicators like energy consumption, greenhouse gas emissions, waste reduction, and social performance indicators like employee turnover, health and safety, and community engagement. They conclude by stating that the TBL technique is an excellent way to gauge how sustainable industrial enterprises are. They contend that applying the TBL strategy can assist industrial businesses in incorporating economic, environmental, and social factors into their operational procedures, resulting in more sustainable development (Hourneaux, Gabriel, and Gallardo-Vázquez 2018).

This finding is supported by more recent research by Khan, Ahmad, and Majava (2021) on sustainable development, specifically focusing on the triple bottom line and sustainable business model perspectives. They discovered through their research that companies that adopt the approach tend to be more sustainable since they prioritize social and environmental factors, not only economic ones, when making decisions. Furthermore, their study adds that businesses that adopt sustainable business models are more likely to be resilient because they can better address the problems caused by social and economic inequality, resource depletion, and climate change. Additionally, businesses prioritizing sustainability are more likely to attract and retain customers, employees, and investors who share their values, which is crucial when undergoing the energy transition (Khan, Ahmad, and Majava 2021).

## 2.2.6 Chapter Summary

To summarize the last four sections, combining the three mentioned theories justifies the focus on the sustainable business model innovation and the TBL approach, which altogether leads to sustainable competitive advantage, as illustrated in Figure 7.



*Figure 7 - Triple Bottom Line in Context of The Theoretical Frameworks for this Thesis.*

The TBL forces businesses to prioritize sustainability on all fronts, including economically, socially, and environmentally. This would advance knowledge about the improvements required in the company model to boost the value of people, the planet, and profit. It would also help determine whether the firm's focus on geothermal energy provides any long-term competitive advantage. However, these ideas enlarge the company's perspective, and a focus on sustainability in the market for renewable energy can be used.

## 3.0 Case Description

### 3.1 The Company

#### 3.1.1 History

Odfjell Technology is a Norwegian integrated supplier of offshore operations, well services technology, and engineering solutions to today's energy industry. The company started as a part of Odfjell Drilling when it was established in 1973 as a drilling contractor. Odfjell Drilling's early operations were devoted to drilling for the Norwegian continental shelf. The business swiftly gained a reputation for creativity and technical brilliance. In the 1980s, it started to grow internationally, opening facilities in the North Sea, the Gulf of Mexico, and other areas. Since it went public in 2011, the company has expanded and diversified, with operations in the North Sea, West Africa, and South America. With the world's increasing energy demand and the need for emissions reduction, Odfjell Drilling started to diversify in 2019. The development of the Odfjell Energy department did not last very long, as it almost immediately branched out, as illustrated in Figure 8, to Odfjell Technology in 2022 (Odfjell Drilling 2022).

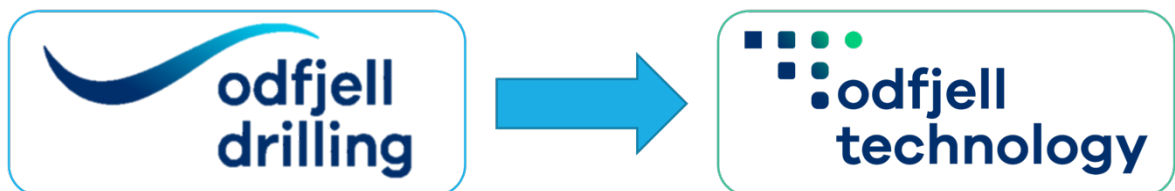


Figure 8 - From Odfjell Drilling to Odfjell Technology

With their five decades of operational experience, Odfjell Technology today serves offshore and onshore markets globally (Odfjell Technology 2021b). Today, their business model provides a diversified portfolio of products and services. However, since the company was established in 1973 as Odfjell Drilling, there have been changes in how they conduct their business. Along with the rest of Norway's oil and gas history, Odfjell Technology has been focusing on supplying the oil and gas industry. However, they have been supporting some other sectors as well. Until March last year, Odfjell Technology was part of Odfjell Drilling, as the department called Odfjell Energy (Odfjell Drilling 2022). As an oil and gas drilling establishment, the focus has been, not surprisingly, on fossil fuel extraction. Therefore, the decision was taken to split Odfjell Drilling and spin-off several business areas (Odfjell

Drilling 2022). However, as the need for an ET increases, traditional oil and gas companies are experiencing pressure to repurpose their business and reduce their emissions slowly (IEA 2018). Considering their 50-year built-up knowledge as an incumbent within the oil and gas industry, their vision is to use their heritage and expertise to support ET and to help the industry switch to alternative energy sources (Odfjell Technology 2021). The dividing of the different parts of the Odfjell corporate is illustrated in Figure 9.

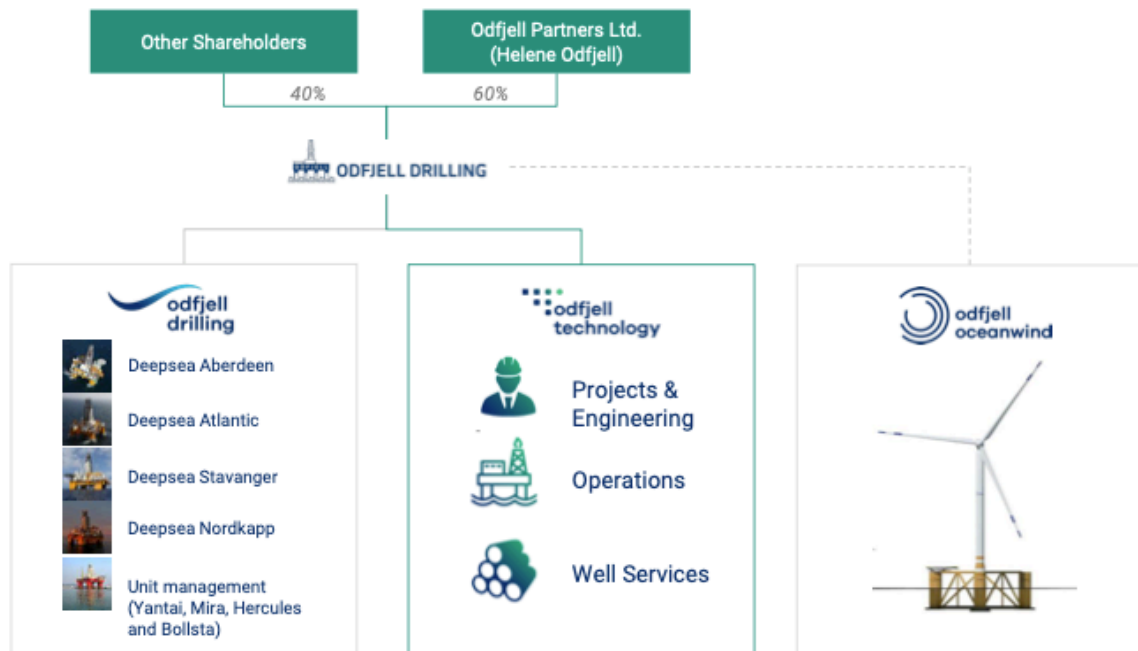


Figure 9 - Odfjell Organization

### 3.1.2 The Need for Change

The increasing need for changes in energy supply and technological innovation is affecting the entire oil and gas industry. Nevertheless, although multiple energy companies are discussing energy transition and the green shift nowadays, there are few actions to those words (IEA 2018; 2022). Considering these causes as an essential change factor, Odfjell Technology saw the opportunity to shift its business model. As the company states, their vision is to use their heritage and expertise to support the industry as it transitions to new energy solutions. Their overall ambition is a 50 percent reduction in carbon emissions by 2030 and to reach the goal of Net Zero by 2050 (Odfjell Technology 2021; Kristensen 2022). New energy sources must be researched since diversifying a nation's energy mix is crucial



for a sustainable and secure energy supply (Child and Breyer 2017; Dong, Dong, and Jiang 2020).

As Odfjell Technology has established the need for a change in their portfolio, the different opportunities were discussed and established. Several possibilities were presented, and the alternatives shown in Figure 10 were those that the company narrowed down.



*Figure 10 – Renewable opportunities for Odfjell Technology*

The Odfjell organization invested in offshore wind projects in a separate Odfjell company; therefore, Odfjell Technology is investigating other possibilities, as seen in Figure 10. Plug and abandonment are one of these possibilities, viewed as an appealing promise given that oil fields must be abandoned satisfactorily. In addition, hydrogen was another alternative that was investigated. This adaptable fuel has the potential to displace fossil fuels in a variety of fields, including industrial and transportation. Odfjell Technology looked at the viability of geothermal and independent hydrogen production. In the latter scenario, geothermal energy production might generate hydrogen as a byproduct, increasing the sustainability and efficiency of the procedure. Though the cost of hydrogen is now higher than that of conventional fuels, hydrogen production, and storage technologies are still in the early stages of development (Odfjell Technology 2023). Lastly, geothermal energy was taken into consideration. This type of energy is produced from the heat kept underground by the earth and can potentially be a consistent and dependable energy source (Barbier 2002; Islam et al. 2022; Ioannou et al. 2023)

### **3.1.3 The Geothermal Energy Alternative**

Due to environmental concerns and the depletion of fossil fuels, the energy sector is dealing with an increase in demand for clean and renewable energy sources. Recent years have seen much attention paid to wind, solar, and hydropower as possible renewable energy sources

(IEA 2022). However, the research on geothermal energy is not extensive concerning this specific case study (Odfjell Technology 2023).

Geothermal energy is a reliable baseload source of power that is independent of the weather, unlike other clean, renewable energy sources. This makes it a feasible baseload option because it can deliver steady and dependable electricity (Islam et al. 2022), as illustrated in Figure 11.

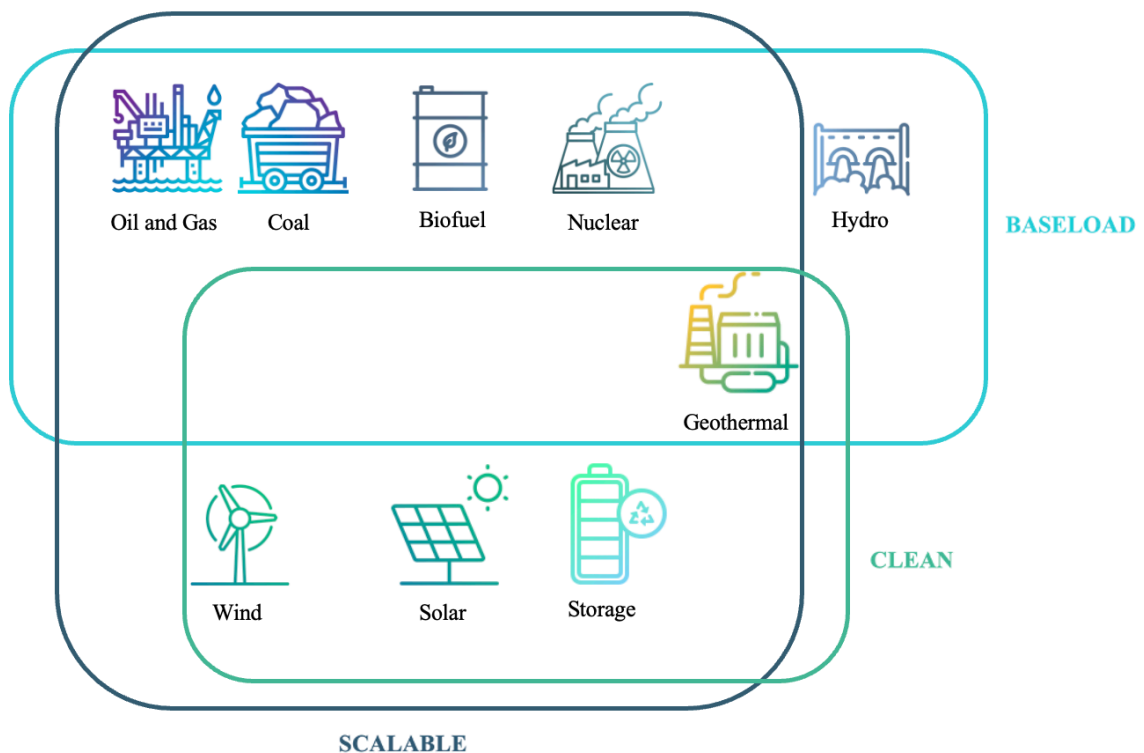


Figure 11 - Energy directions

Additionally, the energy source produces no pollutants or greenhouse gas emissions, making it a clean and sustainable energy source. Despite these advantages, geothermal energy is still underutilized compared to other renewable energy sources (Haslinger et al. 2022).

This case study investigates three different geothermal projects that Odfjell Technology has been investigating. It is a pilot project in Øygarden outside Bergen, a geothermal heat storing project in Tromsø, and an energy capacity problem at Svalbard. Geothermal energy is a renewable power with many applications benefiting society. It is mainly used to generate

electricity, done by harnessing steam from subsurface reservoirs to power turbines. Several industrial processes can also benefit from geothermal energy, as illustrated in Figure 12.

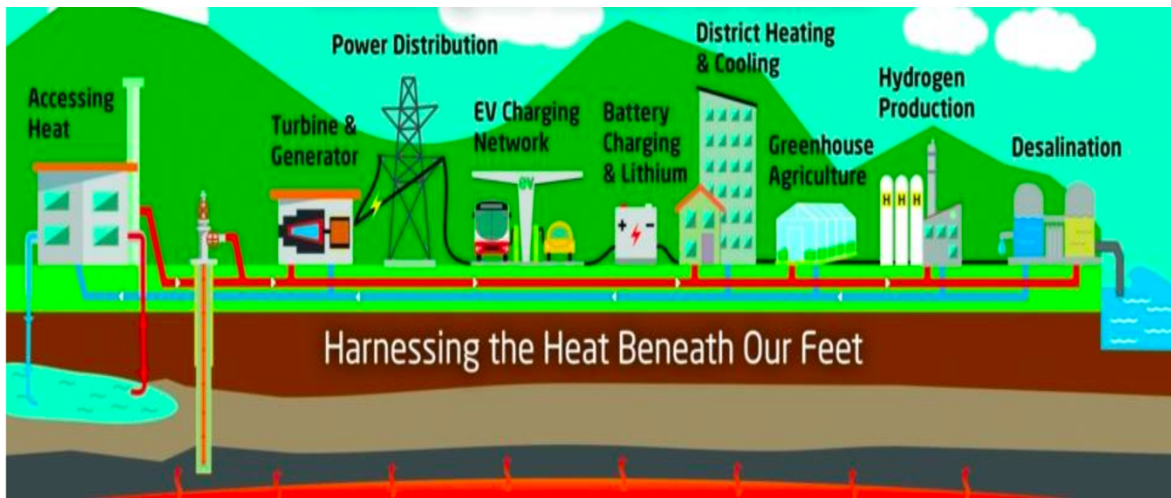


Figure 12 - Geothermal heat

### ***Project 1 – Øygarden***

With the contribution of deep geothermal drilling, the planned geothermal energy project on Norway’s west coast outside of Bergen intends to meet the area’s rising energy demands. This project seeks to take advantage of the region’s undeveloped geothermal resources with a minimum requirement of 500 to 1000 megawatts (MW) of additional energy to meet the high energy consumption of the local industry. The expected cost of the project’s first stage, drilling a pilot well of 5000 meters is 150 million NOK, and the design and implementation of this project are based on in-depth analyses of multiple reference cases, ensuring that practices and lessons gained are integrated.

### ***Project 2 – Tromsø***

The proposed project focuses on recovering waste heat from surrounding industrial operations to create a geothermal energy system in Tromsø, Norway. Between 20 and 50 percent of industrial energy output is wasted as heat, resulting in significant financial losses and excessive greenhouse gas emissions. By attempting to save and store the waste heat, the project aims to reduce this problem while lowering expenses and emissions. With a detailed implementation plan, the project intends to utilize 300 terawatt-hours (TWh) of energy annually in the European Union (EU).

### ***Project 3 – Svalbard***

With the primary goal of meeting the island’s energy demands and encouraging a transition from coal-based energy sources to more sustainable alternatives, this project proposes establishing a geothermal energy project at Svalbard. The project attempts to exploit the geological parallels between the two places, particularly the need for not-so-deep drilling, to harness the enormous geothermal resources accessible at Svalbard. The island has similarities to Iceland, with its deep geothermal heat not so deep. Both heat and electricity are needed for the island’s energy needs. To meet these needs, the geothermal project will aim to offer a double benefit. It first aims to produce power from geothermal resources to add to the local grid. Second, the project aims to reduce the current dependency on coal-based heating systems by providing a dependable heat source for various residential, commercial, and industrial sectors.

#### **3.1.4 Implementation**

Odfjell Technology has partnered with several other energy companies as part of a strategic move, as shown in Figure 13.



Figure 13 - The Preliminary Consortium

Given the limited experience and competence in drilling and constructing geothermal power plants in Norway, Odfjell Technology aims to harness the existing expertise and leverage the collaborators’ external knowledge (Synnevåg 2022).

## 4.0 Research Methodology

A crucial part of this thesis is the methodology chapter, which thoroughly explains the research techniques employed to address the study's objectives and find answers to the RQs. The strategies for gathering data and analyzing it that were employed in this study are described in this chapter. This chapter seeks to improve the openness and thoroughness of the research process by outlining the justification for the chosen methods and procedures. The techniques used to acquire the data, including the tools employed, are thoroughly described, along with the steps required to guarantee the validity and trustworthiness of the data. This chapter also covers data analysis approaches, such as statistical methodologies and qualitative data analysis techniques.

The pursuit of knowledge is closely connected to the subject of study, or more specifically, to the reconstruction of the evidence that will give rise to an explanation for an observed phenomenon that may initially appear problematic. It is human to want to know the truth and nourish our curiosity (Song 2021). The definition of research provided by Western Sydney University highlights the most crucial parts of the research foundation. It is defined as "*The creation of new knowledge and/or the use of existing knowledge in a new and creative way so as to generate new concepts, methodologies and understandings. This could include synthesis and analysis of previous research to the extent that it leads to new and creative outcomes.*" (WSU 2021 in; Song 2021). The research may be seen as having to do with (i) tying together what has been done and what needs to be done to create new knowledge and (ii) objectifying what you are doing to advance your field of study (Song 2021).

To distinguish between methods and methodology by including philosophical and practical issues relevant to the study's topic (Kirsch and Sullivan 1992). The method discusses techniques, strategies, and tools for compiling research-related evidence. On the other hand, the methodology refers to the strategy, process, and plan of action that will be used to select the appropriate technique. Ghauri, Grønhaug, and Strange (2020) stated that "*the main purpose of research is to produce insights or knowledge.*" which highlights the primary objective of the research, which is to produce fresh insights and to understand a specific subject or event.

The research entails a methodical and thorough investigation to find and confirm facts, test hypotheses, and build theories to explain or forecast occurrences. Knowledge generation through research is essential to understanding various academic disciplines, including physics, medicine, psychology, the social sciences, and the humanities. It enables us to build new technology, handle significant societal issues, and arrive at wise conclusions. Researchers use a variety of procedures, including qualitative and quantitative techniques, experiments, surveys, and case studies, to accomplish the primary goal of their work. They also rely on methods for gathering and analyzing data to draw insightful conclusions from their study findings.

Aiming to achieve the best results in this research, the “research onion” model by Saunders, Lewis, and Thornhill (2019) is introduced. The model, illustrated in Figure 14, is a wide-ranged tool that offers a step-by-step way of doing research, from selecting a research topic to presenting its results (Saunders, Lewis, and Thornhill 2019).

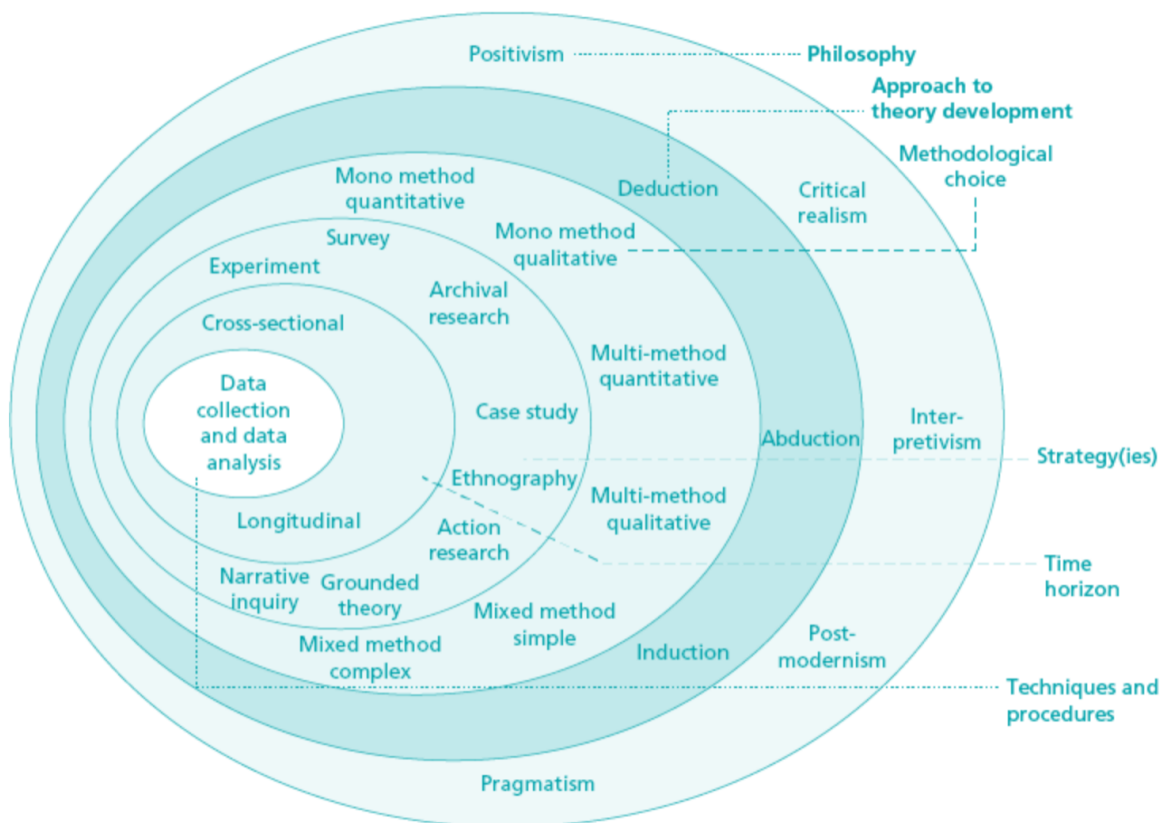


Figure 14 - The “research onion” by Saunders, Lewis, and Thornhill (2019)

As Figure 14 shows, the onion consists of six different layers, representing the different stages in the research process, and will be the following sequence of this chapter. First is the research philosophy, where the research approach is considered. Second is the research approach, which is based on the first layer, and focuses on the perspective of the study. Further, the research design, analysis unit, and strategy are considered. Lastly, the techniques and procedures for data collection and analysis are considered.

## **4.1 Research Philosophy**

The research philosophy, the first layer of the research onion, must be considered in any research study. This layer includes the study's worldview, beliefs, and presumptions about knowledge, reality, and the study's role in the research process. The data collection and analysis method will depend on the chosen research philosophy. According to Creswell and Poth (2018), there are five philosophical assumptions: ontological, epistemological, axiological, methodological, and rhetoric. These philosophical presumptions cover a perspective on reality's nature (ontology), how one comes to know what one knows (epistemology), how values are used in research (axiology), how to use language in research (rhetoric), and how to conduct research (methodology) (Creswell and Poth 2018). These presumptions cover a variety of issues that motivate the researcher and have an impact on the study. Assumptions shape the research and provide context for the final study's findings (Brown 2020).

A study might apply to one of the introduced research onions' five primary research philosophies, each with a distinct viewpoint and relevance to the research procedure. The five philosophies are pragmatism, interpretivism, postmodernism, critical realism, and positivism (Saunders, Lewis, and Thornhill 2019).

Both positivism and critical realism place a high value on objectivity and strive to identify overarching rules or principles that guide conduct. Nevertheless, critical realism emphasizes the significance of subjective perceptions and how social context and experiences create reality (Saunders, Lewis, and Thornhill 2019). Both interpretivism and postmodernism place a strong emphasis on the value of diverse viewpoints and subjective experiences. While postmodernism undermines the idea of a single objective reality and highlights the necessity for academics to be aware of power relations and social hierarchies, interpretivism focuses

on understanding human acts' meaning (Saunders, Lewis, and Thornhill 2019). On the other hand, pragmatism strongly emphasizes the application of knowledge and its utility. It aims to produce knowledge that can be used in practical settings and frequently uses mixed-methods research to develop a thorough understanding of a phenomenon (Saunders, Lewis, and Thornhill 2019).

The strategy, plan of action, or procedure that directs the choice and application of specific procedures and establishes a connection between the choices and applications of the methods and the anticipated outcomes is known as the methodological assumption (Creswell and Poth 2018). For instance, positivists prefer quantitative methods to evaluate hypotheses, whereas constructivists choose qualitative methods for in-depth research. This illustrates how a researcher's philosophical stance affects their research procedures. Nevertheless, the basis of all research is thought to be its philosophy. It helps the researcher choose the most effective approach, plan, data collection strategy, and procedures for responding to RQs and deriving conclusions (Saunders, Lewis, and Thornhill 2019).

Per Saunders, Lewis, and Thornhill (2019), this study calls for an interpretivist research philosophy because it is based on studies in business and management and includes elements of ontological and epistemological presumptions. Qualitative research is related to interpretivism, and it is about how one can learn about the world, which depends on deciphering the meanings people provide to their acts. Interpretivism assumes that every researcher entering the research setting has prior knowledge or understanding of the research problem (Crotty 1998 in Ghauri, Grønhaug, and Strange 2020). Nevertheless, these researchers approach the research environment with some pre-knowledge and a plan. They try to obtain state-of-the-art information that can be obtained through the selected data collection methods (Burrell and Morgan 1979 in Ghauri, Grønhaug, and Strange 2020). The interpretive approach encourages the researcher to delve into the significance of social relationships, human behavior, and society.

Using an interpretive view, the interest of this study lies in understanding the factors of change in business models. The complexity of human behavior and the links between people and their social and natural environments are difficult to successfully and clearly scientifically analyze and explain; using this technique in the social sciences, like this study, problematic. The research philosophy outlines the researcher's intended investigation



method, which helps this study's researchers choose the most appropriate research strategy (Saunders, Lewis, and Thornhill 2019; Ghauri, Grønhaug, and Strange 2020).

## **4.2 Research Approach**

The selection of a methodological technique for data collection and analysis makes up the second layer of the research onion model, called the research approach. The research approach should be chosen based on the research topic and philosophical viewpoint used in the first layer. There are three methods for creating a theory: deduction, abduction, and induction (Saunders, Lewis, and Thornhill 2019).

The deduction is formulating particular predictions that may be verified by empirical inquiry, starting with a broad theory or hypothesis. Deductive reasoning, frequently applied in quantitative research, includes going from general to specific. On the other hand, abduction entails beginning with a particular observation or pattern and creating a general theory to account for it. Abductive reasoning, which entails going from particular to general, is frequently applied in qualitative research. Nevertheless, induction is the process of building a general theory from a set of specific facts or patterns. Inductive reasoning, frequently applied in qualitative research, entails going from the specific to the general (Saunders, Lewis, and Thornhill 2019).

An inductive research approach is most suitable for this study due to its exploratory aspect, which enables a thorough analysis of a particular instance, and the fact that it is preferred for single case studies. It aids in the creation of theories, provides contextual awareness, promotes adaptation and flexibility, and aids in the generalizability of theories (Ghauri, Grønhaug, and Strange 2020).

## **4.3 Research Strategy and Research Design**

The research strategy entails carrying out the study, which includes the research design, sample plan, and data-gathering technique. The research plan should be chosen based on the research topic, philosophical viewpoint, and methodology used in the preceding layers. The term "research design" refers to the overarching framework or plan for carrying out the study, which includes the scheduling of data collection, the order of research tasks, and the

technique of data collection selection. The experimental, quasi-experimental, survey, case study, and ethnographic research designs are only a few options (Saunders, Lewis, and Thornhill 2019; Ghauri, Grønhaug, and Strange 2020).

In experimental designs, cause-and-effect linkages are established by varying an independent variable and observing the impact on a dependent variable. While quasi-experimental designs are comparable to experimental designs, they do not randomly assign individuals to groups. On the other hand, as part of survey designs, data is gathered through standardized questionnaires or interviews, which examine a sample group's attitudes, opinions, and actions. Ethnographic designs entail monitoring and examining the culture and behavior of a particular group or society. In contrast, case study designs involve an in-depth analysis of a particular phenomenon, person, or group. The strategy for choosing research participants or cases is called the sampling strategy. The population of interest, the RQ, and the research design all influence the sampling approach chosen (Saunders, Lewis, and Thornhill 2019; Ghauri, Grønhaug, and Strange 2020).

A case study research technique is a qualitative research approach that entails an in-depth analysis of a particular phenomenon, person, or group. Case studies are frequently employed to investigate intricate problems or unusual circumstances that are challenging to investigate using other research designs. Data collection techniques for case studies typically include a mix of observations, interviews, and document analysis. A case study research's primary objective is to provide a thorough understanding of the case under study, which can then be used to develop theories or guide practice. Although case study research has significant drawbacks, such as low generalizability and potential for researcher bias, it is an effective method for understanding complicated phenomena (Saunders, Lewis, and Thornhill 2019; Ghauri, Grønhaug, and Strange 2020).

The most suitable research strategy for this thesis is a case study, as it is a phenomenon under investigation. It is challenging to study the case outside of its natural setting when the variables under the study are difficult to quantify. Therefore, it qualifies as a case study since there are too many variables to be considered. In addition, the case study is typical for experimental research designs, which this thesis applies to. The study strategy is preferred when investigating how and why and when there is little control over the events. Table 3 presents the different design types for case studies.

Table 3 - Basic design for case studies. Adapted from Ghauri, Grønhaug, and Strange (2020, 110).

|  | Single case design | Multiple case design |
|--|--------------------|----------------------|
| <i>Holistic (single unit of analysis)</i>    | Type 1             | Type 3               |
| <i>Embedded (multiple units of analysis)</i> | Type 2             | Type 4               |

The single case study is a suitable design in several situations. A thorough understanding of a complicated phenomenon can be obtained by doing a single case study using a holistic approach. In this method, the researcher examines the case as a whole and considers each component considering the whole. This enables the discovery of related factors and patterns that might not be obvious when investigating isolated components. A single case study can also be beneficial when researching an unusual or uncommon example that can be difficult to generalize to other settings. A holistic approach allows the researcher to fully understand the nuance and complexity of the issue and produce insights that may not be feasible with more reductionist methods. This method also allows for considering the context and the participants' subjective experiences, which can help comprehend the lived experiences of the people being studied. The same case study might acquire more than one unit of analysis when the case study is investigating other subunits (Yin 2003, 40). However, for this thesis, a case study of Type 2, referred to in Table 3, will be preferred as a single case is appropriate when a particular case is under investigation and needs testing of an established theory (Ghauri, Grønhaug, and Strange 2020).

#### 4.4 Unit of Analysis

As referred to in the previous chapter, the holistic single case study calls for a single unit of analysis. The term "unit of analysis" refers to the degree of analysis or observation being researched and is a crucial part of the research technique. A person, group, organization, event, or any other entity of interest may be the subject of the term, which refers to the phenomena or entity under investigation. The choice of the analytic unit depends on the research topic, the research strategy, and the data-gathering method. An organization is the object of analysis in this case study thesis.

In contrast, the unit of analysis in a survey research design is often the individual respondent. The transferability of research findings can be affected by the unit of analysis, which is a

crucial factor to consider when developing a research technique. Considering the study question and aims, it is crucial to choose the unit of analysis carefully. The research design should define and articulate the choice of analysis unit in a way consistent with the research topic (Saunders, Lewis, and Thornhill 2019).

Yin (2018) provides an overview of the different types of units of analysis for a case study, as presented in Table 4.

Table 4 - Design versus Data Collection: Different Units of Analysis. Adapted from Yin (2018, 102).

| DATA COLLECTION SOURCE |                              |   |   |                                      |
|------------------------|------------------------------|---|---|--------------------------------------|
|                        |                              | <i>From an individual</i>   | <i>From an organization</i>   | <b>Study conclusions</b>             |
| <b>Design</b>          | <i>About an individual</i>   | Individual behavior<br>Individual attitudes<br>Individual perceptions | Archival records<br>Other reported behavior, attitudes, and perceptions | If the case study is an individual   |
|                        | <i>About an organization</i> | How organization works<br>Why organization works                      | Personnel policies<br>Organization outcomes                             | If the case study is an organization |

The second row in the table covers the type of case study on which this thesis is based; data collection from individuals and the organization. Therefore, this thesis has multiple units of analysis within its single case study (Yin 2018). Regarding this study, the unit of analysis differs for the RQs, as illustrated in Table 5, and the differentiation will be beneficial to answer the thesis' questions in the best matter.

Table 5 - Unit of Analyses related to each RQ and data collection.

| <b>Research Question</b>  | <b>Unit of Analysis</b>                                     | <b>Data Collection</b>                          |
|---|---|---|
| <b>RQ1:</b> <i>How can knowledge transfer impact the competitive advantage of an incumbent Norwegian oil and gas company through sustainable business model innovation?</i> | Individuals within the company                              | Interviews                                      |
| <b>RQ2:</b> <i>What drivers and barriers does Odffell Technology face through sustainable business model innovation by implementing geothermal energy?</i>                  | Individuals within the company and organizational documents | Interviews, document analysis, and observations |
| <b>RQ3:</b> <i>How can knowledge transfer help the company overcome the barriers, utilize the drivers to implement geothermal energy, and gain a competitive advantage?</i> | Individuals within the company and organizational documents | Interviews, document analysis, and observations |

## 4.5 Data Collection and Analysis

### 4.5.1 Data Collection

The last layer of the research onion is data collection and analysis. This is an essential component of the study since it advances our understanding of the problems we are trying to answer. Data collection and analysis must be done using scientific methods if this activity is to be handled properly. Data must be gathered, organized, and analyzed at this layer to address the research topic and test the hypothesis. The study approach chosen in the previous levels impacts the data collection techniques used. Surveys, interviews, focus groups, observations, and document analysis are typical data-gathering methods. Researchers must choose a data collection technique carefully to complement the research topic, study plan, and philosophical viewpoint used in prior levels of the research onion model (Saunders, Lewis, and Thornhill 2019).

This approach can and does use a range of approaches when attempting to relate qualitative data-gathering practices to the interpretive worldview (Saunders, Lewis, and Thornhill 2019). Primary and secondary data are the two defined categories. Primary data is material explicitly gathered to help researchers address a particular issue. When this data is processed and made available, it is transferred as secondary data because it is now open for study by anyone, anywhere. According to Yin (2003 in Ghauri, Grønhaug, and Strange 2020), using many data sources is preferable to depending entirely on one source when doing a case study. This enables researchers to examine a broader range of historical and behavioral concerns.

#### *Semi-structured research interviews*

Semi-structured research interviews were used to collect primary data in an exploratory and qualitative manner from experts. Because semi-structured interviews are adaptable and flexible, they are a standard method for gathering data (Kallio et al. 2016). Semi-structured interviews are a great data collection strategy when a researcher wants to: (1) gather qualitative, open-ended data; (2) explore participant thoughts, feelings, and opinions about a particular topic; and (3) delve deeply into personal and frequent sensitive issues (DeJonckheere and Vaughn 2019). A request was filed to the Norwegian Centre for Research Data to obtain consent for the interviews because the study aimed to elucidate the

participants' ideas, feelings, and opinions. This study used open-ended interview questions from interview guides to conduct the interviews.

The three presented projects in the case description serve as a foundational data basis for crucial information and will also provide a pool of potential interviewees. These three initiatives were selected with the intent to fulfill two purposes. They will first act as a thorough and trustworthy data basis, offering a solid foundation of knowledge for multiple applications. This could be used to gather insightful information and perform analyses. Further, these initiatives will be necessary for identifying and selecting candidates for in-depth interviews and further discussion. The data collected from these projects will contain a diverse range of individuals who can offer unique perspectives, expertise, or experiences. These three projects will combine to gather thorough information and encourage insightful discussions by merging the roles of data basis and source of interviewees.

Four interviewees from Odfjell Technology were asked for an interview based on their knowledge and expertise that were considered necessary to conduct the research satisfactorily for the thesis. The interviewees either have extensive geothermal industry experience, have been with the company through many years and changes, or have both. The interviews turned into conversations, allowing both interviewees to delve into topics that were or were not pertinent to this study. Virtual and in-person interviews depended on each subject's options and agreement. The interviews were conducted to get outputs including:

- Development of the company's business model over time and motivations behind the changes
- Challenges and possibilities with a geothermal business area in the company
- Where the knowledge transfer within the company can contribute to help ease the phase of change
- Barriers concerning geothermal energy

Both pilot testing and internal reviews were conducted to improve the interviewing procedure. Before the interview process, the interview guide was pilot tested on fellow students. After the first interviews, the questions and procedures were evaluated to ensure they were on target. This helped check on the efficiency of the opinion-gathering procedure.

Are the interviews being conducted on time? Was one of the topics the evaluation set out to address. Are there any unclear questions? Is there anything that needs to be further explained? Finally, should schedules be adjusted? The scheduled time for the interviews was between 30 and 45 minutes. Each interview was taped, transcriptions were made, and the transcripts were sent to the interviewees for confirmation.

### ***Document analysis***

An effective way to gather data is through document analysis, which can offer deep insights into a business's operations, decision-making procedures, and strategies. Document analysis is the process of looking at various documents in the context of a firm's case study, including financial reports, internal memos, emails, and meeting minutes, among others, to understand the operations and dynamics of the business thoroughly. The history, principles, practices, and external influences that affect the business can all be better understood using this approach. Document analysis can also offer a distinctive viewpoint on the company's decision-making processes by exposing the underlying justifications and presumptions that direct its activities. As a result, document analysis can be a potent tool for researchers and analysts looking to perform in-depth case studies of businesses, revealing insightful knowledge about how they operate and laying the groundwork for further study.

### ***Observation***

Another way to collect data is observation, and according to Ghauri, Grønhaug, and Strange (2020) it includes watching and listening to other's behavior and conversations in a way that can result in learning and data for an analytical understanding. It will provide first-hand information in the natural setting of the case, and it will be beneficial to interpret the information more accurately in a way that is not possible through interviews. However, it is essential to note that it might be challenging to translate into valuable data (Ghauri, Grønhaug, and Strange 2020). The observations were human field observations as they were a natural part of the situation and were not hidden. The observations were executed at the company's main office in Bergen and consisted of several meetings over a ten-day visit. The observations were organized to understand better the plan for implementing the renewable energy alternative and to have the opportunity to ask follow-up questions. Notes were made from the observations and used for further analysis.

## **4.5.2 Data Analysis**

After the collection of the data, it must be categorized and examined. The systematic and meticulous examination of data to spot trends, themes, and linkages is known as data analysis. It involves examining, classifying, tabulating, testing, and occasionally recombining evidence to conclude. It is one of the most challenging research parts because there are no established techniques for handling it (Yin 2003). Several data analysis techniques are used depending on the type of data gathered and the research issue being addressed. Thematic analysis, content analysis, discourse analysis, statistical analysis, and other approaches to data analysis are frequently used. High-quality data analysis is essential for the validity and dependability of study findings. Researchers must follow the proper data analysis procedures and undertake thorough, open analyses. Researchers must also consider ethical considerations when evaluating data and uphold participant privacy and confidentiality (Saunders, Lewis, and Thornhill 2019; Ghauri, Grønhaug, and Strange 2020). The data in this thesis is qualitative, obtained through interviews and document analysis.

A thematic analysis was used to analyze this interview's outputs sufficiently. It is a technique frequently used in research to analyze qualitative data. It entails discovering and analyzing dataset trends, themes, and conclusions. Thematic analysis is beneficial in interview transcriptions for identifying underlying themes and patterns in participant experiences and language. The process consists of several steps, including familiarizing oneself with the data, creating preliminary codes, compiling those codes into probable themes, reviewing and enhancing those themes, and ultimately producing a thorough data analysis. Thematic analysis is an effective method for interpreting complex situations that could be challenging to quantify. The theme analysis method was selected for this thesis to examine the employees' knowledge and viewpoints on geothermal energy. It was intended to find common themes and patterns in the interview transcriptions to gain a more profound knowledge of the elements that affect whether this implementation is successful or unsuccessful.



## 5.0 Findings

In the investigation on how incumbent Norwegian oil and gas companies can utilize their knowledge and capabilities to gain a competitive advantage through sustainable business model innovation, particularly outside their core business operations, a single case study of Odfjell Technology was performed. In this case study, the implementation of geothermal energy in the company's portfolio is researched. Further, the drivers and barriers the company could face with this implementation and how knowledge transfer can affect this transition are investigated.

The results of the primary data collection, which included observations, emails, documents, and webpages, are presented in this chapter. Informal talks before, during, and after the observations (visits) enrich the insights gained from the interviews and observational data. The interviewees have different backgrounds within the company and projects, and this composition of subjects strengthens the data basis. As the interviewees are in a more relaxed environment, this also aids in verifying what has been said. The interviews presented the opportunity to map their current and future business models to determine what they expected from this thesis. The collection of information from the interviews revealed that Odfjell Technology has better fundamentals for implementing geothermal energy in their portfolio than other renewable alternatives due to their expertise and incumbent knowledge in the drilling industry. In addition, an innovation from their traditional business model towards a sustainable one will help them gain a competitive advantage in the long run if conducted beneficially. As the literature mainly focuses on incumbents and the role of incumbent knowledge in the industry, it is helpful for this thesis to conclude that Odfjell Technology falls under the oil and gas incumbent category.

As introduced along with the RQs in Chapter 1, RQ1 has a more general approach than RQ2 and RQ3 as it addresses the broader concept of knowledge transfer and its impact on competitive advantage in the oil and gas industry. Further, RQ2 and RQ3 are specific to the case company and their implementation of geothermal energy. These questions investigate the case company's specific challenges, opportunities, and strategies, making the results more tailored to the company's context. This approach allows for a balanced exploration of theoretical concepts and practical insights specific to the case company. Accordingly, the findings will be presented coherently, reflecting the order of the RQs.

## 5.1 The Impact of Knowledge Transfer on Gaining Competitive Advantage

The interviewees shed light on the pivotal role of absorptive capacity in facilitating internal knowledge transfer across different business areas, specifically through investments in renewable energy sources. These investments open the door to developing sustainable business model innovation, boosting the company's competitive advantage. By effectively utilizing the absorptive capacity, these companies can assimilate, transform, and exploit external knowledge to suitable renewable energy sources. Due to how it complies with shifting market demands, governmental regulations, and societal expectations for environmental sustainability, a sustainable business model innovation is particularly important for achieving a competitive advantage in the renewable sector. The interviewees' underscoring sheds light on the criticality of an incumbent company's absorptive capacity in leveraging knowledge transfer as a powerful tool for sustainable business model innovation, ultimately positioning the organization favorably in a competitive landscape shaped by emerging renewable energy paradigms.

The interviewees perceive knowledge transfer as a severe advantage for utilizing existing capabilities to innovate the business model.

*"I think that it is a very good idea to take the skills that you already have that you are very good at and that you have the expertise of drilling and take that into making something good with it. I think it is one of the few possibilities that you have to do something with it. And not kind of go way out of your comfort zone, but at the same time, it is also very clear that the comfort zone is not enough." (Odfjell Technology Respondent Y 2023; Respondent W 2023).*

Sustainable business model innovation was stated to be fundamental, as the energy market is shifting, and companies must change along with the market to stay competitive.

*"... You will have these tensions of where the money comes from, where the money is spent, and I understand that companies have to make money. That is what they are, or it is said that they were created to do. However, this was in the 60s. Things changed, and right now, it is our time to step up our time, and our generation has one thing that no generation had*

*before. It is a huge task ahead and a blank sheet to fill in.” (Odfjell Technology Respondent Y 2023).*

Knowledge and capabilities of incumbent Norwegian oil and gas companies were identified as vital advantages.

*“... in this context of technology, having the capabilities and expertise is a big flag associated with energy extraction.” (Odfjell Technology Respondent Y 2023).*

*“It is a goal for everyone in our industry to take part in this energy transformation that is taking place, so it is like finding out, what is it? What can be done with the individual company’s core competence in this context and see where to come in and play.” (Odfjell Technology Respondent Z 2023, own translation)*

In addition, the importance of leveraging the capabilities of the specific companies was stressed.

*“The question is, is there any other business that you can use your capabilities offshore that you have of harsh environments and that may be another door? However, I think the key is trying to get the capability you already have in-house accumulated. Not only people but accumulated expertise to launch it.” (Odfjell Technology Respondent Y 2023; Respondent Z 2023; Respondent X 2023).*

On the other side, the capabilities of the specific companies have also shown that this could be a limitation.

*“That is also probably a limitation because when people are accommodated to the situation, they do not question anymore, which is why we always have new people coming. These people are shaking the system. I would not say that you will not need to hire at all, but that you need to keep some of the expertise. You need to shake it because even us, the workers, are formatted to the oil and gas industry, so we need to work in different ways too. Because of yeah, you will not have this kind of profit somewhere else, so there is like an adaptation to the whole organization.” (Odfjell Technology Respondent Y 2023; Respondent W 2023).*

However, there is a significant advantage to gain in leveraging existing knowledge.

*“But I think the capabilities and expertise, like technical expertise, gives you a head start.”*  
(Odfjell Technology Respondent Y 2023; Respondent W 2023).

## **5.2 Drivers and Barriers to Implementing Geothermal Energy in The Company Portfolio**

Investigating the drivers and barriers to implementing geothermal energy within Odfjell Technology’s portfolio yields insightful findings, shedding light on the transformative factors and obstacles influencing this renewable energy transition. The interviewees, observations, and the company documents emphasize that the primary drivers for change come from the internal management pressures for increasing sustainability and the external pressures demanding a reduction in carbon emissions. These components act as powerful propellants encouraging the company to implement geothermal energy. However, significant barriers, including financial incentives, regulatory challenges, and technological difficulties, confront this implementation initiative. With a business model working in a very satisfactory manner today, the company finds itself disinclined to divert resources toward alternative energy sources.

The special drilling requirements for geothermal energy extraction also present technical difficulties beyond those in conventional oil and gas drilling procedures. Nevertheless, an encouraging aspect emerges as the collaboration with other niche companies emerges as a key driver for successful implementation. Given these compelling findings, the significance of pursuing geothermal energy within Odfjell Technology’s portfolio becomes apparent, underscoring the need for strategic actions and informed decision-making to address this domain’s prevailing drivers and barriers. Such partnerships provide possibilities for overcoming barriers and making geothermal energy projects financially feasible by exchanging expert knowledge and experience. The value of pursuing geothermal energy within Odfjell Technology’s portfolio grows more prominent considering these compelling findings, underlining the need for proactive measures, and educated decisions to address prevailing drivers and barriers in this study area.

## ***Environmental***

The most significant driver for implementing a renewable energy source in the company portfolio is the outside pressure of environmental changes.

*“I think that for sure it was, and it is the pressure from outside the world....” (Odfjell Technology Respondent Y 2023).*

As the importance of not harming environmental surroundings when investigating areas for the establishment, the chosen region for Project 1, Øygarden, is already dedicated to several established industries, making it suitable to incorporate geothermal energy into already-existing systems (Odfjell Technology 2023). According to extensive research and analysis by Norges Geologiske Undersøkelser (NGU), Geological Survey of Norway, the geothermal wells in this area can efficiently supply a sizable fraction of industrial energy usage (NGU in Odfjell Technology 2023).

The importance of not harming environmental surroundings when investigating areas for the establishment is also highlighted by further interviewees.

*“And then I think that what is OK about that is that the only negative environmental impact you get in this type of geothermal operation is the space you take, and if you put it close to houses or take and use arable land or one or the other. However, the footprint of such a type of geothermal well is not that insanely large.” (Odfjell Technology Respondent X 2023, own translation; Respondent W 2023).*

In addition, the stored heat in the solution of Project 2 in Tromsø can be extracted as needed by utilizing the bedrock’s ability to act as massive natural thermal batteries. This arrangement enables effective heat retrieval and storage (Odfjell Technology 2023). In addition, a successful test operation for the project was already conducted in the first quarter of 2023. Seven wells were drilled into the granite bedrock at the Kvitebjørn Varme District Heating facility, which was finished in the fourth quarter of 2022 (Odfjell Technology 2022). The project’s use of natural fracture networks, which makes it easier for the injection and production wells to communicate with one another, is noteworthy. A thorough risk analysis has been done, and the results show shallow surroundings and a low probability of

surface tremors. Additionally, using merely sand and water instead of chemical additions assures an environmentally friendly method. The pilot testing proved that all wells could communicate effectively and that the reservoir was prepared to store heat by the summer of 2023 (Odfjell Technology 2023).

At Svalbard, data from Project 3 shows that geothermal heat can be extracted due to favorable geological circumstances characterized by steep temperature gradients and sedimentary rock underpinnings. Svalbard has enormous underground heat potential by using a similar drilling technique to that used in Iceland, which does not need drilling to tremendous depths (Odfjell Technology 2023).

Drilling for geothermal heat is supported by the interviewees to have similarities to the challenges compared to drilling for oil and gas. Therefore, transitioning into this business area would be less critical than others.

*“It is dealing with the same issue of energy that you are right now. So, it is tackling one of the biggest problems or perceived problems in the world, so I think that if it helps advance not only the youth but also technologically, you can kind of bend it as a solution to improve our society. I think that is what we have the capacity to do.” (Odfjell Technology Respondent Y 2023).*

However, in Project 1, there is friction-related heat brought on by seismicity. Additionally, the heat added to the crust by high-temperature upper-mantle anomalies must be carefully controlled. The conductive heat transfer necessary for effective geothermal energy extraction can be interfered with by regional groundwater movement. To ensure long-term sustainability, it is also essential to consider how erosion, deposition, and thermal equilibrium interact. Given the distinct geological features and information available, the Western Norway area in mainland Norway stands out as a viable place to extract deep geothermal energy (Odfjell Technology 2023).

Several interviewees also emphasized that technology is a crucial barrier to implementing geothermal energy, which is still in the early stages of development and has only been pilot tested in certain areas.

*“The technology is one of the obstacles, so now it is becoming much more mature but has only pilot tested part of it.” (Odfjell Technology Respondent X 2023, own translation).*

*“One of the main challenges for geothermal energy in Norway is almost like this with the geological ones.” (Odfjell Technology Respondent Z 2023, own translation).*

The execution itself is additionally highlighted as a significant barrier.

*“In Norway, there is granite, and that is how it is, and we do not have very much data that says how deep when you only have data to find sufficient heat in Norway. We have such a good overview of what we are saying. Yes, only 8,000 meters, so maybe you will get the warmth you need.” (Odfjell Technology Respondent X 2023, own translation).*

### ***Economic***

One of the main incentives related to economic sustainability is the desire of the company to live for many decades ahead.

*“I think it comes from the owners who believe we should continue as a business. Moreover, the oil and gas industry has its lifespan, and if we are also going to be involved, the company is at the same time supporting more sustainable energy production. Then we have to look at what other types of areas we should be involved in.” (Odfjell Technology Respondent X 2023, own translation).*

*“We have specialist expertise in certain areas, which we can enter and take part of, and make good money from.” (Odfjell Technology Respondent W 2023, own translation).*

Financial sustainability is a significant driver for the company. Figures 15 and 16 illustrate the potential growth areas within renewables related to the hypothetical future return on investments related to the businesses potentially conducted. Investments in renewable and sustainable energy sources to make their business model sustainable are crucial for the business’s sustainability initiatives and the possible long-term return on investment. Odfjell Technology is exhibiting its commitment to sustainability by investing in renewable energy sources and positioning itself for long-term success and profitability (Odfjell Technology 2023).

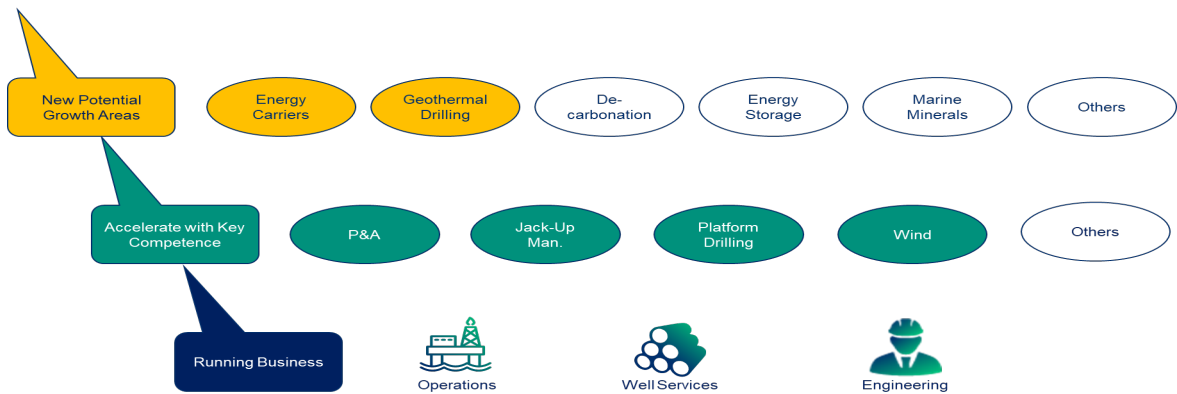


Figure 15 - Overview of Odfjell technology's potential growth areas in the context of their key competence

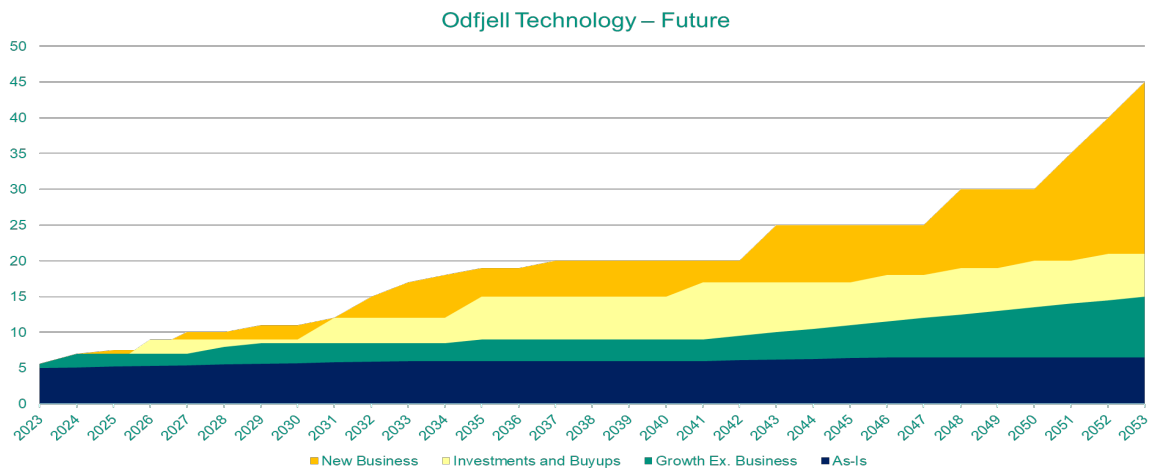


Figure 16 - Schematic illustration for ET in Odfjell Technology. Leveraging existing competencies and expanding into new business areas enables organizations to support ET with pre-existing expertise.

The reasoning behind the investigation of geothermal energy rather than other renewable energy sources was stated clearly by all the interviewees.

*“Well, I think geothermal stands out for Odfjell Technology because it links two things that we can. For me, in terms of organization, it is a very good topic because it will explore the capacity that you already have so you do not have to hire, and you do have to make changes, but not as much as you would. If you change gears completely, that kind of gives you maybe 40-50% ahead than the other companies you already have a thing, so that is something that I think that geothermal has in favor of the other renewables.” (Odfjell Technology Respondent Y 2023).*



Furthermore, the importance of financial sustainability within the company was stressed.

*“You have transition risks, and you have climate risks, there are physical risks, so it almost sounds irresponsible to continue to not act in one direction of income, like purposely and willingly like say.” (Odfjell Technology Respondent Y 2023).*

However, although the barrier of missing incentives from within the company is prominent, there are foreseen changes shortly.

*“... but I think you will start having that pressure internally, and you will start having people that try to move things in one way. So yeah, it is slower, but I think that among leadership, the main leverage here for change is investors, and that is what it is required from investors now or what it is that is required from me that there is not a couple of things can communicate into actually changing the whole picture. I think we still miss a few to give that big jump.” (Odfjell Technology Respondent Y 2023).*

However, the main barrier to transitioning to other business areas is the lack of urgency to expand the business areas within the company.

*“The only thing that I can say is that it lacks the urgency and the speed we need to have a society in the future. It lacks the jump to actually go in, and effectively go in that makes the whole difference in developing technologies and innovation, and someone has to do it.” (Odfjell Technology Respondent Y 2023).*

In addition, the missing incentives to innovate from within the company were an additional barrier.

*“It is kind of having this type of organization that is so dependent on an industry that it will certainly not add to our society. It needs to be a little more visionary and not afraid of that jump, even if the money is not there. This notion is already very outdated, that you need to have like money at the end of the year to be able to make something good that everyone will benefit from.” (Odfjell Technology Respondent Y 2023).*

The reason for not already having developed a geothermal business area correlates with the lack of incentives.

*“I think that is a very easy answer from the financial sustainability perspective. It did not go further because you already had a business that is a millionaire business. It is very difficult to compete with an industry that makes profits that are crazy compared to all the other industries. So that also makes it hard for us to investigate other areas and industries because we expect the same type of returns, and the same type of returns are simply impossible, and it should not be like this.” (Odfjell Technology Respondent Y 2023).*

Presenting a non-sufficient business case regarding finance is not noteworthy. A long-term approach and slowly but surely transitioning is easier to get approval for.

*“Someone has to say yes, so of course, you need to make a good business case about it. I think we need leaders that recognize that there is more to it than our lifetime. ... Imagine that you have a business case, and you have a very bad business case for money. You always have to compare. You have one business case that will be bad regarding money because you are comparing it to something else. So, if you compare it to something else and all the implications of the something else, in this case, it is you, and if you put this same business in 20 years ahead and you see no, it is not working. However, this is not a good business case either. So, I think having a long-term view on things could help these cases that may not be appealing.” (Odfjell Technology Respondent Y 2023).*

## **Social**

There is an increasing social need for more than just money, emphasizing the significance of finding purpose and contributing to something more significant for a happy and fulfilling life.

*“... The generation of people that are now the millennials. People want a little bit more than money most of the time. Now we understand more what it is to have a happy life, and a happy life is a high life with purpose, and sometimes even with all the money in the world, will not have a purpose. So, I think it is much more important that people feel like they are contributing to something more.” (Odfjell Technology Respondent Y 2023).*

The project documents reveal significant social findings, including the introduction of thermal solutions for generating electrical power, the advantageous energy pricing associated with thermal energy, the importance of collaborations with public and commercial institutions for project implementation, and the influence of changing regulations and growing environmental concerns on Svalbard's transition from coal to cleaner energy sources. Project 1 opens the door for new advancements and opportunities to utilize thermal solutions by releasing electrical power. The favorable and reliable energy pricing connected with thermal energy is one of the main benefits of this geothermal energy project (Odfjell Technology 2023). Collaborations with public and commercial institutions in Project 3 will be pursued to implement the project further using their knowledge, resources, and investment capacity. Another critical force for change in Svalbard is the regulatory environment. Regulations changing and growing environmental concerns impact the island's transition from coal to cleaner energy sources (Odfjell Technology 2023).

However, requirements in the form of regulations on emissions reduction play a significant role in why the company is looking to expand their business areas.

*“There are threats to the main industry, so it is a very hard thing to break, and that is where these external pressures come. They start asking companies to OK lower your emissions; this is the minimum you should do. Then you have to allocate more capital to your innovation areas, and you have to allocate more capital to renewables.” (Odfjell Technology Respondent Y 2023).*

In Project 1, support programs are available to help decrease investment costs and make the project economically feasible (Odfjell Technology 2023). In addition, the abundance of drilling activity data and regional geological knowledge aids the project's resilience and viability (Odfjell Technology 2023). Other social drivers in the regulatory form were found in the initiative in Project 3 aligns with the Svalbard government's environmental objectives and sustainable development plan and will be able to get financial support (Odfjell Technology 2023).

On the other hand, requirements in the form of regulations also hinder the immediate transition to geothermal energy as a business area.

*“I will not say regulation this much, but I definitely think that regulations need to be stronger to even take this further.” (Odfjell Technology Respondent Y 2023).*

However, energy policy plays a crucial role in driving the implementation of geothermal energy. It is emphasized that energy security and reducing dependence on external sources are vital considerations in adopting geothermal energy, which implies that ensuring a reliable and self-sufficient energy supply is a motivating factor for embracing geothermal energy,

*“Energy policy is a central element in this, as I see it, how vulnerable you become because you depend on others and lack the energy security.” (Odfjell Technology Respondent Z 2023, own translation).*

The company will continue with their existing business areas and seek more sustainable areas for several reasons, but the lack of energy regulations is a significant barrier.

*“So, in terms of regulations, a lot needs to be done there because it is not possible that you are making it as you are and at the same time you have a license to operate where you are destructing something that is all of ours. So, if it is in terms of the industry itself; I think that there is a lot of lobbying to prevent other energy sources from surfacing.” (Odfjell Technology Respondent Y 2023).*

Figure 17 provides a comprehensive illustration of the significant drivers and barriers identified within the context of the TBL approach to sustainability. This visual representation offers a summarizing overview of the drivers and barriers affecting sustainable practices across economic, environmental, and social dimensions.

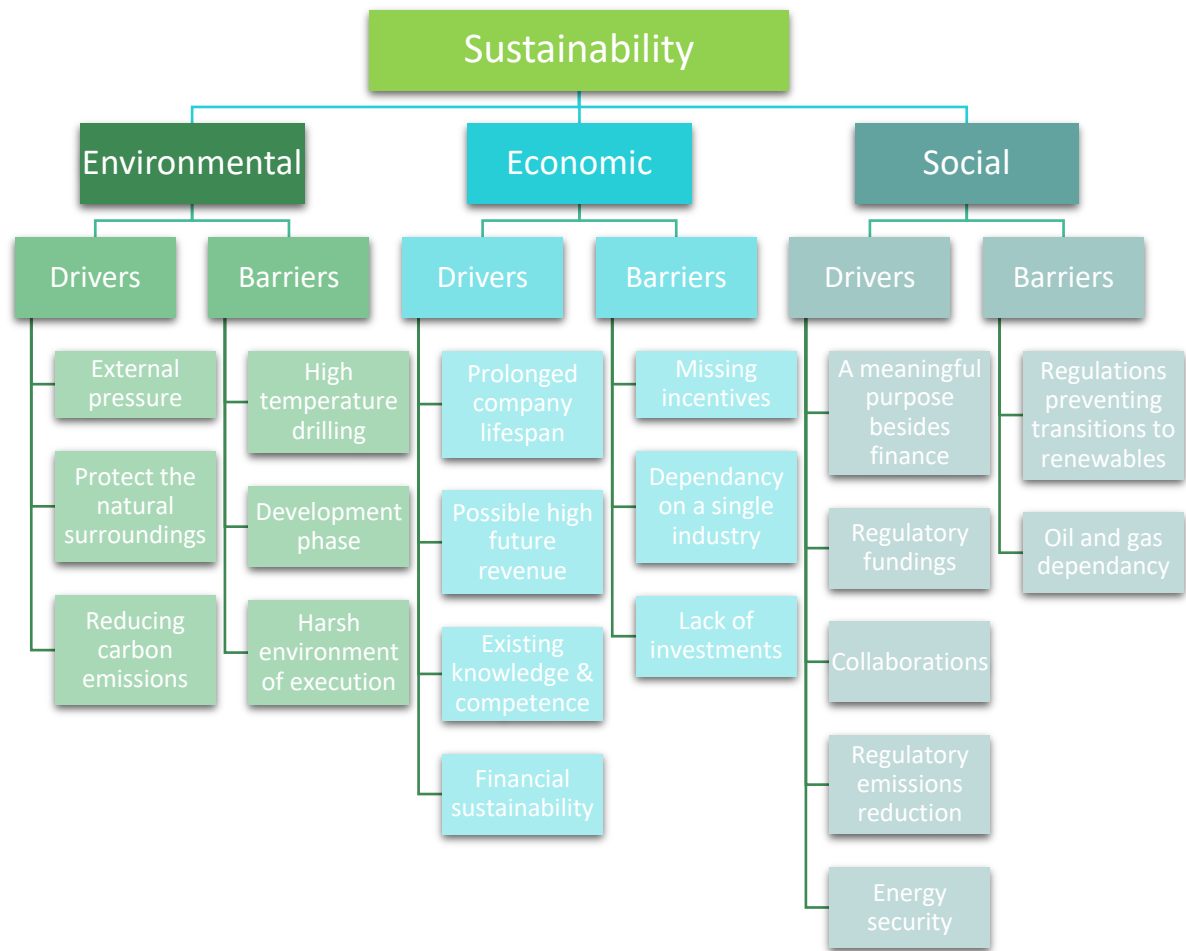


Figure 17 – Drivers and Barriers Presented Regarding the TBL Approach

### 5.3 The Effect of Knowledge Transfer on Gaining Competitive Advantage Through Geothermal Energy Implementation

The interviewees, observations, and company documents highlight the critical role Odfjell Technology’s capacity for information absorption and knowledge transfer across different business units plays through implementing geothermal energy within the company’s portfolio. These capabilities hold the potential to not only surmount the barriers identified beforehand but also capitalize on the drivers revealed. Their ability to absorb information is crucial for assimilating, transforming, and utilizing external knowledge associated with harnessing geothermal energy. They can, however, overcome the financial incentives and manage the technological challenges of geothermal drilling by wisely utilizing this ability.

Furthermore, the company's ability to transfer knowledge from one business area to another amplifies the benefits of absorptive capacity and collaboration with niche companies, offering a pathway to realize the potential of geothermal energy extraction. Odfjell Technology can optimize its existing knowledge, capabilities, and resources by strategically transferring knowledge and expertise across areas, positioning itself favorably to establish a competitive advantage through utilizing the geothermal energy market. The interviewees and observations also emphasize the importance of efficient knowledge transfer mechanisms within the organization and the need for strategic actions and well-informed decisions that efficiently utilize knowledge to create a competitive advantage in the geothermal energy sector.

There has been knowledge transfer within Odfjell Technology from the early beginnings, but slower and not as revolutionary.

*“The business model has developed from being a maritime expertise company that originated and from being more in the direction of oil drilling, but always had a lot of expertise in both the maritime and just technical aspects, and that is what makes you have an excellent understanding of everything we do is seen from several perspectives, whether it is forced in the sea or efficiency or renting drilling techniques, or what is the most sensible tool to use, so in a way you have built up extensive expertise.” (Odfjell Technology Respondent X 2023, own translation).*

*“When I started with Odfjell, we were pretty much oil and gas a little bit trying to look ahead.” (Odfjell Technology Respondent Y 2023).*

The statement suggests that the company has been considering alternative strategies to diversify their business model sustainably.

*“Theoretically, we have been exploring other ways of diversifying our business.” (Odfjell Technology Respondent Y 2023).*

*“... the development then leads to the creation of Odfjell Energy, which was again a large part of what became Odfjell Technology, and what it became when you established together that you should go in a “Green Ventures” direction.” (Odfjell Technology Respondent X 2023, own translation).*

However, the need for urgency and swift action, as being the first to embrace new opportunities, is emphasized as crucial to maintaining a competitive advantage and maximizing leverage in the new business area. This finding highlights the importance of timely and proactive business model innovation to ensure long-term sustainability and success.

*“In practice, we need urgency and to be quick because if we are not the first ones to go in, then we will lose a lot of leverage on things.” (Odfjell Technology Respondent Y 2023).*

Sustainable business model innovation emphasizes the need for Odfjell Technology to go beyond the oil and gas industry, develop long-term strategies, and navigate the challenges of the energy transition as a frontrunner to ensure their success and contribute to a sustainable future.

*“We still have a business to maintain, and in that part of the business, we need to control the objective, be the best doing it, and it is not enough to remain in oil and gas. It is a huge risk because if you are aware of all the trends; how is the world in 20 years if you remain in this business? It will crack. So, in that perspective, there is a way to develop. We have some hints of where to go. We need to be more aware of the long-term thing, and like the long-term, it is essential in this type of company because we are the sharp end of the transition; this is it.” (Odfjell Technology Respondent Y 2023).*

One of the interviewees indicates that Odfjell Technology’s capabilities and expertise position geothermal energy as a more favorable business case than other alternatives.

*“... capabilities and expertise ... are, I think, a big reason why it is maybe a better business case than probably the others at this point.” (Odfjell Technology Respondent Y 2023).*

*“Considering the costs for equipment, personnel, and mobilizing, we have a good overview of what type of company must be involved to plan this type of well.” (Odfjell Technology Respondent X 2023, own translation).*

There is a need for the company to identify their expertise within geothermal energy, particularly in drilling, and highlights their confidence in their in-house capabilities in this business area.

*“I think that the first thing that we need to sort out is where in geothermal we will be the expert, and I think that that is quite easy for us to think that is drilling. So, in the drilling part, I assume that we have most of the capabilities in-house.” (Odfjell Technology Respondent Y 2023; Respondent Z 2023).*

Conformingly, their expertise in geothermal energy, including resources, equipment, and techniques, emphasizes the need to cultivate a forward-thinking mindset among staff.

*“So, for geothermal, I think we have expertise in how to do that, not only resources, but also equipment, and you know what can be done, so I think that is also very necessary to give the staff a way of thinking about new ways of doing things.” (Odfjell Technology Interview Y 2023; Respondent X 2023).*

However, another respondent limited these existing pieces of knowledge.

*“We have some experience, but it is mainly based on supplying concrete equipment to run pipes up and down the wells and a little more, which we have supplied for many years. However, what we have delivered to those projects is largely the same equipment that will be delivered to oil and gas operations offshore in Norway or wherever, and there is no difference there.” (Odfjell Technology Respondent Z 2023, own translation).*

Odfjell Technology entered into a collaboration regarding developing this geothermal business area, and the consortium was established to optimize the potential for geothermal energy extraction at Øygarden, Tromsø, and Svalbard. There are many contributing companies, as illustrated in Figure 15. Baker Hughes contributes its knowledge to creating creative geothermal solutions that can increase the effectiveness and sustainability of energy generation. They have a wealth of knowledge in utilizing geothermal energy to create clean energy. Given the limited experience and competence in drilling and constructing geothermal power plants in Norway, Odfjell Technology aims to harness the existing expertise within their Netherlands office to provide support in site planning (Odfjell Technology 2023; Odfjell Technology Respondent Z 2023).

Furthermore, Eviny, a local public energy company emphasizing renewable energy, intends to deploy their region-specific expertise in this domain. For geothermal drilling, Xrig, a



technology business focusing on drilling solutions, offers tools and equipment (Synnevåg 2022). For the Svalbard project, the companies working together for the optimal solution are Odfjell Technology, Baker Hughes, and Norwegian Hydrogen, where Norwegian Hydrogen is responsible for green fuels, also known as energy carriers (Odfjell Technology 2023).

Statements from interviewees also emphasize the importance of collaboration for knowledge transfer, the need for collective efforts to address challenges, gain valuable experience from others, and advance innovation and technology.

*“I do not think that there are disadvantages to such collaboration. I do think that for big challenges, you need every hands on board. So, I do not think we are in a situation in 2023 where we can work alone. We will not change anything. Alone, we always need everyone else and everyone aboard. Everyone, everywhere, at the same time to do something and to change things. And I think that, from my perspective, that is the task I have. Something needs to change. So, you need to have everyone available to make something happen, for starters. Secondly, you need to keep things moving. And thirdly, of course, you will get a lot of experience from other people. And there is a lot to talk about—open innovation versus closed innovation. And if you think about, like the big companies, and things that are revolutionary; no one sits on their own solution without sharing. I think that collaboration and having inputs and giving inputs is fundamental to advancing any innovation and technology, and that is what we are talking about too.” (Odfjell Technology Respondent Y 2023).*

The consortium’s focus on geothermal energy extraction aligns with Norway’s carbon reduction goals, while their engagement with local stakeholders ensures fair distribution of project benefits. Their commitment to openness and cooperation facilitates knowledge transfer and practices.

The consortium’s emphasis on boosting energy output through geothermal energy extraction is consistent with Norway’s pledge to cut its carbon footprint and move toward a low-carbon economy (Odfjell Technology 2023). Additionally, their dedication to stakeholder engagement and community involvement in the energy transition is evidenced by the participation of local actors. The initiatives to interact with neighborhood companies and residents will guarantee that the project’s possible downsides are reduced, and its benefits

are spread fairly. Moreover, their dedication to openness and cooperation will encourage knowledge exchange and the application of best practices in the extraction of geothermal energy, which will be helpful to other areas and nations facing similar energy issues (Odfjell Technology 2023).

It is emphasized that collaborations are beneficial for gaining a competitive advantage. Sharing solutions and collaborating with others is seen as more valuable than keeping them to oneself.

*“I think it might help you move in the right direction, but it will mostly help you rather than hinder you. I do not see how good it would be if you made a solution and did not share it with anyone, and I do not think it will work in the big world as we need it to work.” (Odfjell Technology Respondent Y 2023).*

Further, the need for businesses to shift their mindset towards serving the world rather than solely focusing on monetary gains is enlightened. Considering indicators beyond financial metrics and recognizing that there is more to success than just making money is vital.

*“So, I think that right now, the business need to have the mindset of, OK, so now our next task is to serve the world, and in serving the world, there is no “I am making money, and you are not making money, and I will keep all the money to myself,” there are other indicators that right now. Unfortunately, we do not have an overview of them, but maybe that is like a step to consider them truly because right now, we are measured by how much money we make in terms of organization. Money should not be all of it, ..., it should be more to it.” (Odfjell Technology Respondent Y 2023).*

Gaining a competitive advantage through sustainable business model innovation involves being an early adopter, forming strategic collaborations, and capitalizing on the potential cost efficiencies and market opportunities associated with sustainable technologies.

*“And you know what happens when this type of technology is developed more, and you know, like years ago with the wind, and the wind prices will go down, the supply chains will kind of improve themselves, so it is kind of waiting time, and you know that you are going to be in while it is still expensive and you are going to be the ones that are making all the*

*connections and this collaboration so that you can have like a more profitable product in the end.” (Odfjell Technology Respondent Y 2023).*

*“... It weakens competitiveness. I think that if you want to participate, if you want to develop, then you have to be at the cutting edge. You must constantly be on the lookout for new opportunities. You have to dare to be present and spend resources on it; otherwise, you will fall behind as time passes.” (Odfjell Technology Respondent W 2023, own translation).*

The main difference in gaining a competitive advantage or not is taking the risk of being the first.

*“So, of course, now the risk is should you sit and wait and see others doing it and then just join when the price is low? And I think this is what most businesspeople will do. However, if you are the first ones, that is the difference.” (Odfjell Technology Respondent Y 2023).*

Knowledge transfer in sustainable business model innovation presents challenges, including the need for investment and a shift in focus. The respondents acknowledge the importance of dedicating resources to sustainable ventures and recognize that previous geothermal energy potentials have not been fully explored.

*“I think it will be challenging because you have to assign a percentage of your business to go down the drain if needed, which is a tough decision for a business. So, of course, investment is needed, and you need to push it some way because it cannot always be like this. I know that we already have some work in the geothermal, but we never went completely for it, exploited it, and never went to the other level.” (Odfjell Technology Respondent Y 2023).*

*“And now we see that, OK, the development is going on and has become large industrial projects that are more than just a mini domestic plant, but contributing to a more sustainable energy production, and then it suddenly ticks under that this is relevant for us.” (Odfjell Technology Respondent X 2023, own translation).*

Finally, the need for further investigation, communication, and guidance of employees toward embracing geothermal services instead of traditional oil and gas services is emphasized.

*“You need to have a direction and tell people that this is the way we want to go. So, start shifting your mind and thinking forward to geothermal services instead of oil and gas services.” (Odfjell Technology Respondent Y 2023).*

*“It is essential to bring in more expertise, and we do not know whether that expertise is here in Central Europe or where, but I think the next step will be to fill it up with more expertise. We have only used our oil and gas expertise so far. And then we have relied on some literature and other resources, of course, then we have sought out and asked those in interviews who have received information from inside companies with some of the equipment needed.” (Odfjell Technology Respondent X 2023, own translation; Respondent W).*

The respondents clearly state that knowledge transfer and sustainable business model innovation can be facilitated by leveraging the company’s experience and reputable brand name in the industry. By capitalizing on Odfjell’s established position as a trusted drilling contractor, the company can form valuable partnerships and collaborations to drive sustainable practices forward. These concepts are illustrated in Figure 18.

*“We have to use our experience and the position we have in the market as a drilling contractor, and it is clear that if you look here in Norway, Odfjell is an excellent brand name in the industry we operate in today so that there are many who would like to work with us. Moreover, we can take it with us and use that name for what it is worth, together with the experiences and what we have been doing for 50 years.” (Odfjell Technology Respondent Z 2023, own translation; Respondent X 2023, Respondent Y 2023).*

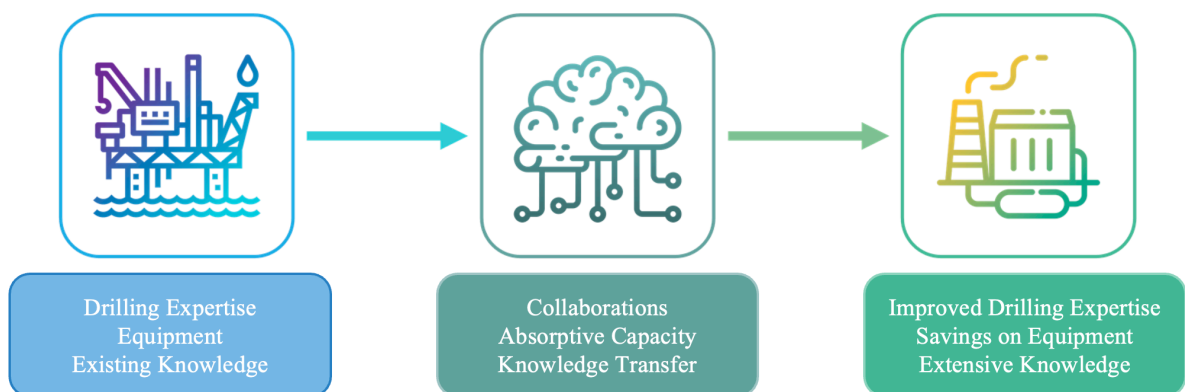


Figure 18 – Absorptive Capacity and Knowledge Transfer in Geothermal Energy Implementation

## **6.0 Discussion**

This chapter presents a comparative discussion of the interview data, observations, and document analysis findings in conjunction with the literature synthesized in the literature review, aligning with the perspective adopted in this thesis. The discussion integrates the RQs, considering the contextual factors, case description, and insights derived from the theoretical framework presented in the literature review. This approach enables a comprehensive examination of the three RQs in this thesis, which will be elaborated during the following subchapters.

### **6.1 RQ1: How can knowledge transfer impact the competitive advantage of an incumbent Norwegian oil and gas company through sustainable business model innovation?**

Mitigating climate change and transitioning to sustainable energy sources has become critical in recent years, demanding a shift from fossil fuel reliance (von Borgstede, Andersson, and Johnsson 2013; IEA 2022). Due to the need for energy transition, Incumbent Norwegian oil and gas companies are at a crossroads (Bach 2017; IEA 2018; Bach 2019), and they will have to take advantage of the opportunities and challenges the shifting world economy presents. The discussion of the first RQ aims to examine how knowledge transfer could impact the competitive advantage of incumbent oil and gas firms through sustainable business model innovation.

The need for an energy transition and the country's substantial reliance on the revenue generated by this industry conflict placing the Norwegian oil and gas industry at a critical juncture (Bach 2019). Respondent Y mentioned that the industry's extremely inbuilt expectation of substantial financial rewards makes it challenging to implement change. However, the same respondent stated that reform is required given the pressing need for sustainable practices and the expanding demand for clean energy sources globally. The Norwegian oil and gas industry must adapt to stay competitive and relevant, given the paradigm shift in the global energy environment brought on by climate change and the pressing need for an energy transition (Bocken and Geradts 2020). This sector has a solid

foundation that can be used to successfully navigate this transitional phase because of its substantial knowledge and experience (Di Lorenzo and van de Vrande 2019).

Norway's oil and gas industry has a wealth of knowledge in various areas, such as exploration, drilling, production, refining, distribution, energy markets, and infrastructure (Odfjell Technology 2023). Respondent W declared that this gathered information could be crucial in advancing the energy transition, as incumbents have the chance to concentrate on creative and sustainable projects by using their current knowledge and expertise. They can significantly contribute to the transition to a sustainable energy system by refocusing their knowledge and resources on sustainable business models (Bocken and Geradts 2020). However, Respondent Y stated that using current knowledge to innovate sustainable business models is challenging, as oil and gas workers are less adaptable to change since they are used to the current practices and equipment.

It is stated by Respondent Y that development of a cultural shift within the sector is crucial. Moving past the ingrained belief that the oil and gas industries will generate substantial sums of money is essential. This cultural change makes it easier for knowledge transfer to be implemented in the sector, ensuring the successful application of sustainable business models. Referring to Figure 3, knowledge transfer through absorptive capacity can facilitate the successful adoption of renewable energy technologies within their existing operations, giving established oil and gas enterprises a competitive advantage during the energy transition if implemented successfully (Liao et al. 2017). These businesses can utilize their current knowledge to profit from their industry-specific expertise, operational prowess, and wide-ranging networks. Thanks to this advantage, they can quickly spot possibilities, manage the challenges of sustainable business model innovation, and stay ahead of the competition, Respondent Y and W emphasizes.

Another crucial element is cooperation with specialized businesses focusing on renewable energy and sustainable technology (Liu, Dutta, and Park 2021). Existing oil and gas enterprises have access to external knowledge and can gain an understanding of new trends and the best practices in the sustainable energy sectors. The transfer of information is facilitated through strategic alliances and initiatives that promote knowledge exchange, and incumbent enterprises can incorporate sustainable practices into their business models as a result (Liu, Dutta, and Park 2021; Odfjell Technology 2023). Their perspectives are

widened, their absorption capacity is increased, and this collaboration keeps them at the forefront of the energy revolution.

An incumbent Norwegian oil and gas company's ability to adapt and innovate is essential to its long-term viability in the context of sustainable business model innovation (Geissdoerfer, Vladimirova, and Evans 2018; Bocken and Geradts 2020). As Respondent X and Z stated, a company's ability to absorb and incorporate knowledge allows it to navigate the shift to sustainable practices successfully. Therefore, these businesses may ensure long-term viability and relevance in a dynamic energy economy by implementing renewable energy projects, making clean technology investments, and investigating new business models. On the other hand, established oil and gas corporations may encounter severe difficulties if they lack the knowledge needed to shift effectively (IEA 2018; Liao et al. 2017). Their capacity to adopt sustainable business strategies, take advantage of renewable energy sources, and reach climate change mitigation goals is hampered by a lack of information transfer. This failure to adapt may lead to lower profitability, a loss of market share, and reputational harm (Hourneaux, Gabriel, and Gallardo-Vázquez 2018).

In conclusion, innovation in sustainable business models and knowledge transfer are significant factors in determining the competitive advantage of established Norwegian oil and gas firms. These companies may successfully manage the energy transition by utilizing their expertise, partnering with specialized companies, and increasing their absorption capacity. Success in accepting knowledge transfer requires a culture shift and an adaptable attitude. Incumbent oil and gas companies may leverage their experience, successfully navigate the energy transition, and gain a competitive advantage by embracing this revolutionary journey. Lack of knowledge absorption and transfer impedes the development of sustainability and may have detrimental effects on the industry's long-term profitability. Existing businesses can create a more sustainable and resilient future for the Norwegian oil and gas industry by recognizing the need for knowledge transfer.

## **6.2 RQ2: What drivers and barriers does Odfjell Technology face through sustainable business model innovation by implementing geothermal energy?**

The transition towards sustainable business models has become a pressing issue for organizations across various industries, and Odfjell Technology is no exception. As part of their efforts to reduce their carbon footprint and embrace sustainable practices, Odfjell Technology has contemplated implementing geothermal energy to enhance their operations. However, there are several difficulties with this choice. By deploying the three aspects of the TBL approach, environmental, economic, and social, introduced in Figure 6, the discussion of the second RQ explores the drivers and barriers that Odfjell Technology faces in its pursuit of sustainable business model innovation through its implementation of geothermal energy.

### ***Environmental***

Following the environmental component of the TBL approach, the external pressure for reducing carbon emissions is one of the main factors pushing Odfjell Technology to use geothermal energy. They want to decrease their carbon emissions in half by 2030 and reach net zero by 2050 (Hourneaux, Gabriel, and Gallardo-Vázquez 2018; Odfjell Technology 2023). The company can drastically cut their carbon emissions and contribute to global efforts to mitigate climate change by using geothermal energy, a sustainable and renewable energy source (Odfjell Technology 2023). However, all four respondents state that the technical feasibility is a significant barrier to reaching the environmental goals. Geothermal energy systems need specific geological conditions and access to appropriate heat reserves beneath the Earth's surface, which can be difficult without the necessary information and resources (Odfjell Technology 2023). A thorough geological assessment is essential to ascertain the potential of geothermal energy in the operations areas of Odfjell Technology. Respondent Z and X mention that there are challenges in successfully installing geothermal energy wells and achieving their environmental benefits without a thorough grasp of the geological variables and available heat reservoirs.

The absence of thorough study in geothermal energy is another difficulty that Odfjell Technology encounters, in accordance with Respondent W. Despite the development of



successful geothermal projects in nations like Iceland, there is still a lack of knowledge and experience in utilizing geothermal energy in the particular setting of Odfjell Technology's business areas (Odfjell Technology 2023). Understanding the most suitable techniques, best practices, and potential hazards involved with adopting geothermal energy presents issues due to the lack of study in this area. Additionally, the harsh environment and logistical challenges may make it challenging to execute geothermal energy projects in Norway, where Odfjell Technology is based, according to Respondent Z. In terms of accessing geothermal resources and deploying the requisite equipment, the country's rough topography, harsh weather patterns, and distant sites present extra difficulties (Odfjell Technology 2023).

On the other hand, high-temperature drilling presents a unique challenge since it needs specialized equipment and drilling methods that can endure extremely high temperatures and pressures (Odfjell Technology 2023). The adoption of geothermal energy is made more difficult and expensive. Additionally, the absence of thorough study in the area is a barrier because it restricts the knowledge, tried-and-true techniques, and benchmarking information that can be used for geothermal energy projects. Odfjell Technology's pursuit of sustainable business model innovation using geothermal energy is made more difficult by these variables, which raise uncertainty and risk.

### ***Economic***

For Odfjell Technology to pursue a sustainable business model and ensure the long-term profitability of their operations, investments in renewable and sustainable energy sources are crucial. The move to renewable energy is essential for their sustainability goals and fits with the TBL approach's economic component. Renewable energy sources provide numerous advantages, such as cheaper operating costs, reduced carbon emissions, and increased dependability (IEA 2022). Respondent Y mentioned that investments in renewable energy should grow over time as the world gradually moves towards a more sustainable energy mix. Additionally, the potential for cost reductions and long-term financial gains, which align with the economic dimension of the TBL approach, is a crucial factor in Odfjell Technology's use of geothermal energy. The business can eventually experience cheaper energy expenses than conventional energy sources by investing in geothermal energy. Geothermal energy systems are an economically appealing choice for the corporation because of their low operating expenses (Odfjell Technology 2023). This economic viability

of sustainable business model innovation is supported by its cost-effectiveness (Bocken and Geradts 2020).

Other findings relevant to the economic barriers faced by Odfjell Technology include the potential for a prolonged company lifespan and high future revenue. In accordance with Respondent Y and W, lowering reliance on limited fossil fuel supplies and addressing the rising need for renewable energy, including geothermal energy in their innovative sustainable business strategy, can increase the organization's durability. Furthermore, as the world's energy landscape shifts to cleaner and more sustainable sources, geothermal energy offers the potential for considerable future revenue, according to Respondent X. The company can use its expertise and knowledge to help geothermal energy be implemented successfully. They may leverage its core competencies to handle the financial barriers connected with geothermal energy projects by building on their drilling and engineering experience (Odfjell Technology 2023). By doing so, they can gain financial sustainability, another driver for their pursuit of geothermal energy. The corporation can attain better stability and resilience in the face of economic uncertainties by diversifying their energy portfolio and decreasing dependence on varying fossil fuel prices. The long-term, dependable, and affordable energy option offered by geothermal energy helps Odfjell Technology maintain its financial viability.

However, several barriers hinder the economic dimension of sustainable business model innovation through geothermal energy implementation. Respondent Y mentions insufficient incentives and supportive regulations may discourage geothermal project investments, making it difficult for businesses like Odfjell Technology to defend the upfront costs and risks. Furthermore, Odfjell Technology may find it difficult to diversify their business and invest in renewable energy options due to their reliance on a single sector, such as the oil and gas industry. Another major obstacle, according to Respondent W, is the absence of funding for geothermal energy infrastructure, research, and development. This prevents geothermal projects from being scaled up and restricts access to established technology.

### ***Social***

By incorporating geothermal energy into its innovative sustainable business model, Odfjell Technology can better integrate with the social component of the TBL approach and build

its brand. Companies that adopt sustainable practices frequently benefit from attracting socially conscious customers, giving them a competitive advantage. Using geothermal energy, Odfjell Technology may position itself as an ethical and reliable business, enhancing its brand value and possibly gain new clients (Bocken and Geradts 2020). This social component enhances the company's reputation as a socially conscious corporation, which helps its innovative sustainable business model succeed.

The Svalbard regulatory framework serves as an illustration of the importance of policy alignment in geothermal projects. The area's laws guarantee that the geothermal project complies with the law and receives approval from the appropriate authorities. To prove compliance and get the required approvals, it is vital to highlight sustainable development and the project's decreased carbon footprint (Odfjell Technology 2023).

Respondent Y mention that the desire of the younger generations to contribute to a meaningful purpose beyond financial considerations drives Odfjell Technology's pursuit of geothermal energy. The business can support a greener and more sustainable future by implementing sustainable practices, which aligns with a larger social goal. The respondent also states that regulatory frameworks are essential motivators for the use of geothermal energy, supported by Respondent Z. Other companies may be encouraged to invest in geothermal projects by favorable rules and policies that encourage the development of renewable energy sources. Collaborations with other businesses can help geothermal energy efforts succeed even more by facilitating information sharing, allocating resources, and establishing a positive ecology. Regulatory emissions reduction goals and the need for energy security can also division businesses to investigate renewable energy options like geothermal, as Respondent Z mentions.

Nevertheless, there are social barriers in the manner of legislation that make transitioning to renewable energy sources difficult. In some circumstances, obsolete or insufficient rules may prevent geothermal energy from being widely used and prevent the company from maximizing its advantages. The dependence on the oil and gas sector is another obstacle to Odfjell Technology's operational diversification. It takes careful strategic planning and overcoming entrenched interests and dependencies to move away from the traditional fossil fuel industry and toward renewable energy sources (Zhong and Bazilian 2018).

## *Summary*

The case study of Odfjell Technology's geothermal energy implementation provides insights into their sustainable business model's economic, social, and environmental aspects. Although there are technical difficulties and specialist knowledge needs, geothermal energy has advantages for the environment. Although there may be financial and cost savings, initial investment and technological viability are barriers. The adoption of geothermal energy improves the company's social standing; nonetheless, legal frameworks and policies have an impact on implementation. These conclusions guide Norwegian oil and gas businesses as they analyze, interact with stakeholders, locate funding, and promote favorable legislation. Companies may navigate their settings, contribute to sustainability, increase brand value, and cut costs by customizing ways to overcome barriers.

### **6.3 RQ3: How can knowledge transfer help the company overcome the barriers, utilize the drivers to implement geothermal energy, and gain a competitive advantage?**

The third and final RQ revolves around utilizing knowledge transfer to overcome barriers, capitalize on drivers, and achieve a competitive advantage through sustainable business model innovation in implementing geothermal energy. This discussion explores the potential of knowledge transfer as a strategic approach to address the company's barriers to adopting geothermal energy, leverage the key drivers that support its implementation, and ultimately gain a competitive advantage through sustainable business model innovation. By examining the literature and relevant empirical evidence, this argumentative discussion will shed light on the significance of knowledge transfer in driving the transition toward geothermal energy and its potential to enable the transition to a sustainable business model.

#### *Utilizing Knowledge Transfer to Overcome Barriers*

The results highlight how crucial knowledge transfer is to Odfjell Technology's capacity to capitalize on the factors influencing the motivation for and viability of adopting geothermal energy. The TBL approach emphasizes economic gains, environmental benefits, and social considerations.

All four respondents emphasize the fact that through knowledge transfer activities, Odfjell Technology can learn about resource assessment methods, drilling technology, and environmental best practices. The company is now better equipped to carry out geothermal energy projects and coordinate them with environmental objectives (Odfjell Technology 2023). The company can guarantee that their geothermal projects are environmentally sustainable and support environmental conservation by investigating innovative drilling technologies and resource assessment techniques with minimal ecological impact (Odfjell Technology 2022).

Knowledge sharing enables Odfjell Technology to benefit from the financial incentives for using geothermal energy (Geissdoerfer, Vladimirova, and Evans 2018). The business may improve operational performance, cut expenses, and increase economic sustainability by learning about cost-effective geothermal technologies and procedures. Odfjell Technology is better positioned for long-term economic viability in the renewable energy industry by utilizing knowledge transfer to exploit the cost-efficiencies of geothermal energy. The company can maintain its competitiveness and capitalize on the rising demand for sustainable energy solutions thanks to this strategic advantage (Liu, Dutta, and Park 2021).

Furthermore, knowledge transfer is essential for tackling social issues related to the use of geothermal energy. Odfjell Technology can influence beneficial policies and regulatory frameworks by sharing knowledge with stakeholders, policymakers, and regulatory organizations. This cooperative strategy facilitates permitting procedures, addresses regulatory barriers, and fosters an atmosphere conducive to long-term geothermal growth (Bocken and Geradts 2020). By using knowledge transfer in this way, Odfjell Technology can ensure that its geothermal projects align with societal goals and benefit the neighborhood.

### ***Leveraging Knowledge Transfer to Capitalize on Drivers***

The findings shed light on how crucial knowledge transfer is to enable Odfjell Technology to take advantage of the factors identified in the quest for geothermal energy deployment. The requirement for haste and quick action to maintain a competitive advantage and maximum leverage in the new business area is one of the essential drivers highlighted by both Respondent Y, W and Z. Odfjell Technology may keep ahead of the curve by actively

participating in knowledge transfer events, earning crucial insights and know-how that enable them to be at the forefront of geothermal energy development.

Geothermal energy has a more substantial business case than other options, according to Odfjell Technology's capabilities and experience (Odfjell Technology 2023). The company can increase their grasp of geothermal technology, best practices, and operational strategies through knowledge transfer programs. With this information, they are better equipped to make the most of their skills and knowledge, maximizing the financial advantages of geothermal energy through smart decisions and investments.

Further, the findings emphasize that collaboration is a crucial component of knowledge transfer (Synnevåg 2022). Odfjell Technology may benefit from a wealth of expertise and information by working effectively with stakeholders, industry experts, and partners. This cooperative approach encourages innovation and technology development in the geothermal energy sector, making it easier to share insightful knowledge and lessons learned. Odfjell Technology can get a competitive advantage by accelerating their learning curve and gaining access to a more extensive knowledge base by cooperating and sharing solutions (Liao et al. 2017).

Respondent Y also highlight the necessity for firms to change their perspective from only concentrating on financial advantages to serving the world and considering indicators beyond financial measures. By adopting this mentality, Odfjell Technology may use knowledge transfer to understand better the social and environmental factors that influence the use of geothermal energy. This information enables the business to match its plans and operations with sustainability goals, increasing its corporate standing and luring clients and investors who respect businesses that take an ethical approach to business.

However, knowledge transfer in developing sustainable business models comes with difficulties (Bocken and Geradts 2020). To allocate resources to sustainable businesses, there needs to be an investment and a change in perspective. The findings also acknowledge the incomplete exploration of earlier geothermal energy potentials, highlighting the need for additional research and communication, as stated by Respondent Y and W. By promoting communication and leadership among staff members, engaging in research and development, and always seeking out new knowledge and skills to get around obstacles and

maximize the use of geothermal energy, Odfjell Technology can handle these difficulties through knowledge transfer.

### ***Gaining Competitive Advantage through Sustainable Business Model Innovation***

Gaining a competitive advantage through the development of sustainable business models requires being an early adopter, building strategic alliances, and utilizing the potential cost savings and market opportunities linked to sustainable technology (Liao et al. 2017). The importance of these components is acknowledged by Odfjell Technology, which actively uses knowledge transfer to develop innovative strategies that establish the business as a market leader in the renewable energy field (Odfjell Technology 2023).

By embracing geothermal energy as a sustainable alternative and implementing it in their business model, Odfjell Technology demonstrates their proactive approach to innovation and willingness to explore new opportunities. Early adoption enables the business to create a strong foundation in the geothermal energy market before rivals, giving them a competitive advantage regarding market share, clientele, and industry impact. Odfjell Technology can make informed judgments and stay ahead of the curve by transferring information and gaining insights into new sustainable technologies and market trends (Liao et al. 2017).

The pursuit of a competitive advantage by Odfjell Technology depends heavily on strategic alliances and partnerships. The corporation gains access to essential resources, experience, and share information by developing relationships with other organizations, including specialists, stakeholders, and industry peers (Synnevåg 2022). These partnerships help to exchange ideas, best practices, and creative solutions, advancing the development of Odfjell Technology's sustainable business model. The organization may access many information and experiences by utilizing knowledge transfer through these relationships, which will help them improve their plans, streamline their operations, and spot new growth prospects.

Furthermore, Odfjell Technology strengthens its position by utilizing sustainable technology's market prospects and potential cost savings. Geothermal energy installation, for example, has the potential for long-term cost reductions through decreased energy consumption, decreased operating costs, and improved resource usage. Utilizing knowledge transfer, the company may obtain data on cost-effective solutions, best practices, and

sustainable technology, as Respondent Y and X emphasizes. This enables them to streamline operations, cut expenses, and boost profitability. As a result, the business is positioned to compete effectively and sustainably in the market for renewable energy.

### ***Summary***

Odfjell Technology can deploy geothermal energy despite budgetary limitations, regulatory barriers, and technical feasibility issues by being an early adopter, encouraging collaboration, and adopting a sustainability-focused mindset. This technique relies heavily on knowledge transfer for the business to gain experience, improve financial planning, and influence favorable legislation. Odfjell Technology improves its brand, engages stakeholders, takes advantage of cost savings and market opportunities, and obtains a competitive advantage in geothermal energy by utilizing their drilling capabilities and dedication to sustainability. Other oil and gas businesses can benefit from these insights, which will help them overcome barriers, encourage innovation, and aid in developing a market for sustainable energy. However, due to the case study's context-specific nature, caution must be taken when extending these findings.



## **7.0 Conclusions**

This chapter presents the research summary, together with a discussion of its managerial implications and limitations of the study. Finally, suggestions for further research are presented.

### **7.1 Research Summary**

The research objective of this thesis has been to figure out how the knowledge and capabilities of incumbent Norwegian oil and gas companies can contribute to gaining a competitive advantage through sustainable business model innovation, investigating the case study of Odfjell Technology. The main conclusions this research has contributed are summarized below.

#### ***RQ1:***

Knowledge transfer is crucial in determining incumbent Norwegian oil and gas companies' competitive advantage and ability to transfer to a sustainable business model. These enterprises may successfully manage the energy transition by utilizing their existing knowledge and collaborating with niche companies while improving absorptive capacity. Lack of knowledge absorption and transfer can result in lost competitive advantage, decreased profitability, and delayed progress toward sustainability. Therefore, prioritizing knowledge transfer is vital for these companies to successfully transition to sustainable practices and ensure long-term viability in an evolving energy environment.

#### ***RQ2:***

Odfjell Technology's pursuit of sustainable business model innovation through geothermal energy implementation is driven by climate change urgency, cost savings, and enhanced corporate image aligned with the TBL approach. Nevertheless, overcoming barriers, including up-front costs, technical problems, and regulatory issues, is crucial for success. Strategic planning, stakeholder collaboration, and a long-term perspective are required to navigate these drivers and barriers successfully. Other oil and gas companies can learn from

this case study, align with the TBL approach, and position themselves as leaders in sustainable practices by applying similar strategies and contributing to a greener future.

***RQ3:***

Knowledge transfer is vital for Odfjell Technology to achieve a competitive advantage through sustainable business model innovation in geothermal energy. It aids in overcoming barriers and utilizing drivers like economic effectiveness and environmental sustainability. They could position themselves as front-runners in the new energy market by addressing the complexity, financial limitations, and regulatory challenges associated with geothermal energy. By utilizing knowledge transfer, other oil and gas companies can profit from this strategy by aligning their business models with sustainability principles, navigating complexity, optimizing techniques, and contributing to a sustainable energy future.

## **7.2 Managerial Implications and Limitations of The Study**

This section summarizes the main findings of the managerial implications for the thesis' research objective.

The findings of this master's thesis investigating the knowledge and capabilities of incumbent oil and gas companies contributing to gaining competitive advantage through sustainable business model innovation, specifically focusing on the case study of Odfjell Technology, have several important managerial implications.

First, the study highlights the critical role of knowledge transfer in impacting the competitive advantage of incumbent oil and gas companies through sustainable business model innovation. By effectively transferring knowledge within the organization, these incumbents can utilize their current capabilities and expertise to transition towards sustainable business models that provide them a competitive advantage in emerging energy markets by successfully transferring knowledge within the organization.

Further, the research identifies the drivers and barriers faced by the case company, Odfjell Technology, in implementing geothermal energy as part of their sustainable business model innovation. Understanding these drivers, such as regulatory incentives and the evolving

market demand, can enable the company to identify opportunities and prioritize resources accordingly to improve the company's viability of lifespan. Similarly, recognizing the barriers, such as technical challenges or financial limitations, allows Odfjell Technology to address and mitigate these barriers to successful implementation proactively.

Ultimately, the study emphasizes the significance of knowledge transfer in assisting Odfjell Technology to overcome these barriers, successfully leverage the identified drivers to implement geothermal energy, and ultimately gain a competitive advantage through sustainable business model innovation. Odfjell Technology may improve their internal capacities, encourage innovation, and adapt to the shifting energy landscape by facilitating the sharing of knowledge and expertise across various departments and levels of the company.

However, it is critical to recognize certain limitations of this research. First off, the results are based on a single case study of Odfjell Technology, which could limit their applicability to other oil and gas companies. To provide a more comprehensive understanding of the topic, future studies could investigate other case studies or use a more comprehensive research design. Second, while additional factors, such as market conditions, or outside alliances, could also impact these results, the study primarily focuses on the impact of knowledge transfer on competitive advantage through sustainable business model innovation.

### **7.3 Suggestions for Further Research**

Additional study is essential to establish a more thorough and solid grasp of the research objective and address the identified limits successfully. It might be necessary to broaden knowledge of the relationship between innovation in sustainable business models and knowledge transfer, particularly in the oil and gas sector. This involves conducting multiple case studies across multiple companies, using a comparative analysis across industries, integrating longitudinal studies into practice, looking at external factors, adding quantitative research approaches, and carrying out intervention studies. These study approaches would strengthen the findings' generalizability and robustness and offer management insightful guidance on making the best possible use of their knowledge resources, encouraging innovation and creating a long-term competitive advantage.

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# Appendices

## A. Interview Guide

### Guide for exploratory interviews

*(The following information is to be read by the interviewer to the respondent before the core interview starts and/or shared with the respondent in written form before the interview)*

#### General Questions:

1. Can you describe your company's current business model and its evolution?
  - a. What motivated your company to shift towards a more sustainable business model?
2. How does geothermal energy fit into your company's sustainability strategy?
3. What are your company's goals for incorporating geothermal energy into the portfolio?
4. Can you describe any previous experience your company has had with geothermal energy or renewable energy sources in general?

#### Drivers and Barriers:

1. What are the primary drivers behind your company's decision to incorporate geothermal energy into the portfolio?
2. How does geothermal energy compare to other renewable energy sources regarding feasibility and cost?
3. What challenges has your company faced when transitioning towards a more sustainable business model?
4. How has your company addressed any obstacles to implementing geothermal energy in the portfolio?
5. How do you see geothermal energy contributing to your company's overall sustainability goals in the long term?

#### Knowledge Transfer:

1. What expertise or knowledge did your company need to develop to implement geothermal energy in the portfolio?
  - a. How did your company go about acquiring this expertise?
2. Did your company collaborate with external partners or stakeholders when incorporating geothermal energy into the portfolio?
  - a. How has your company shared the experience and knowledge of incorporating geothermal energy with other stakeholders in the industry?
3. How does your company plan to continue learning and developing the knowledge of geothermal energy?